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C O N T E N T S

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THE IMPORTANCE OF AGRICULTURE'S EXTENSION IN THE ARAB REPUBLIC OF IRAQ

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Abstract

The study is situated in the field of agriculture and the main subject is extension of agriculture in Iraq, within the context of creating a clear vision of the current status of agriculture in Iraq, by comparison regarding crop and agricultural areas with neighbouring countries such as Iran, Jordan, Saudi Arabia, Turkey, and Syria. Given the fact that extension is a multidisciplinary function, an educational, political and organizational instrument, several factors will be taken into account, such as the population of Iraq, since it is important to evaluate the efficiency of the agricultural production regarding meeting local needs and not being depended on imported food. The Iraqi educational system will also be considered a factor of extension, which is why a section will be dedicated to it, also the practical activities of society are considered important since they lead to the drafting and implementation of policies that are able to help the development of agriculture and at the same time respect the environment, health and quality of food.

Key words**:** *agriculture in Iraq, extension of agriculture*

INTRODUCTION

Agriculture represents a major component of the economy in Iraq and prior to the petroleum industry it was the main economic activity. The sector of agriculture has been heavily influenced by Iraq's involvement in military conflicts (particularly the 1980-1988 Iran-Iraq War, the 1991 Gulf War, and the 2003 Iraq War) and has declined considerably due to the lack of investment, isolation from the global economy and counterproductive agricultural policies. Iraqi agriculture is now beginning to take a new direction and markets are just beginning to modernize their operations in order to meet local demands. The direction in which the Iraqi agriculture is going represents an important matter, since it can revive and contribute to national wellbeing, by taking also into account the growing competition for water and the challenges due to climate change, or use pesticides and chemicals in order to increase the production.

"Extension" usually refers to an educational function that applies to an institution which disseminates information with the intention to promote knowledge, skills and methods, in the case of this study it is associated with agriculture. Extension of agriculture represents all the methods that help promote good practices of agriculture, including education, technology and special techniques, which is why a section will be dedicated to the educational system in Iraq.

At the same time, extension is a political and organizational instrument and most ministries of agriculture have an extension unit that deals mainly with crops and other agricultural systems, extension is multidisciplinary.

This study will include sections dedicated to agricultural surfaces in Iraq and population, both urban and rural, in order to obtain a realistic view of the current status of agriculture that will lead to conclusions and recommendations.

MATERIALS AND METHODS

This study involves the use of theory and statistical data. The theory may or may not be

made explicit in the design of the research, although it will usually be made explicit in presentation of the findings and conclusions.
In the paper the following indicators have been used: arithmetic mean, coefficient of variation, average annual growth rate, ecologic indicators and statistical indicators.
The formulas used for to calculate these indicators, are:
For the arithmetic mean $\bar{x} = \frac{\sum xi}{n}$, where $\bar{x}$ = the arithmetical mean, xi = the average production values for a number of years (i); n= number of years taken into account. The average annual rate of growth [1] = *r*1990-1999 (and respectively r2000 – 2014)= $\sqrt{\prod \frac{(p1)}{(p0)} - 1}$, where r1990-1999, and respectively r2000 -2014= average annual growth rate: $\prod \frac{(p1)}{(p0)}$ = entangled growth indicators.

RESULTS AND DISCUSSIONS

The evolution of the rural population during 2000-2015 in the Arab Republic of Iraq

The total population in Iraq was estimated at 35.9 million people in 2015, according to the latest census figures. The population of Iraq represents 0.48 percent of the world´s total population.

Table 1. Evolution and statistical indicators characterizing the total population and rural population in Iraq and some neighbouring countries during 1990-2015

Country	Indicator	MU	Period 1990-2015					St Dev	Coefficient of variation	The annual growth rate
			1990	2000	2010	2015	Mean			
							Mil. ha	Mil. ha	%	%
Iran	total	mil pers	56.17	65.85	74.25	79.11	67.66	6.99	10.33	1.38
	rural	mil pers	24.53	23.68	21.81	21.06	23.03	1.15	5.01	-0.61
		vs tot %	43.67	35.96	29.37	26.63	x	x	x	X
Iraq	total	mil pers	17.48	23.57	30.87	36.42	25.72	5.65	21.97	2.98
	rural	mil pers	5.29	7.43	9.56	11.12	7.99	1.72	21.58	3.01
		vs tot %	30.29	31.50	30.97	30.53	x	x	x	X
Jordan	total	mil pers.	3.36	4.77	6.52	7.59	5.29	1.23	23.24	3.32
	rural	mil pers	0.90	0.96	1.14	1.24	1.02	0.11	10.71	1.30
		vs tot %	26.71	20.19	17.53	16.32	x	x	x	X
Syria	total	mil pers	12.45	16.35	20.72	18.50	16.98	2.62	15.45	1.60
	rural	mil pers	6.36	7.86	9.18	7.83	7.92	0.84	10.54	0.84
		vs tot %	51.07	48.05	44.32	42.34	x	x	x	X
Turkey	total	mil pers	53.99	63.24	72.31	78.67	65.67	7.34	11.17	1.52
	rural	mil pers	22.03	22.30	21.18	20.93	21.79	0.48	2.20	-0.20
		vs tot %	40.80	35.26	29.28	26.60	x	x	x	X

FAOSTAT, http://faostat3.fao.org/download/E/EL/E [3]

In Iran, it appears that there has been an increase of the total population during 1990-2015, and a decrease of the rural population, maybe due to the economic development.
In Iraq though, an increase appears both to the rural and total population. As of 1 January 2016, the population of Iraq was estimated to be 37,032,056 people. This is an increase of 3.30 % (1,183, 712 people) compared to population of 35,848,344 the year before. In 2015 the natural increase was positive, as the number of births exceeded the number of deaths by 1,066,847.
Jordan also shows and increase of the total and rural population, just as Syria. Turkey shows a relatively constant total population, and shows a decrease in the rural one.
Compared between them, Iran shows the highest mean, followed by Turkey.
The rural population in Iraq was 10,951,000 like in 2015.
A third of Iraq's population works in the agricultural sector, which provides a living for about 11 million out of 35 million Iraqis.

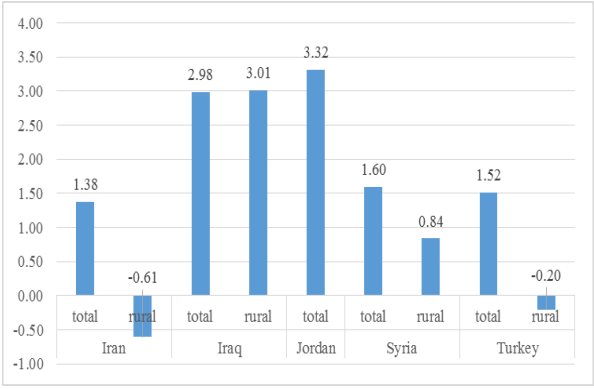

Fig. 1. Total and rural population growth rate in some countries bordering Iraq and for the period 1990-2015

All countries show an increase of the population density since 1990 to 2015. The highest mean shows is Syria (92.44) and in Turkey (85.33). Jordan and Iraq have a relatively close mean (59.8 and 58.95).
Iran however, seems to have a mean of 41.55, which is the smallest in comparison to the development of population density in the other countries.

Table 2. Indicators characterizing population density (people per sq. Km of land area) in Iraq and some bordering countries during 1990-2015

Country	MU	Period 1990-2015					StDev	Coefficient of variation	The annual growth rate
		1990	2000	2010	2015	Mean			
						mll ha	mll ha	%	%
Iran	per/km2	34.5	40.4	45.6	48.6	41.55	4.29	10.33	1.38
Iraq	per/km2	40.0	53.9	71.1	83.9	58.95	13.12	22.26	3.01
Jordan	per/km2	38.1	54.0	73.4	85.5	59.82	13.75	22.98	3.29
Syria	per/km2	67.8	89.0	112.8	100.8	92.44	14.31	15.48	1.60
Turkey	per/km2	70.2	82.2	94.0	102.2	85.33	9.53	11.17	1.52

FAOSTAT, http://faostat3.fao.org/download/E/EL/E [3]

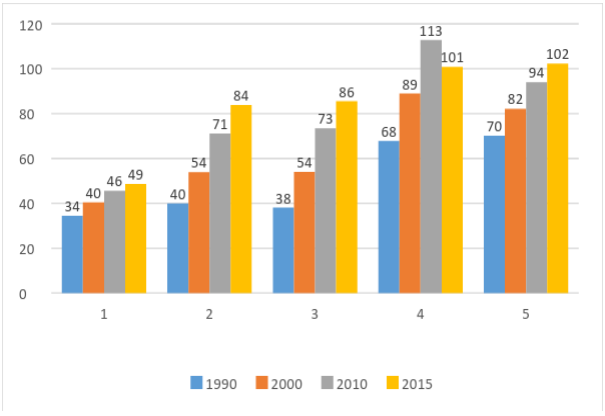

Fig. 2. Size of population density (people per sq. Km of land area) in Iraq and some countries bordering the period 1990-2015

main crops production in the Arab Republic of Iraq during 2000-2013

Agricultural land (% of land area) in Iraq was last measured at 18.90 in 2011, according to the World Bank. Agricultural land refers to the share of land area that is arable.
Of the total area of Iraq (43.7 million ha), 22, percent i.e. 9.5 million ha is cultivable land, suitable for agriculture.
Land actually under crops is about 5 million ha.4 Agriculture is mostly practiced on small farming units. More than 80 percent of the farms have a total size of less than 10 ha and even these 10 ha are on average scattered over several different locations

Evolution of agricultural areas and the

Table 3. Structure and use of land in Iraq during 1990-2013

Land use	1990		2000		2010		2013	
	mil ha	%	mil ha	%	mil ha	%	mil ha	%
Country area	43.832	100.0	43.832	100.0	43.524	100.0	43.524	100.0
Agricultural area	9.230	21.1	8.300	18.9	8.220	18.9	9.230	21.2
Arable land	5	11.4	4.1	9.4	4	9.2	5	11.5
Permanent crops	230	0.5	200	0.5	220	0.5	230	0.5
Total area equipped for irrigation	3.525	8.0	3.525	8.0	3.525	8.1	3.525	8.1
Permanent meadows and pastures	4	9.1	4	9.1	4	9.2	4	9.2
Forest	804	1.8	818	1.9	825	1.9	825	1.9
Inland water	95	0.2	95	0.2	92	0.2	92	0.2
Other land	33.703	76.9	34.619	79.0	34.387	79.0	33.377	76.7

FAOSTAT, http://faostat3.fao.org/download/E/EL/E [3]

Table 4. Evolution of the use of land in Iraq during 1990-2013

Mode of use	MU	1990	1995	2000	2005	2010	2013
Country area	mil ha	43.832	43.832	43.832	43.832	43.524	43.524
	vs % 1990	*100.0*	*100.0*	*100.0*	*100.0*	*99.3*	*99.3*
Agricultural area	mil ha	9.230	9.100	8.300	9.390	8.220	9.230
	vs % 1990	*100.0*	*98.6*	*89.9*	*101.7*	*89.1*	*100.0*
Arable land	mil ha	5.000	4.800	4.100	5.200	4.000	5.000
	vs % 1990	*100.0*	*96.0*	*82.0*	*104.0*	*80.0*	*100.0*
Permanent crops	mil ha	230	300	200	190	220	230
	vs % 1990	*100.0*	*130.4*	*87.0*	*82.6*	*95.7*	*100.0*
Total area equipped for irrigation	mil ha	3.525	3.525	3.525	3.525	3.525	3.525
	vs % 1990	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Permanent meadows and pastures	mil ha	4.000	4.000	4.000	4.000	4.000	4.000
	vs % 1990	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Forest	mil ha	804	811	818	825	825	825
	vs % 1990	*100.0*	*100.9*	*101.7*	*102.6*	*102.6*	*102.6*
Inland water	mil ha	95	95	95	95	92	92
	vs % 1990	*100.0*	*100.0*	*100.0*	*100.0*	*96.8*	*96.8*
Other land	mil ha	33.703	33.826	34.619	33.522	34.387	33.377
	vs % 1990	*100.0*	*100.4*	*102.7*	*99.5*	*102.0*	*99.0*

FAOSTAT, http://faostat3.fao.org/download/E/EL/E [3]

Of the total area of Iraq (43.7 million ha), approximatively 9 million ha is cultivable land, suitable for agriculture.
Land actually under crops has a mean of 9.230 mill ha. The total area equipped for irrigation shows a mean of 3.525 mill ha (constant), while a mean of 33.905 mill ha is used for other land.

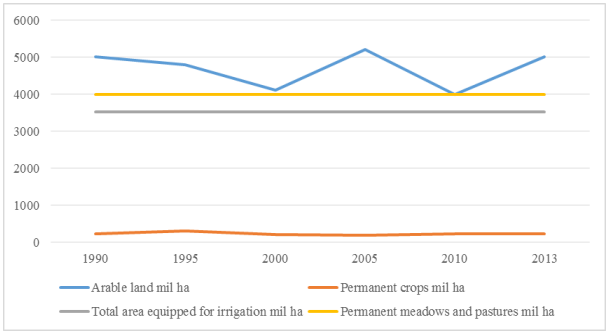

Fig. 3. Size surfaces on usage categories, in Iraq, during 1990-2013

Table 5. Evolution cereal production (kg per hectare) in Iraq and neighbouring countries during 1990-2014

Country	Indicator	Period 1990-2014					St Dev	Coefficient of variation	The annual growth rate
		1990	2000	2010	2014	Mean			
						Mil. ha	Mil. ha	%	%
Iran	kg/ha	1,445.3	1,833.3	2,357.9	1,963.4	1,992.05	315.63	15.84	1.28
	vs 1990(%)	100.0	126.8	163.1	135.8	x	x	x	x
Iraq	kg/ha	1061	363.2	1,697.1	2,187.2	1,190.09	537.35	45.15	3.06
	vs 1990(%)	100.0	34.2	160.0	206.1	x	x	x	x
Jordan	kg/ha	1,220	1,726.3	1,962.6	1,455.4	1,370.36	451.56	32.95	0.74
	vs 1990(%)	100.0	141.5	160.9	119.3	x	x	x	x
Syria	kg/ha	750	1,148.6	1,231.9	1,063.4	1,500.82	391.00	26.05	1.47
	vs 1990(%)	100.0	153.1	164.3	141.8	x	x	x	x
Turkey	kg/ha	2,214.2	2,311	2,727.1	2,831.1	2,420.24	343.83	14.21	1.03
	vs 1990(%)	100.0	104.4	123.2	127.9	x	x	x	x

World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators[12]

The highest development of cereal yield (kg per hectare) is registered during 1990-2014 in Turkey, with a mean of 2,420, followed by Iran with 1,992.05 and Syria, with 1,500.82. Iraq and Jordan show relatively close means, respectively 1,190.09 and 1,370.36.

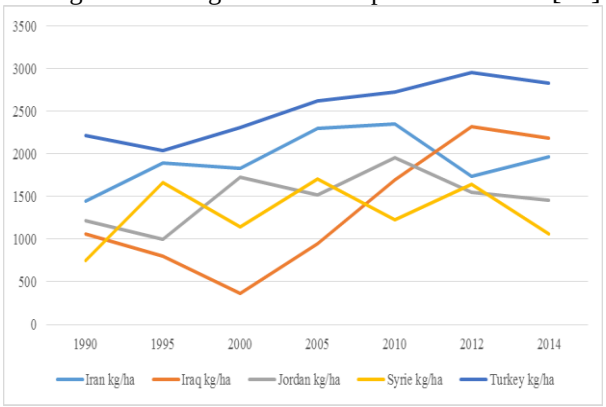

Fig. 4. Cereal grain yield in Iraq and neighbouring countries during the period 1990-2014

In terms of cultivated areas, there are large variations between the years due to climatic and/or economic reasons.

The evolution of the education system in the Arab Republic of Iraq

The political changes from Iraq after 2003 and the transition to democracy have led to a reform of the educational system. The philosophy on which the new educational system was based has been established in 2008, and relies on the moral and religious values, perceived as foundations of the social, educational and scientific processes and on the humanistic values, which is respecting the human dignity of all individuals and the family as foundation of the society.

Table 6. Evolution duration of compulsory education (years) in Iraq and neighbouring countries during 1999-2014

Country	MU	1999	2005	2006	2007	2012	2013	2014	Vs Iraq (+ years)
Iran	years	5	8	8	8	8	8	8	2
Iraq	years	6	6	6	6	6	6	6	-
Jordan	years	10	10	10	10	10	10	10	4
Syria	years	6	9	9	9	9	9	9	3
Turkey	years	8	8	8	8	12	12	12	6

World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators

During 1999 -2014, the duration of compulsory education has been of 8 years in Iran (except for 1999, when it was 5 years), 6 in Iraq, and 10 in Jordan. In Syria and Turkey the evolution appears to be more obvious. During 1999-2007 the duration of compulsory education was of 8 years in Turkey, and since 2012 of 12 years.

In Syria, the duration of compulsory education was 6 years and since 2005 it became of 9 years.

Table 7. Evolution adult literacy rate, population 15+ years, both sexes (%) in Iraq and adjacent countries.

Country	MU	1991	2002	2004	2009	2011	2015
Iran	both sexes (%)	65.53	77.00	82.44	82.96	83.63	87.17
	vs. 1991 (%)	*100.00*	*117.50*	*125.80*	*126.60*	*127.61*	*133.02*
Iraq	both sexes (%)						79.72
Jordan	both sexes (%)		89.89	91.13	92.55	95.90	98.01
	vs. 2002(%)		*100.00*	*101.38*	*102.96*	*106.69*	
Syria	both sexes (%)		82.89	80.84			86.30
	vs. 2002(%)		*100.00*	*97.53*			*104.12*
Turkey	both sexes (%)	79.23		87.37	90.82	94.11	95.69
	vs. 2004(%)	*100.00*		*110.26*	*114.62*	*118.77*	*120.77*

World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators, [12]

In Iran, during 1991-2015, the adult literacy rate has a mean of 79 %, in Iraq a mean of 79.72 % (in 2015), in Jordan a mean of 93%, and in Syria a mean of 83 %. The more constant literacy rate is registered in Turkey for both sexes, 89.4%.

Table 8. Evolution of employment in agriculture (% of total employment), în Iraq and neighbouring countries during 2000-2014

Country	MU	2000	2006	2008	2011	2014	Error (%)
Iran	%		23.2	21.2		17.9	-5.3
Iraq	%		29.7	23.4			-6.3
Jordan	%	4.9	3.1	2.6	1.7	1.8	-3.1
Syria	%	32.9	19.6	14.5	13.2		-19.7
Turkey	%	36	22.6	22.1	22.8	19.7	-16.3

World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators [12]

During 2000-2014, employment in agriculture has represented 17.9% of total employment in Iran, 1/8% in Jordan and the highest rates appear to be in Turkey. The new Curriculum has been drafted with the technical support of the UNESCO International Bureau of Education, and includes the following principles:

-Encouraging excellence and creativity in all the areas of intellectual life, scientific work and the arts

-Increasing the enrolment of learners in educational institutions

-Paying particular attention to the population of rural and remote areas

-Strengthening the role of education in consolidating tolerance and understanding among people based on the principles and practices of learning to live together peacefully at national, regional and international levels.[6]

According to the National Development Plan 2010-2014, Iraq is seeking to be a peaceful and stable nation under the auspices of a federal democracy.[7] In Iraq, the Ministry of Education has the function to elaborate the educational policy, plan and monitor implementation, develop the curriculum, manage schools, teachers and other educational personnel, develop standards for educational guidance and vocational counselling, develop standards for assessment and examinations. Education is under the supervision of the Ministry of Education, Kurdistan Region (According to the Constitution of 2005).

The Ministry of Higher Education and Scientific Research consists of six departments, defines the higher education policy and supervises the administration and organization of the higher education system: universities, colleges and technical institutes. Both the private and the public universities are autonomous in Iraq regarding the financial, administrative and technical matters. In Iraq, the Ministry of Agriculture and Irrigation, just like other ministries, can administer vocational training centers in order to produce skilled workers.[8]

In June, 31, 2015, 144 students were enrolled in formal education (grades 1 – 12); 15,508 in camp settings, and 15,636 in non-camp settings. Of the 29,338 children enrolled in basic education (grades 1 – 9), 69% were boys and 71% girls. 3,810 students were benefitting from non-formal education activities. There are currently a total of 115,000 students enrolled in the 13 public universities and 11 private universities of the Kurdistan Region. The vast majority of these students attend public universities, which tend to be much larger than private universities and do not charge tuition. Most of the universities in the Region are very new: with the exception of Salahaddin University, nearly all of the local universities are less than two decades old. However, because of the Region's stability, Kurdistan's universities are drawing higher-level professors and students from historically more prestigious universities in Baghdad, Basra, and Mosul. While this process is providing the universities a boost in competitiveness, it also places further stress on the capacity of the Region's higher education system. [10]

Table 9. The evolution of life expectancy at birth, total (years), in Iraq and neighbouring countries during the period 1990-2013

Country	Indicator	Period 1990-2013					St Dev	Coefficient of variation	The annual growth rate
		1990	2000	2010	2013	Mean			
						Mil. ha	Mil. ha	%	%
Iran	years	63.9	70.1	74.0	75.1	70.48	3.07	4.36	0.71
	vs 1990(%)	100.0	109.8	115.8	117.6	x	x	x	x
Iraq	years	68.4	70.8	68.8	69.5	69.87	0.90	1.29	0.07
	vs 1990(%)	100.0	103.5	100.6	101.6	x	x	x	x
Jordan	years	69.9	71.8	73.4	73.9	72.01	1.21	1.68	0.24
	vs 1990(%)	100.0	102.7	105.0	105.7	x	x	x	x
Syria	years	70.3	73.3	74.9	74.7	73.35	1.58	2.15	0.27
	vs 1990(%)	100.0	104.4	106.6	106.3	x	x	x	x
Turkey	years	64.3	70.0	74.2	75.2	70.31	3.48	4.95	0.68
	vs 1990(%)	100.0	108.9	115.4	116.9	x	x	x	x

World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators[12]

The highest life expectancy at birth, total (years) appears to be in Syria (73,35) during 1990-2013, followed by Iran, Turkey and Jordan. The highest coefficient of variation is showed in Turkey.

Agricultural extension in the Arab Republic of Iraq

Extension is a non-formal educational function that applies to any institution that disseminates information and advice with the intention of promoting knowledge, attitudes, skills and skills. Educational organizations are important elements in the institutional context for extension. The work of universities and training institutes in particular has a significant impact on extension organizations. The content of their curricula as well as the numbers and qualifications of their graduates are limiting or enabling factors in any country[1].

At the same time, extension is a political and organizational instrument utilized to facilitate development. Its purposes may differ, from technology transfer to problem-solving educational approaches and advancing community involvement in the process of development.

Most ministries of agriculture have an extension unit that deals mainly with crops and other agricultural systems. During the 1970s and 80s, efforts were made to unify ministerial agricultural extension operations but with limited success.

Extension is multidisciplinary. It combines educational methodologies, communication and community techniques. When effectively provided extension is known to enhance social and economic development. Many studies have demonstrated the high economic returns of investments in agricultural dissemination, thus investment in agricultural research and extension is a good input of agricultural growth [2]. The role of government is critical for the reconstruction of agricultural extension even if the extension services are provided by private contractors[9]

The agricultural policies in Iraq indicate that many ministries, committees, and institutions are involved in drawing up the agricultural policies of the country. These include the Agriculture Committee in the parliament, Council of Ministers, Ministry of Agriculture, Ministry of Water Resources, Ministry of Environment, and some non-governmental organizations (NGOs). The most important agriculture related policies that have recently been adopted in Iraq are:

-Adoption of the five-year plan (2010-2014) for the development of Iraqi agriculture by the Ministry of Agriculture[7]. The plan has allocated USD 9.5 billion to implement its provisions. The plan targets strategic projects in the fields of water resources and provides the input requirements for agricultural production, including using environmentally friendly approaches to pest control and modern irrigation techniques, in addition to providing seeds of new varieties which are resistant to salinity and drought

-Agricultural initiative. The agricultural initiative was launched by the Iraq Council of Ministers in 2008. It included creating several projects and activities to help the agricultural sector reduce desertification and to provide farmers with agricultural machines and suitable water for irrigation.

-The Ministry of Agriculture allowed 10 years for the country to reach a state of self-sufficiency in strategic crops through the application of the agricultural initiative

-The national strategy for the protection of the environment in Iraq and the executive work plan for the period of 2012-2017 were prepared by Ministry of Environment.

-On the private sector, USAID has invested in programs designed to stabilize communities, foster economic and agricultural growth and build the capacity of national, local, and provincial governments to respond to the needs of the Iraqi people. Currently, USAID assists private Iraqi agricultural businesses in improving their productivity by introducing to them the latest technologies in agribusiness, including soil and water management. The goal is to increase productivity, lower production and marketing costs, increase the profitability of agricultural enterprises, and generate rural employment with technical assistance and business development training. USAID is helping the private sector increase agricultural revenues.[11]

-Of the total area of Iraq (43.7 million ha), 22

percent, i.e. 9.5 million ha is cultivable land, suitable for agriculture.
-Land actually under crops is about 5 million ha.4
-Agriculture is mostly practiced on small farming units.
-There are currently a total of 115,000 students enrolled in the 13 public universities and 11 private universities of the Kurdistan Region.
-The agricultural policies in Iraq indicate that many ministries, committees, and institutions are involved in drawing up the agricultural policies of the country.
-The national strategy for the protection of the environment in Iraq and the executive work plan for the period of 2012-2017 were prepared by Ministry of Environment.
According to the comparison in Tables 3,4 and 5 it appears that Iraq needs some improvement, Turkey shows consistency, Iran and Syria, show mixed results. It is important at the current status to create effective communication on new techniques and trends and generate extension services, such as infrastructure facilities, needed for agricultural development.

CONCLUSIONS

Analysing the distribution of the sample Iraq's agriculture sector has declined \during the last few decades due to the lack of investment and counterproductive agricultural policies. Iraq has been dependent on importing a significant portion of its food. However, Iraqi agriculture and business are just beginning to modernize their operations.
According to Gallagher (2002) "agricultural extension services in developing countries are currently grossly under-funded to undertake the activities required for achieving food security while protecting the productive resource base in order to keep up with population and economic growth[4]".
A weak link between research and extension is a major issue in technology flow in many countries [5].
Private companies and nonprofit organizations also provide advice to farmers on agrochemical and other input use. Extension organizations need to develop communication with fertilizer providers since excessive use of agrochemicals can harm human health and the environment, and programs such as integrated pest management are recommended.
Of the total area of Iraq (43.7 million ha), 22 percent, i.e. 9.5 million ha is cultivable land, suitable for agriculture.
Land actually under crops is about 5 million ha.
Agriculture is mostly practiced on small farming units.
There are currently a total of 115,000 students enrolled in the 13 public universities and 11 private universities of the Kurdistan Region
The agricultural policies in Iraq indicate that many ministries, committees, and institutions are involved in drawing up the agricultural policies of the country
A third of Iraq's population works in the agricultural sector, which provides a living for about 11 million out of 35 million Iraqis.

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THE HUMAN RESOURCES IN THE TOURISM OF THE BISTRITA-NASAUD COUNTY, ROMÂNIA

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Abstract

The study aimed to analyze the employment evolution in tourism sector of Bistrita-Nasaud County during 2011 – 2015 both in terms of quantity and quality. Therefore, the following indicators were taken into consideration and analized: civilian occupied population in the county economy by gender, average number of employees, number of employees by gender and activities, nominal average income gross, share rate of occupied population in tourism industry. The results showed that in the analyzed period, 2011 – 2015, the employment in tourism industry recorded an ascendant trend, which can be considered a sign of activity growth in this sector. Also, the salary earnings in this sector of activity increased during period 2011 – 2015.

Key words**:** *labor force, human resources, tourism*

INTRODUCTION

Bistrita-Nasaud County is located in the North of Romania and includes 62 administrative units of which: 1 municipality, 3 towns, 58 communes and 235 villages.
In the rural tourism development, human resources have an important role.
Besides the technical endowment, tourism activity requires the presence of human resources, a factor that ensures the other components functionality of the offer.
Non agricultural sectors are less developed in the rural communities and oblige mainly young people to look for jobs in the cities or to emigrate in the other EU countries. [2]
In this respect, the present article is a study case in Bistrita Nasaud County including a quantitative analysis of human resources in tourism during 2011 - 2015 in order to identify the influence of labor on the development of tourism and agro tourism in the area.

MATERIALS AND METHODS

The following indicators were analyzed: civil occupied population by national economic activities and gender, average number of employees by economic sector, the number of employees splitted by gender and activities from national economy and the medium monthly gross earning by national economy activities.
The average annual growth was calculated by the following formula $r = \sqrt[n-1]{\prod(p1/p0)} - 1$; which: ∏p1/po = growth chain indicators. The trend was calculated by: linear equation Y=ax+b; quadratic Y= ax^2+bx+c and power function $y=Ax^{b,}$ in which Y is the analyzed phenomenon, a,b,c= coefficients and t=time. The data presented and analyzed in the present study were provided by the National Institute of Statistics of Romania for the period 2011-2015.

RESULTS AND DISCUSSIONS

According to the balance of labor methodology, the employed population includes all the people who have an income generating occupation, which habitually is included in one of the national economic activities, being employed in an economic or social activity, based on a work contract or independently (on their own) in order to obtain income in the wages, payment in kind etc.

During the period 2011 – 2015, concerning the civil occupied population in Bistrita-Nasaud County in economic activities and tourism industry, by gender it can be observed that from the total county's labor force an important part is engaged in the tourism activity, respectively in hotels and restaurants.
In 2012, it was recorded the highest number of 131.7 thousand people occupied civilian population at the county level. Of this number, 2,400 are people who work in "hotels and restaurants".
If in 2011, there were 2,100 people involved in tourism activity, in 2015 this number increased to 2,500 persons, the growth recorded in the period under review being a significant one: 4.46% (Table 1).

Table 1. The occupied civil population at Bistrita-Nasaud county level, by economic activity and gender during 2011 – 2015 (thousand persons)

Year	Total occupied civil population at county level	of which: females	Occupied civil population in hotels and restaurants	of which: females
2011	127.0	61.3	2.1	1.7
2012	131.7	63.2	2.9	2.4
2013	130.2	60.5	2.1	1.6
2014	128.8	60.0	2.5	1.8
2015	129.1	60.1	2.5	2.0
Annual growth rate %	0.41	-0.49	4.46	4.15

Source: Processed data from http://statistici.insse.ro [1]

This increase is also even more important at the county level, where the total economic activity rate was only slightly upward (0.41%).
The overwhelming share of females among workers in the tourism is due to the specificity of the activity in this area where, in most sectors, are traditionally required skills specific to women.
The evolution of occupied civil population at Bistrita-Nasaud county level during 2011 – 2015 is also illustrated in Fig.1.
Regarding the average number of employees it can be noticed a larger number of the occupied civil population employed in the tourism sector, year by year during the period 2011 – 2015 (Table 2).
If in the 2011, the average number of employees accounted for 54,045, in 2015, it reached 60,053 persons, by 6,008 employees more compared to the reference year 2011.

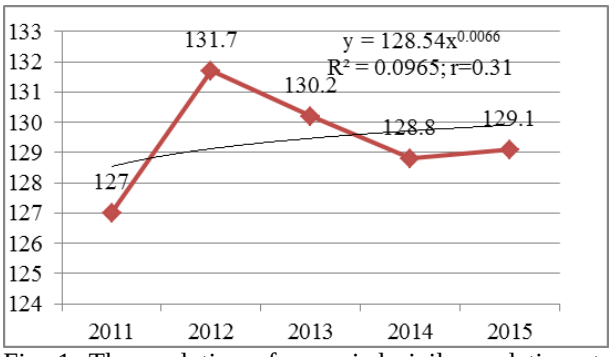

Fig. 1. The evolution of occupied civil population at Bistrita-Nasaud county level during 2011 – 2015
Source: Processed data from http://statistici.insse.ro

Table 2.Average number of employees in Bistrita-Nasaud County

Year	Average number of employees at county level (Persons)	of which: in hotels and restaurants (Persons)
2011	54,045	1,365
2012	56,482	1,494
2013	56,734	1,411
2014	57,639	1,455
2015	60,053	1,557
Annual growth rate (%)	2.67	3.34

Source: Processed data from http://statistici.insse.ro [1]

The evolution of occupied civil population in tourism industry in Bistrita-Nasaud county level during 2011 – 2015 is also illustrated in Fig.2.

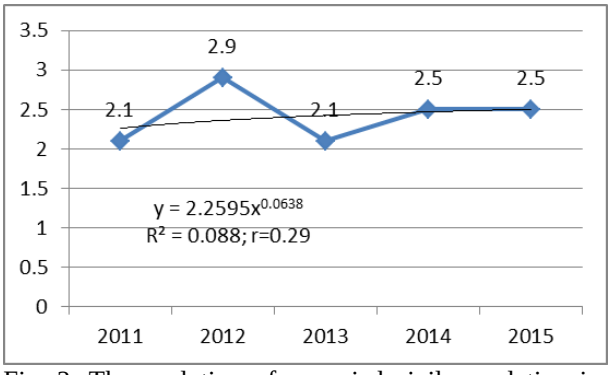

Fig. 2. The evolution of occupied civil population in tourism industry in Bistrita-Nasaud county during 2011 – 2015
Source: Processed data from http://statistici.insse.ro [1]

Therefore, the growth rate of employment in Bistrita-Nasaud county was by 2.67% higher in 2015 compared to 2011.
The same ascending trend recorded by total economic activities was also found in tourism industry, where the rate growth in this segment in Bistrita-Nasaud county was even

higher (+3.34%).
The evolution of the average number of employees in Bistrita-Nasaud county during the period 2011 – 2015 is also illustrated in Fig.3.

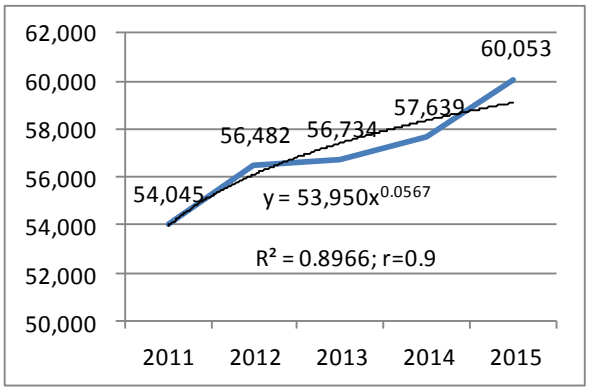

Fig. 3. The evolution of the average number of employees in Bistrita-Nasaud county
Source: Processed data from http://statistici.insse.ro [1]

Regarding the average gross income presented in Table 3, it can be observed that in Bistrita-Nasaud county in the tourism industry is below the national average in the analyzed period.
If at national level in tourism industry, the monthly average gross salary was 1,474 Ron, in Bistrita-Nasaud county, it was 1,152 Ron in 2015.
Regarding the gross medium salary in Bistrita-Nasaud county during 2011 – 2015 it was recorded an important growth. Considering that the inflation rate in the last 2 years was 1.1 % in 2014, in 2015 it was recorded a deflation (-0.6 %).

Table 3. The annual growth rate of monthly nominal gross income in turism in the period 2011 – 2015 in Bistrita-Nasaud county

Economic sector	Region	MU	2011	2012	2013	2014	2015
Total economic activities	Romania	Ron/ month	1,980	2,063	2,163	2,328	2,555
	Bistrita - Nasaud County	Ron/ month	1,508	1,570	1,641	1,742	2,041
of which: hotels and restaurants	Romania	Ron/ month	1,139	1,148	1,214	1,300	1,474
	Bistrita - Nasaud County	Ron/ month	894	954	959	1,046	1,152

Source: Processed data from http://statistici.insse.ro [1]

In addition to the quatitative aspects, the relation of tourism with human resources can be also analyzed from a qualitative point of view taking into account the following aspects: professional qualification, personnel fluctuation, employment type: undetermined or determined by a period labor contract (part time or full time labor contract).
The evolution of the average gross income in tourism industry in the period 2011 – 2015 is illustrated in Fig.4.

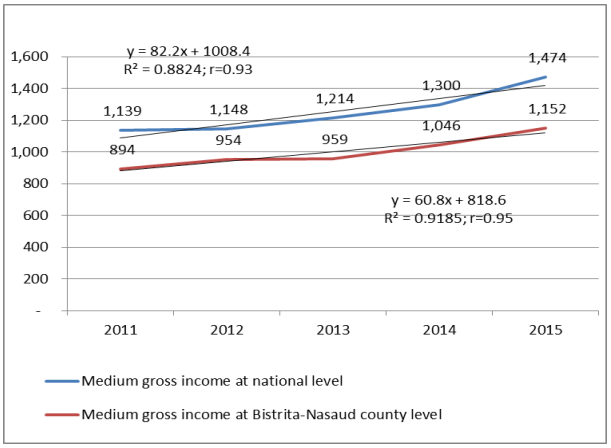

Fig. 4. The evolution of the average gross income in tourism industry in the period 2011-2015 [1]

Analyzing the structure of employees from Table 4, it can be noticed that the part time employment in turism industry is higher than in the general economic activities.
When it is the choice of workers part-time jobs can be viewed as positive; they do provide significant benefits, particulary for people who are looking to earn money in various ways, for those looking for flexibility in their work schedules, for a supplementary incometo that of their main job, or for a start in the labour market, etc. [4]

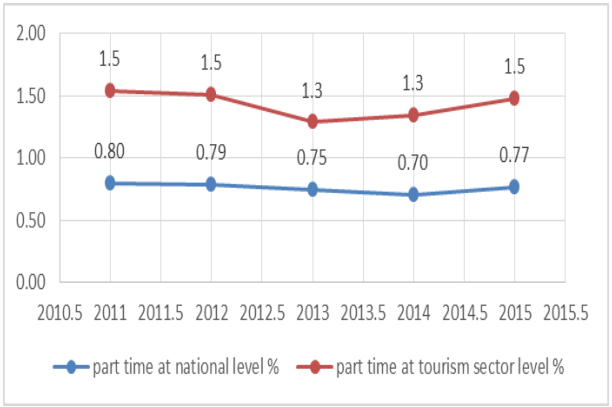

Fig. 5. The evolution of the share of part time employment at national level and in tourism sector (%)
Source: Processed data from http://statistici.insse.ro[1]

Table 4. The number of employees by employment type (full – time or part – time) at national level and in tourism industry during the period 2011 – 2015

Specification	MU	2011	2012	2013	2014	2015	2015/2011 %
Total economy	Thousand persons	5,697	5,734	5,743	5,850	6,062.2	106.41
of which: full - time	Thousand persons	5,652	5,689	5,701	5,809	6,015.8	106.43
of which: part - time	Thousand persons	45.54	45.16	42.86	41.11	46.50	102.10
Part - time share %	%	*0.80%*	*0.79%*	*0.75%*	*0.70%*	*0.77%*	-
Total accomodation and food service sector	Thousand persons	162.3	163.3	165.4	170.9	177.1	109.11
of which: full - time	Thousand persons	159.8	160.8	163.3	168.6	174.4	109.13
of which: part - time	Thousand persons	2.5	2.5	2.1	2.3	2.6	104.00
Part - time share %		*1.54%*	*1.51%*	*1.29%*	*1.34%*	*1.48%*	-

Source: Processed data from http://statistici.insse.ro [1]

The temporary nature of employment in tourism but also other aspects already mentioned are reflected in the relatively high cost (comparable, according to some authors, with the industries with a high level of technicity) creating a work place in tourism and it maintenance. [3]

CONCLUSIONS

In the analyzed period, the population employed in the tourism sector of the county of Bistrita-Nasaud has peaked in 2012, and later falled to 2015.

A similar trend is recorded at the level of employees, part of the wider concept of the occupied civilian population.

Earnings recorded successive increases year by year in the period 2011 – 2015. It is about the real gain, given the fact that inflation has been steadily declining over the past 3 years, and in the year 2015 it recorded even deflation (-0.6%) due to lower VAT.

From the analyzed figures, we can conclude that the economic branch of tourism has recorded an ascending curve in the last 3 years, both nationally and in the county of Bistrita-Nasaud.

An indicator of the growth in tourism industry can be consider the higher workforce need in this sector.

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THE VOLATILE ESTERS OF BERRIES OF THE INTERSPECIFIC HYBRIDS TO THE VINES *(VITIS VINIFERA* L. X *MUSCADINIA ROTUNDIFOLIA* MICHX.*)*

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Abstract

In the process of creating grape varieties are analyzed not only volatile esters of grape processing products, but also their content in juice berries selection of new varieties obtained by inter- and intra the grapevine. These investigations are aimed at the scientific characterization of new varieties of vine varieties compared to classical group Vitis vinifera L. In the study conducted was monitored in order to verify the content of volatile esters of interspecific hybrids juice berries vine V. vinifera L. x M. rotundifolia Michx. (DRX-M3-3-1; DRX-M4-502, -512, -571, -578, -580, 609, -640) is in amounts similar to those classic Vitis vinifera L. (Feteasca Alba, Feteasca Neagra, Rara neagra). Determining the concentration of volatile esters of interspecific hybrids juice berries vine V. vinifera L. x M. rotundifolia Michx. BC3 and by comparison with conventional varieties berries juice concentrations of native vine of V. vinifera L. ssp. Sativa D.C. We conclude that these constituents are in narrow ranges intervals.

Key words: *berry, chemical compounds, interspecific hybrides, vines, volatile esters.*

INTRODUCTION

Odorous substances from the grapes are located in the largest amount in epicarp (epidermis). They belong to several categories of chemical compounds.
The volatile compounds are chemicals that can be immediately notified bodies olfactory smelling or tasting the grapes, grape must or wine, and are best represented in flavored varieties [7, 8; 11; 14; 15].
The esters are chemical compounds that characterize the stage of maturation (aging) of the wines. They are formed as a result of the reaction between acids and alcohols in the process of fermentation of the must, by enzymatic esterification.
Only in the maturation and aging of wine is produced mainly by esterification chemical mechanism [10; 12; 17].
The reactions are slow and time consuming storage / maturation (aging) of wine.
During the process of creating new varieties of vines are volatile esters studied not only from grape processing products, but also their content in juice berries selection of new varieties obtained by inter- and intra-vine to vine.
These investigations aimed at scientific characterization of new varieties of grape-vine varieties compared to classical group *Vitis vinifera* L. [7; 9; 12; 15]
The purpose of the study was conducted to verify the content of volatile esters of the juice berries of the interspecific hybrids of vine *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.

MATERIALS AND METHODS

As object of the study have served interspecific hybrids of vines *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx. DRX-M3-3-1; DRX-M4-502, -512, -571, -578, -580, 609, -640) and varieties of group *Vitis vinifera* L. (Feteasca Albă, Feteasca Neagră şi Rară Neagră) [1; 2].
The determination of volatile esters was

carried out according to the gas phase chromatographic method. [3; 6; 8; 15; 19; 20].

RESULTS AND DISCUSSIONS

The volatile esters of the juice berries of the interspecific hybrids of vine *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx are in amounts similar to those varieties of aboriginal group of the *Vitis vinifera* L. (Table 1).

Table 1. The content of volatile esters

	Volatile esters, mg/dm^3							
	Etila-acetat	Izoamil-acetat	Xecsil-acetat	Xeptil-acetat	Etil-lactat	Etil-octanoat	Etil-decanoat	B-fenil-acetat
Interspecific hybrids to the vine *Vitis vinifera L. x Muscadinia rotundifolia Michx.* BC3								
DRX-M3-3-1	41	21	0.44	4.4	2,9	13.50	3.71	0.34
DRX-M4-502	39	28	0.39	4.0	3,3	11.60	4.13	0.39
DRX-M4-512	21	31	0.51	5.1	4,1	12.47	4.09	0.31
DRX-M4-571	23	36	0.57	6.3	5,2	13.45	3.16	0.29
DRX-M4-578	27	19	0.61	4.9	3,0	15.59	3.91	0.26
DRX-M4-580	19	22	0.43	6.0	4,9	16.11	4.49	0.33
DRX-M4-609	26	29	0.69	5.9	6,1	9.90	4.88	0.27
DRX-M4-640	22	34	0.27	4.7	5,5	15.60	3.17	0.29
Vine varieties indigenous *Vitis vinifera* L. ssp. *sativa* D.C.								
Feteasca Albă	48	37	0.77	5.6	5.1	17.04	6.47	0.43
Feteasca neagră	39	28	0.59	4.8	4.3	13.95	5.41	0.37
Rară neagră	33	17	0.37	4.1	3.7	9.73	3.37	0.25
The perception threshold volatile ester, mg/dm^3								
	7.5	*0.003*	*0.67*	*1.43*	*0.154*	*0.002*	*0.2*	*0.25*

Source Own determinations

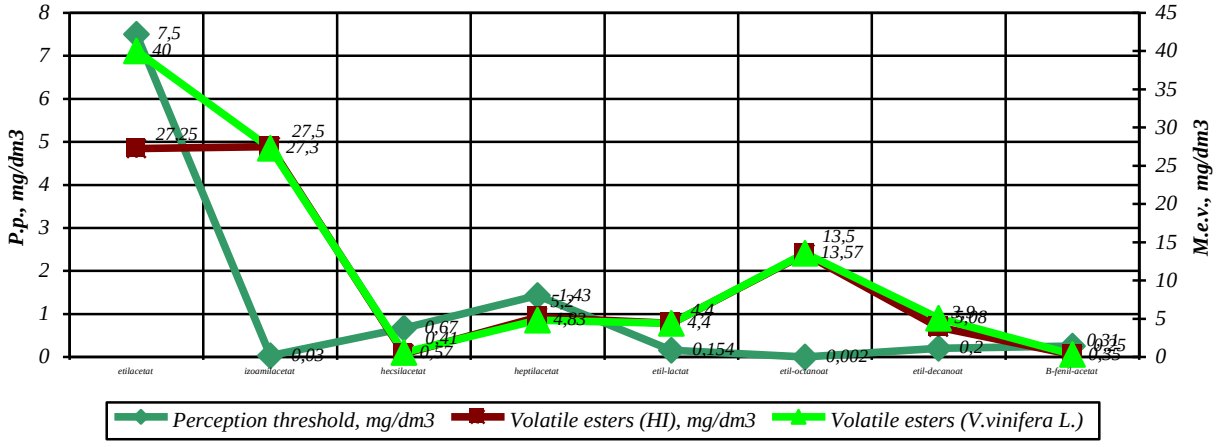

Fig. 1. The concentration of volatile esters in berry of the interspecific hybrids of vines (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.)

P.p. - the perception threshold volatile esters, mg/dm^3.

M.e.v. – the average concentration of volatile esters from the juice interspecific hybrides, mg/dm^3.

Determining the concentration of volatile esters of interspecific hybrids juice berries vine *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx. BC3 and comparing the concentrations of the juice berries indigenous varieties of vine *Vitis vinifera* L. ssp. *sativa* D.C., we conclude that these constituents are in narrow ranges intervals (Table 1. Fig. 1).

CONCLUSIONS

The concentration of volatile esters from the juice berries of interspecific hybrids of vine *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx. BC3 compared with concentrations of the juice berries indigenous varieties of vine *Vitis vinifera* L. ssp. Sativa D.C. (Feteasca Alba, Feteasca Neagra, Rara Neagra) we see that these constituents are in narrow ranges intervals.

By comparing the spectrum of aromas interspecific hybrids vine that of local varieties vine can say with certainty that the new varieties obtained are close to the classics and can be accepted and approved as varieties for table and for industrial processing.

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THE CONCENTRATION OF THE TERPENE ALCOHOLS FROM THE JUICE OF BERRY OF THE INTERSPECIFIC HYBRIDS TO THE VINES *(VITIS VINIFERA* L. X *MUSCADINIA ROTUNDIFOLIA* MICHX.*)*

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Abstract

Comparing the concentration of the terpene alcohols from the juice of berry of the interspecific hybrids to the grape-vine V.vinifera L. x M.rotundifolia Michx. BC3 with traditional indigenous varieties of grape-vine Vitis vinifera L. ssp. sativa D.C. (Feteasca White, Black Feteasca, Black Rara) been found that concentrations of these constituents are limits appropriate intervals. For a category of terpene compounds such as, for example, linalool, geraniol and xotrienol, the perception threshold is lower than their concentrations in juice berries. Thus, these hybrids are easy to make out the aromas that are specific of these compounds, such as those rose, white acacia blossom, geranium leaves.

Key words: *berry, gas phase chromatographic method, interspecific hybrides, terpene alcohols, vines*

INTRODUCTION

Flavoring chemical compounds derived product dictates the character and quality of the wine. The perception olfactory of chemical molecules is due to their volatile properties. So to be perceived they must stand support. The aromas of wines that are perceived about smell, is due to several classes of chemical compounds: higher alcohols, esters, terpenes, lactones, aldehydes etc. The maximum concentration of odorous substances are recorded 10-15 days after peak levels of carbohydrates, when berries ripening on the stalk and synthesis of these flavorings is favored by the increased content of carbohydrates and amino acids [1; 2; 12; 13].

MATERIALS AND METHODS

As object of the study have served interspecific hybrids of vines *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx. BC3 (DRX-M3-3-1; DRX-M4-502, -512, -571, -578, -580, 609, -640), as well as three classic varieties indigenous of vine (Feteasca Alba, Feteasca Neagra and Rara Neagra) [1; 2; 4; 5; 9].

There were identified and quantified seven of the most important representatives of terpene alcohols: linalool, xotrienol, £ -terpeniol, citronellol, linalool oxide-cis, trans-linalool, geraniol.

The determination of the quantitative and qualitative terpene alcohols was carried out according to the gas phase chromatographic method [10; 11; 15; 16; 17; 18].

RESULTS AND DISCUSSIONS

The content of terpene derivatives ranges from variety to variety, as follows: 0.3 to 3.5 mg/l in flavored varieties, 0.5 mg/l discreet aromatic varieties (Sauvignon, Muscadelle etc.) and 0.2 mg/l unflavoured varieties but manifesting a certain specific (Feteasca Alba Silvaner, Rhine Riesling, etc.). In some varieties, terpene compounds are in the quantities which cann't be dispensed or may even be absent.

By using the method with gas phase chromatography were investigated interspecific hybrids of vines BC3, on the content of terpene alcohols in the juice of berries. As a result were identified and quantified seven of the most important representatives of terpene alcohols: linalool, xotrienol, £-terpeniol, citronellol, linalool oxide-cis, trans-linalool, geraniol [13; 14].

The results obtained demonstrate that of terpene alcohols concentrations in the juice berries are much lower in comparison with their threshold of perception: £ -terpeniol, citronellol, linalool oxide-cis, trans-linalool quantify the perception threshold is much higher than the concentrations determined.

Thus, from an organoleptic point of view, nuances can be detected as having a weak character (wild flowers, petals of rose hips, in some cases thyme).

But for one category of these of terpene compounds for example such as linalool, geraniol xotrienol and perception threshold is lower than their concentrations in juice berries.

Table 1. Terpene alcohols in the juice of berry of the vine

Terpene alcohols, μg/dm^3							
	Linalool	**Hotrienol**	**£-terpeniol**	**Citronelol**	**Cis-linalool oxid**	**Trans-linalool oxid**	**Geraniol**
Interspecific hybrids of vines *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx. BC3							
DRX-M3-3-1	129	91	51	3	11	16	131
DRX-M4-502	137	79	17	5	9	19	117
DRX-M4-512	169	87	19	6	17	15	108
DRX-M4-571	109	110	26	8	14	11	98
DRX-M4-578	117	127	20	3	12	17	89
DRX-M4-580	96	77	18	2	15	15	118
DRX-M4-609	146	110	29	7	13	14	121
DRX-M4-640	115	116	28	8	12	16	120
The classical indigenous varieties of vines *Vitis vinifera* L. ssp. *sativa* DC							
Feteasca Albă	179	127	59	9	22	19	146
Feteasca Neagră	157	111	44	6	16	16	122
Rară Neagră	129	88	31	4	13	10	93
Terpenic alcohols threshold of perception, μg/dm^3							
	15	*110*	*250*	*18*	*3,000*	*65*	*30*

Source: Own determinations.

Organoleptically, for these hybrids of juice berries it is easy to determine the terpene alcohols such as specific aromas that smell aromatic with shades of rose, white acacia blossom, geranium leaves [5; 7; 8; 12].

Citronellol, been found that the threshold of perception and concentration of terpene alcohols are quite close: values of 5.25 μg/dm^3 concentration in juice berries average and 18.0 μg/dm^3 the threshold of perception.

Contrary to results determined for linalool showed an average concentration in the juice of berries 127.5 μg/dm3 just 15.0 μg/dm3 the threshold of perception.

Comparing the terpenes alcohols content of interspecific hybrids juice berries of the vine *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx. BC3 with classic varieties native of the vine *Vitis vinifera* L. ssp. *sativa* D.C. (Feteasca Alba, Feteasca Neagra, Rara

Neagra) found that concentrations of these constituents are limits close intervals (Table. 1. Fig. 1).

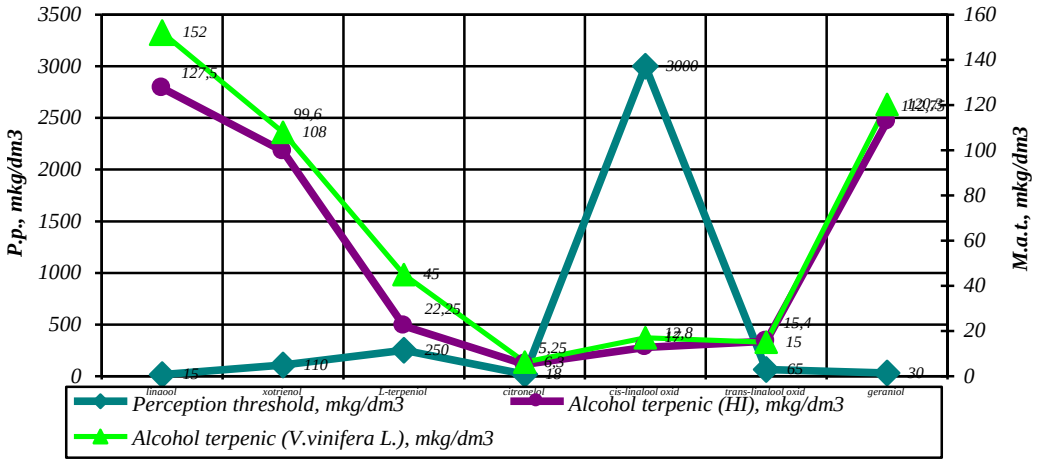

Fig. 1. The mean concentration of terpenic alcohols in the juice of berry of the interspecific hybrids of vines (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.) BC3 in compared to the threshold of perception.
P.p. – threshold of perception of the alcohols terpenic, μg/dm^3.
M.a.t. – the mean of the alcohols terpenic in the juice of berry of the interspecific hybrids of vines, μg/dm^3.

Interspecific hybrids in these diversities F4 terpenes alcohols content are due to the particularities genetics of the genitors - participants in the creation of these varieties.

CONCLUSIONS

Comparing the terpenes alcohols content of interspecific hybrids berries juice grape-vine *V.vinifera* L. x *M.rotundifolia* Michx. BC3 with of classical indigenous varieties of grape-vine *Vitis vinifera* L. ssp. *sativa* D.C. (Feteasca Alba, Feteasca Neagra, Rara Neagra) found that concentrations of these constituents are limits appropriate intervals.
For a category of terpenes compounds such as, for example, linalool, geraniol and xotrienol, the perception threshold is lower than their concentrations in juice berries. Thus, these hybrids are easy to discern specific aromas of these compounds, such as rose, white acacia blossom, geranium leaves.

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THE ANATOMICAL FEATURES OF THE STABILITY OF THE GRAPES TO THE PHYLLOXERA

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Abstract

The resistance against phylloxera of the vine is ensured by the morphological and anatomical characteristics of root. The study establish the fact that the first periderm is formed of cells arranged at rizodermoy and that the thickness of the first root periderm in interspecific hybrids of grapes Vitis vinifera L. x Muscadinia rotundifolia Michx., ranges from 80 µm to 124 µm and is formed of 8-12 rows of closely packed cells. The length of these cells varies from 30 µm to 45 µm, and the width varies from 8 µm to 12,5 µm. Fellemy thickness is ranging from 75 µm to 93 µm. The next layer fellemy, if created in the same year, is formed from the deeper layers of the root cortex cells. In the interspecific hybrid DRX-M5- (4-6) a second layer is located beneath the fellemy brown crust with a thickness in the range 93-110 µm. As a result, this area of dead tissue, formed of two layers fellemy, inside and outside, and a layer of crust disposed between two layers fellemy has a thickness in the range 170-180 µm and protects the roots of phylloxera exposure and pathogenic organisms.

Keywords: *fellem, interspecific hybrides, periderm, phylloxera, root, vines.*

INTRODUCTION

The problem of stability of the grapes to the phylloxera (*Phylloxera vastatrix* Planch.) has been studied for over a hundred years and still has not been solved completely. Creating a healthy planting material grafted on rootstocks with resistance to this pest is quite challenging. Creation of own-rooted vine plantations would be much more economical and easier, but it needs to be resistant to phylloxera grapes. To create such varieties is necessary to determine the anatomical and biochemical characteristics that provide immunity against phylloxera [1; 7; 17; 24].

At the end of the 19th century, after the from phylloxera killed almost all the vineyards of Europe, "*grafted culture*" accepted everywhere "*as a necessary evil*."

Thus, there is an actual problem of the creation new varieties of grapes with agro biological signs which would satisfy maximally requirements for table grapes, used in fresh form, as well as those which are intended for industrial processing (juices, concentrates, wine, etc.) [12; 13; 32].

MATERIALS AND METHODS

As object of the study have served interspecific hybrids of vines *Vitis vinifera* L. x *Muscadinia rotundifolia* Michx. and some of varieties of grafted vines. [2; 3; 6; 7; 11; 24; 25; 27].

RESULTS AND DISCUSSIONS

The viticulture it is practiced in over 75 countries, limited parallels 35° and 53 ° north latitude and within parallels 40° and 25° south latitude [Fig. 1].

Fig. 1. The evolution of world vine plantations.

- vine plantations are growing
- vine plantations are stable
- vine plantations are decreasing.

Vine plantations are growing in Chile, China, New Zealand etc. Vine plantations in Brazil, Romania, South Africa, Germany, Turkey, USA, etc. are stable and vine plantations in France, Hungary, Italy, Spain, Greece etc. are decreasing [Fig.1.].

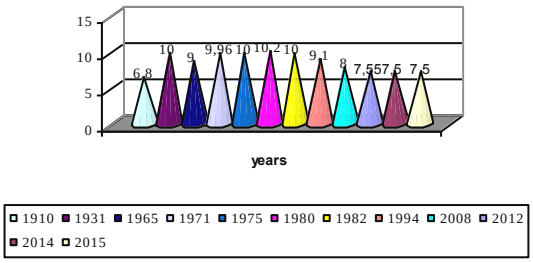

Fig. 2. The total land area occupied by the vines on the globe. (millions ha)

The total area of agricultural lands of the entire world constitutes about 4.6 billions. hectares, and of vines plantations occupy an area of 7.5 millions hectares [Fig. 2].

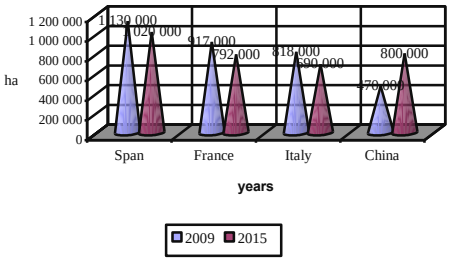

Fig. 3. The evolution of surfaces with vineyards in some countries vines.

57.9% of the total area planted with vines of the entire world is in the European countries [Fig. 4.].

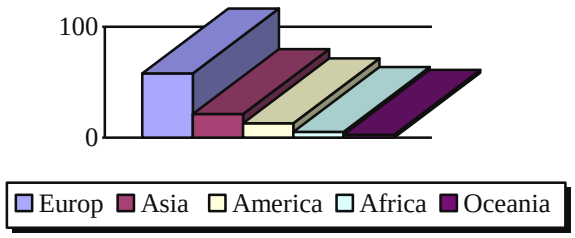

Fig. 4. Land distribution vineyards on Earth.

In China and the some countries of South America lands with vineyards are growing. In the last 6 years China has redoubled surfaces covered with vineyards (from 470,000 ha to 800,000 ha). In most European countries vine plantations are decreasing. The decline in land with vineyards in Europe is to regulation by the EU Council quantity of wine products and prevent lower prices [Fig.3].

The land fund of Republic of Moldova constitutes about 3,384,600 ha, including agricultural lands - 2,528,300 ha (75.6% of the total) of vines plantations occupies the area of 140,000 ha (3.7%) [Fig. 5].

Derived products the wine in Republic of Moldova is about 25% of total manufacturing and about 5% of GDP. Currently about 25% of revenues from the export of Republic of Moldova wine production are generated [29].

The development of viticulture in Bessarabia until the XIX century was based on the indigenous varieties like: *Feteasca Neagră (Băbeasca Neagra, Serecsia), Feteasca Albă, Feteasca Regală, Cabasma (Cabasma Albă, Cabasma Neagră), Ciorcuţa Roză, Calabura, Gordin Verde, Gordin Gurguiat, Zghihara de Huşi, Plăvaie, Copceac* etc. [1; 7; 13; 29; 31].

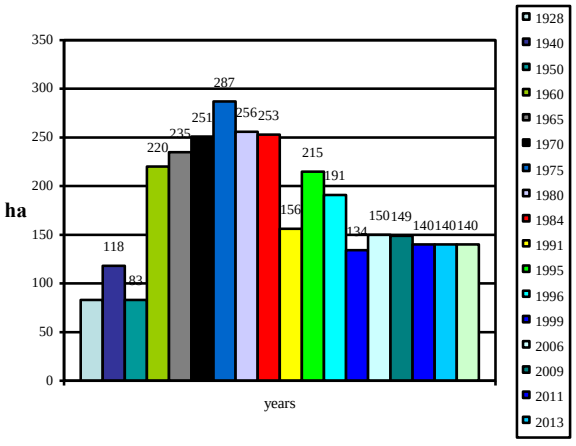

Fig. 5. The evolution of vines of surfaces the Republic of Moldova

The vine was planted on their own roots.

In Bessarabia phylloxera it was detected in 1886 on lands of vines in localities: Lupa-Cold Drăsliceni, Miclesti etc. the central region of the country. To save the vineyards, by 1915 all plantations vines on their own roots were replaced by grafted vines [23 - 25].

The direct methods of combating phylloxera as: disinfection of ground with carbon disulfide or naphthalene, periodic flooding of land, etc., did not contribute to solving the

problem.

The revitalization of viticulture, in that period was possible thanks to the work all coaches will pick: M.Baco, A.Seibel, Terras, Couderc etc. by creating and introducing direct producer hybrids (Seibel 1, Seibel 1000, Terras-20, Flot d'or, Baco Noir, Couderc, Rayon d'Or, etc.) and grafted varieties [1; 2].

For the cultivation of the vine it had to be applied highly productive method of grafting, which has some drawbacks, namely:

- to produce grafted planting material are needed:
  - the considerable human and financial resources;
  - parent stock and scion mother plantations;
  - professional technological equipments etc.;
- for the production of the wine derivatives is required:
  - chemical treatments (12 treatments/season);
  - perfecting technological processes (double filtration etc.) [1; 17; 31;32].

The renowned French viticulturist Daniel, mention: *"... the introduction of the method of cultivation of vines grafted saved vineyard in France at the moment, but has destroyed her future ..."*

Currently are known about 12,000 genotypes of the vine. Nevertheless, so far does not was succeeded in to obtain the variety "ideal".

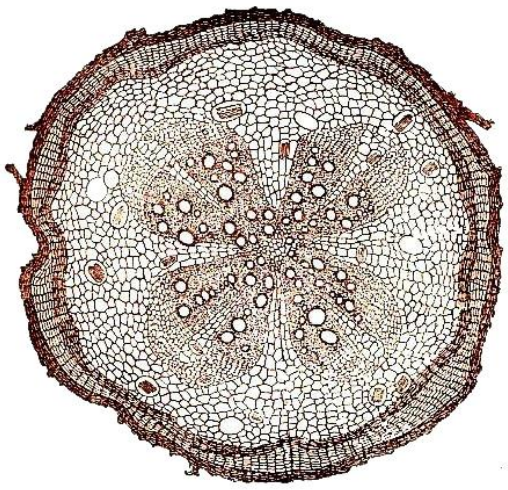

Fig. 6. The perriderm insulates entire primary root cortex.

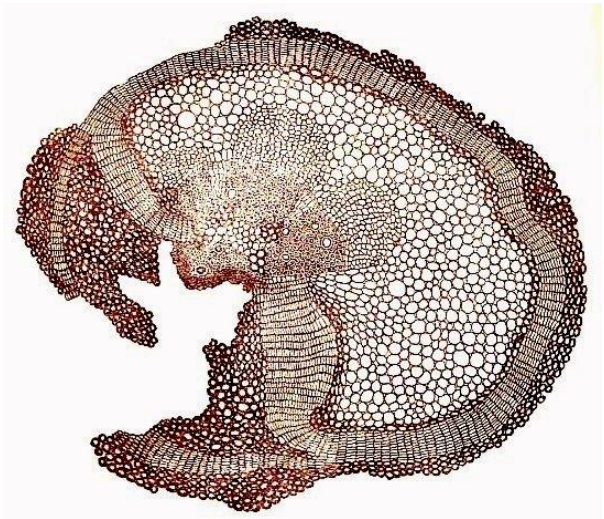

Fig. 7. Not insulates root perriderm tissue attacked by phylloxera.

It is should be noted that European varieties cultivation makes it compulsory grafting parent stock North American (resistant to phylloxera), which greatly increases the cost of production of planting material and plantation of vines creation.

The question thus remains the actual issue of creating indigenous of the vine varieties with increased resistance to biotic and abiotic factors of the environment, productive and quality.

As a result of cross-breeding of the American of wild grapes *M.rotundifolia* Michx. with cultural grapes *V.vinifera* L. ssp. *sativa* D.C. different generations of interspecies hybrids own rooted grapes were obtained [2; 3; 4].

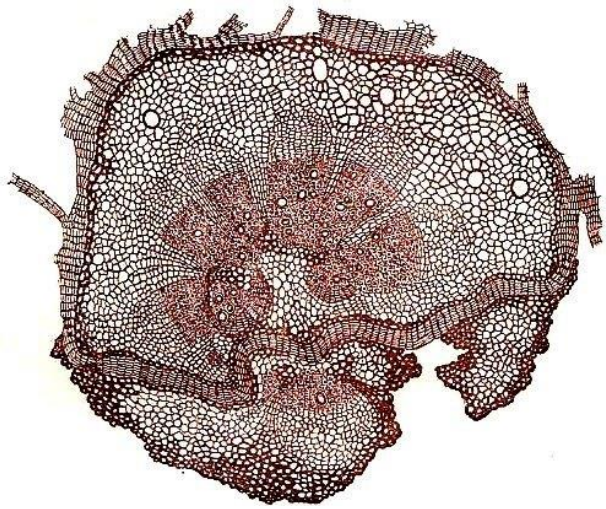

Fig. 8. Of the plague be the periderm tissues insulates attacked by phylloxera.

The study of the anatomical structure of interspecific hybrids of grape roots has the purpose to establish their primary and secondary structure to determine the anatomical features typical of a wild grapes *Muscadinia rotundifolia* Michx., which has an absolute resistance to phylloxera [11].

Vine varieties of *Vitisi vinifera* L., non-resistant to phylloxera, the first root periderm is formed and isolated pericycle all primary root bark, which then dies and falls off at the root [Fig. 6.; Fig. 7.].

Of the plague be the periderm tissues insulates attacked by phylloxera and push them outwards. Thereby, it enables the development of pathogen agents [Fig. 8.].

The vine resistant to phylloxera develop to the wound periderm, which has bactericidal properties and stop the spread of pathogens [Fig. 9.].

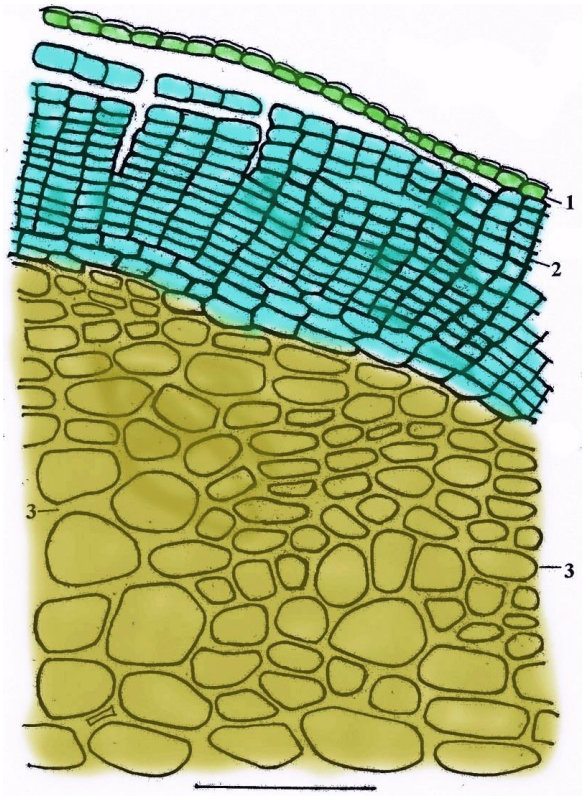

Fig. 9. The interspecific hybrids of grapes (*V.vinifera* L. x *M.rotundifolia* Michx.), 11-508: 1. epidermis; 2. peridermis; 3. cortex.

In interspecific hybrids of grapes (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.), the first root periderm, with secondary anatomical structure, created from layers of radial 8-12 tangentially elongated cells compactly arranged between them, created from the layer of cells beneath the rizodermoy. Another layer of periderm, if created in the same year, is formed from the deeper layers of the root cortex cells [11; 25]. This morphological and anatomical and hybrids-specific feature determines the resistance to phylloxera root interspecific hybrids of grapes (*Vitis vinifera* L. x *Muscadinia rotundifolia* Michx.) [Fig. 9.].

Interspecific hybrids *Vitisi vinifera* L. x *Muscadinia rotundifolia* Michx can be effectively grown on their own roots in the region of Central and Northern agroclimatic the Republic of Moldova, there where most varieties vine *Vitis vinifera* L. not withstand low temperatures of winter [2; 3; 5; 6; 17; 18].

Fig. 10. The sector of interspecific hybrids of vine *V.vinifera* L. x *M.rotundifolia* Michx.

Initiated the procedure for creating sectors of interspecific hybrids of vines on their own roots in the Central region (Chişinău, IGPPP ASM) and North (Soroca) of Moldova [Fig. 10; Fig. 11.], where most varieties of vines group *Vitis vinifera* L. overwintering does not withstand low temperatures [2; 3; 5; 6; 17; 19].

Fig. 11. New varieties of vines on their own roots for implementation (12-35; 11-37; 11-75).

CONCLUSIONS

The resistance against the phylloxera of the vine is provided by morphological and anatomical structure of root and concentration of chemicals, such as: resveratrol etc.

Periderm, the first layer is formed from cells located under rizodermoy and that the thickness of the first root periderm in interspecific hybrids grape V.vinifera L. x M.rotundifolia Michx.), ranges from 80 μm to 124 μm and formed from 8-12 rows of cells arranged compactly. The length of these cells varies from 30 μm to 45 μm, and the width varies from 8 μm to 12.5 μm. Fellemy thickness ranging from 75 uM to 93 μm. The next layer fellemy if created in the same year, formed from the deeper layers of the root cortex cells. In the interspecific hybrid DRX-M5- (4-6) a second layer located beneath the fellemy brown crust with a thickness in the range 93-110 μm. As a result, this area of dead tissue, formed of two layers fellemy, inside and outside, and a layer of crust disposed between two layers fellemy has a thickness in the range 170-180 μm and protects the roots of phylloxera exposure and pathogenic organisms.

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HONEY RESOURCES OF AVRIG CITY (SIBIU COUNTY) AND ECONOMIC RELEVANCE

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Abstract

The work is part of a broader theme of flora honey more research of Sibiu. The current study aims at identifying the plants bees Avrig city and its surroundings. They highlighted important issues such as heat index of flowering (T^0C), average time trigger flowering for each identified species, honey production (kg/ha) and the share of agriculture. The research methods applied in the study there were: documentation based on a specialized bibliography, direct observation in field, collection of plant material, the use of the photo database which characterizes the investigated area. There were identified 45 species of bees collecting nectar in the spontaneous and cultivated area. The flowering period of this species was from March to August. In Avrig area, beekeeping area is a good occupation for local people due to climate and biodiversity of plants suitable for nectar pickings.

Key words**:** *honey production, Avrig (Sibiu)*

INTRODUCTION

Symbiosis bee-flower bears in the world the message of eternity. The DNA which encoded genes is responsible for the change of behavior, and for the assurance of an existential condition and especially for the beauty of our lives. The triad bee-flower-man is responsible for the terrestrial existence.

Freedom was regarded in antiquity as the god of bees. For not be lost, bees were shut down in a hollow, which was the first hive. Honey was a miracle left for future generations [9].

Bee was seen, always, "as a masterpiece of creation" [8]. An inspired subject by many facets of behavior, a whole encyclopedia about productions, social organization, attitudes and moral codes, topics of scientific research. The scientiifc research solved the controversial subjects such as the honeycomb geometry and the enigm of communication among bees, which brought the Nobel Prize to the biologist Karl von Frisch. The local inhabitands of oru land in the past, and even the Ottomans and the Venetians knew the uses of honey and wax. [6]

Pliny the Elder exclaimed: "What men can be, in good faith, like bees for intelligence" [12]. He recorded the cosmic factor in the production of honey from honeydew, "a liquid that is either sweat of the stars or the stars' saliva or secretion of air purification" [14].

The flower, a symbol of beauty and love, allows a youmg girl to count the petals and think of her lover to meet him. Some forgotten lyrics say: "It would be flowers on the bush/would wax torches/flowers like all of us coming/sweet honey bee" (unidentified). Flowers are attached to the end of our existence by giving it an aura of tranquility. "The acacia tree rains its flowers. Grandpa sits on the porch. He is thinking. What is he thinking? At nothing. Just the flowers are falling". [20]

As regards man, the last creation, called to offer brightness triad, it fulfills its role, correlating in an ingenious mannare the contribution of all.

Bees have stimulated interest in research on food and essential role of the flora their bees from an apiary area [1,2,6,7]. Romania today has 11 million hectares of natural or cultivated flora to produce about 20,000 tons honey [21]. Beekeeping in our country has become a lucrative business because soil and climate enable the development of bee flora in all the

regions. Sibiu County is no exception. Beekeeping has become an increasing concern especially in villages.

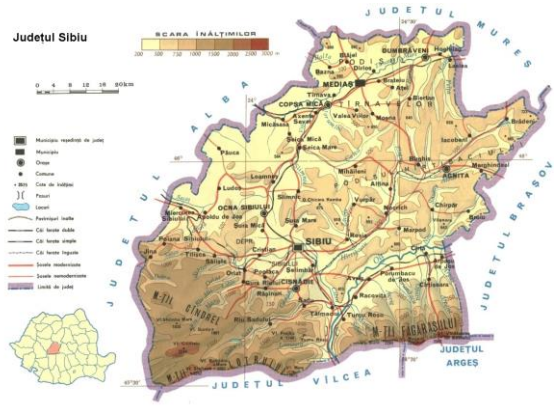

Fig. 1. The localization of Avrig locality in Sibiu County
Source: http://pe-harta.ro/Sibiu/

The statistics carried out by the Directorate for Food Safety and Veterinary Sibiu mentioned an increased number of bee colonies from 15,451 families registered in 2010 to 20,679 families registered in 2013, therefore by 26 % more bee colonies[22]. Under these circumstances, the interest in honey flora of Sibiu has also increased [15-19].
The work is part of a larger study that aims to analyze the diversity of the bee flora in the Sibiu area.

MATERIALS AND METHODS

The study was carried around the Avrig city in the period 2015-2016.
To achieve the proposed objectives of the paper there were considered the following specific methods:
- Using information from the literature;
- Using information taken from the field or by observation in order to inventory the main species of bee plants or by the direct qualitative collections of plants;
- Taking photos to complement the database of bee flora of the study area;
- The lab was used to analyze the studied material and draw up the list of flora [3, 5, 10-14].

RESULTS AND DISCUSSIONS

The natural environment that provides a trophic support for the development in symbiosis of the bees and flowers in the physical and geographical area of Avrig. Seated, at 26 km distance from Sibiu, in a true natural amphitheater, the complex topography benefit of a large range of forms from the Olt River valley to the peaks of the Fagaras Mountains (Fig. 1).
The diversity of the landscape caused a great diversity of flora (Fig.2, Fig.3).

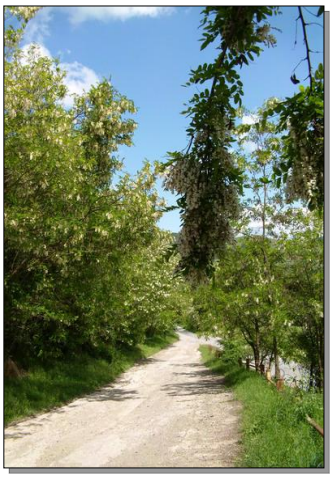

Fig. 2.*Robinia pseudoacacia* L. - acacia (original)

Fig. 3. *Fragaria vesca* L. Fraga-bee-pollinated (original)

Avrig area includes over 402 species of cormophytes [4]. Of these, in the period of the study, there were 45 plant species identified as suitable for honey production (Table 1).

Table 1. The meliferous basis in Avrig locality (Sibiu County) in 2015-2016.

Nr	Species name	The termic index of blooming (T^0 C)	The average data of blooming	Honey production (kg/ha)	The apiarian weight
1.	2.	3.	4.	5.	6.
Asteraceae					
1	*Helianthus annuus* L.	1,000-1,100	24.06-30.07	34-122	Very big
2	*Taraxacum officinale* L.	176-275	05-15.04	200	Medium
3	*Centaurea cyanus* L.	1,320-1,463	02-22.07	50-60	Small
4	*Crataegus monogyna* Jacq.	550-645	01-14.05	35-100	Medium
5	*Arctium lappa* L.	1,275-1,450	15-27.07	30-50	Small
Apiaceae					
6	*Eryngium campestre* L.	1,750-1,980	10-30.07	100-300	Medium
Brassicaceae					
7	*Brassica napus oleifera* L.	220-330	10-20.04	40-100	Big
8	*Brassica rapa oleiferă* L.	220-330	10-20.04	30-100	Big
9	*Sinapis arvensis* L.	765-940	20-30.05	40	Medium
Cucurbitaceae					
10	*Cucumis sativus* L.		20.06-16.08	20-100	Small
Ericaceae					
11	*Vaccinium myrtillus* L.	525-680	05-15.05	15-30	Medium
Fabaceae					
12	*Robinia pseudoacacia* L.	600-765	10-20.05	800-1200	Very big
13	*Onobrychis viciifolia* Scop.	1,038-1,235	05.05-06.06	120-300	Big
14	*Trifolium repens* L.	765-940	20-30.05	100-250	Big
15	*Medicago sativa* L.	680-850	15-25.05	25-200	Medium
16	*Vicia pannonica* Cr.	765-940	20-30.05	30-50	Medium
17	*Vicia sativa* L	850-960	25-31.05	10-30	Medium
18	*Vicia villoasa* L.	765-940	20-30.05	30-100	Medium
19	*Trifolium pretense* L.	1,230-1,430	15-25.06	25-50	Medium
20	*Medicago lupulina* L.	1,230-1,450	07-27.06	30-40	Medium
21	*Medicago falcate* L.	680-850	15-25.06	30	Small
Grossulariaceae					
22	*Ribes nigrum* L.	275-395	14-24.04	20-50	Medium
Lamiaceae					
23	*Mentha aquatica* L.	1,400-1,575	22-30.06	220	Big
24	*Thymus serpyllum* L.	1,230-1,430	15-25.06	150-220	Medium
25	*Salvia verticillata* L.	1,330-1,540	20-30.06	400-600	Medium
26	*Mentha piperita* L.	1,620-1,870	05-15.07	100-200	Medium
27	*Mentha spicata* L	1,620-1,870	05-15.07	100-200	Medium
28	*Stachys recta* L.	1,130-1,335	10-20.06	150-250	Medium
29	*Melissa officinalis* L.	475-502	28.05-20.06	100-150	Medium
30	*Salvia pratensis* L.	798-960	22-31.05	280	Medium
31	*ia officinalis* L.	1,750-1,980	10-20.07	200-400	Medium
32	*Origanum vulgare* L.	1,130-1,335	10-20.06	70-80	Medium
33	*Lamium album* L.	680-850	15-25.05	100-180	Medium
34	*Lamium purpureum* L.	80-135	20-31.03	50-90	Medium
Rosaceae					
35	*Rubus idaeus* L.	1,038-1,235	05-15.06	50-200	Very big
36	*Prunus armeniaca* L.	200-300	11-23.03	25-40	Medium
37	*Cerasus avium* (L.) Moench	220-330	10-20.04	30-40	Medium
38	*Malus domestica* Borkh	350-450	20-30.04	30-42	Medium
39	*Rubus caesius* L.	798-960	22-31.05	30-50	Medium
40	*Prunus spinosa* L.	350-450	20-30.04	25-40	Medium
41	*Prunus domestica* L	300-350	15-25.04	20-30	Medium
42	*Fragaria vesca* L.	?	20.04-29.05	30-40	Small
Salicaceae					
43	*Salix alba* L	100-135	20-30.03	100-150	Big
Tiliaceae					
44	*Tilia tomentosa* Moench	1400-1450	17-27.06	1200	Very big
Liliaceae					
45	*Allium cepa* L.	1330-1540	20-30.06	70-150	Medium

In Avrig area, the honey suitable for honey include herbaceous species, shrubs and trees. The vast majority of plants are part of spontaneous flora, and some of them are cultivated. The 45 plant species belonging to 12 plant families have been: *Asteraceae, Apiaceae, Brassicaceae, Cucurbitaceae, Ericaceae, Fabaceae, Grossulariaceae, Lamiaceae, Rosaceae, Salicaceae, Tiliaceae* and *Liliaceae*. The most represented family is Lamiaceae with 12 species (27.3%) followed by *Fabaceae* family including 10 species (22.22%), *Rosaceae* with 8 species (17.17%),

Asteraceae with 5 species (11.11%), *Brassicaceae* with 3 species (6.66%). At the opposite pole there are the families *Apiaceae, Cucurbitaceae, Ericaceae, Grossulariaceae, Salicaceae, Tiliaceae* and *Liliaceae* each with only one species (2.22%) (Fig. 4).

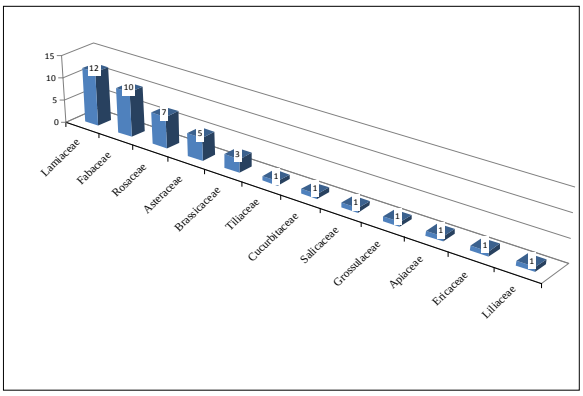

Fig. 4. Numerical abundance of plant species for bees in the surroundings of Avrig (Sibiu)

In terms of share of the honey bee base, in the Avrig area, the plants were divided into 4 categories (Table 1):

- Plants with a very large share in beekeeping with a high potential which could assure high yields of honey: *Helianthus annuus* L., *Robinia pseudoacacia* L., *Rubus idaeus* L. and *Tilia tomentosa* Moench. The four species represent 8.88% of the total of 45 floriferous species.
- Plants with a large share of the honey potential like: *Brassica napus oleifera* L., *Brassica rapa oleiferă* L., *Onobrychis viciifolia* L., *Trifolium repens* L., *Salix alba* L, *Mentha aquatica* L.

These six species represent 13.33% of the total flower base.

- Most are the plants suitable for middle-bee pickings, which could sustain the nectar and pollen production. The 29 floriferous species represent more than a half of the studied flora (64.44%).
- The plants with a small share, offering nectar and pollen necessary for bee family survival without picking production, are represented by a small number of floriferous species, only 4 (8.88%).

From an economic point of view, only the first three categories are important because they contain plants suitable for bee pollination providing a good honey production. The blooming period depends on species (Table 1). These species are active throughout the season, ensuring the picking required for the maintenance of the bee family and mainly for growing and preparing the contingent of young bees for winter.

The plant flowering period begins in March for the following species: *Lamium purpureum* L., *Prunus armeniaca* L., *Salix alba* L. and it ends in August, with the flowering species *Cucumis sativus* L.

CONCLUSIONS

In the surroundings of Avrig, there were identified 45 species of bee plants belonging to 12 botanical families.

The Family *Lamiaceae* with 12 species is the best represented. The families *Apiaceae, Cucurbitaceae, Ericaceae, Grossulariaceae, Salicaceae, Tiliaceae și Liliaceae* comprise only one species of honey.

The methods used to achieve the study were: the analysis of the bibliographic, direct observation in order to inventory the flora in the ecosystem, direct collection of botanical material to analyze it in the laboratory, realization of photographic images.

The Avrig base of plants for honey bees was divided into four categories: plants with a very high share (8.88%), plants with large share in beekeeping (13.13%), middle-bee plants (64.44%) and plants with a small share in beekeeping (8.88%).

In Avrig area, beekeeping has become a profitable occupation due to the mild climate from March to the end of August and due to the generous nature offering the city the biodiversity of plants for honey, lime and acacias forests, and areas cultivated with sunflower, and fruit trees (apple, apricot, and cherry trees).

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STUDY ON THE HARMFUL FAUNA FROM EDUCATIONAL RUSCIORI FARM (SIBIU COUNTY) AND ITS ECONOMIC IMPORTANCE

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Abstract

The work fits into the broader concept called "Plant protection". The researchers from the Faculty of Agricultural Sciences, Food Industry and Environmental Protection of "Lucian Blaga" intensified their research work in the direction of plant pathology, as well as on the specific pests. The research was carried out between 2014-2015 in the School Farm's apple orchard in the Rusciori village, Sibiu County. This research aimed to identify the fauna of the studied agricultural ecosystems, determining the severity of pest attack, assessing the damages and suggesting solutions. The Rusciori Farm passed through a period of decline due to the frequently changing of orchard owners. At present, by appropriate studies, it was tried to bring the farm into an appropriate form. In this study, there were the following research methods: direct observation on the plant, the collection of the entomological material with attacked organs of the plants, the use of the entomological jar, the use photo paper. The main conclusion was that the integrated protection by applying measures and means of prevention and treatment against pests play a very important role, representing the number one technological factor on fruit growing practice.

Key words**:** *fruit trees, damaging fauna, protection*

INTRODUCTION

Development of human society in economic and travel increasingly faster progress (especially the technology) led to a number of consequences on the ecology, not always negative, but particularly harmful to the environment, the only living environment of all organisms this planet, what we call, in the universal language of love: "Sweet home, our single home." In this context, Victor Vernescu in his 2004 "Pathogens and pests on crop plants" demonstrate the theoretical and practical importance of the concept of protection of which it is the plant protection [18]. Do not forget that "the protection of plants triggers the production, productivity, efficiency and ultimately profit, the fundamentals of welfare" [17]. In line with this concept, the staff of the Faculty of Agricultural Sciences, Food Industry and Environmental Protection "Lucian Blaga" has intensified the research work both in the direction of plant pathology [13-16], as well as in the direction of the specific pests, mostly insects that bring serious damage to agricultural production [1-4,7-10]. Also, the plant protection research has not identified only the crop diseases and pests, but also it found appropriate ways and means to prevent and fight against them.

Today, the faculties involved in the project of the integrated management of the Rusciori school farm, the fruit tree farm, aimed to study both the pathogens and pests of the apple culture.

Apple, the biblical tree, has its origin in a complex spread Asian, the sign and the land between the four rivers surrounding the "Garden of Eden". Apple is the first fruit mentioned in the Bible and who led the first people to choose between an "Endemic existence" and another responsible.

From the original area, the apple has spread to Egypt, Greece, Rome finally embracing the temperate zone. Theofrast wrote that in the year 2400 BC apple was known in Europe [5]. Testimonies of apple spread to the Mediterranean world abounds in Greek and Roman mythology as in the writings of many authors of antiquity.

Hera, Zeus's wife and sister, appreciating the

beauty and qualities of the apple when, at his wedding with Zeus, Gaia, mother of all, I gave the bride an apple. This has made a real apple orchard known as the "Garden of the Hesperides", named after the three sisters and daughters of Zeus, to guard the garden, Hesperides. Vigilance was pierced Hesperides not only great hero Heracles who meet one of the twelve labors ordered cousin or Euristeu.

Apple, caused the greatest feats of the ancient Greek Trojan War. At the wedding of Peleus with Nereid Thetis whole community was invited Olympians. Only the goddess of discord was not invited. Revenge, it threw out the window in the middle of the wedding, a golden apple that read: "the more beautiful". The verdict in choosing the most beautiful of the goddesses Hera, Athena and Aphrodite gave him Paris, who then kept the flocks of his father King Priam of Troy, on the mountainside Ida. Aphrodite was chosen, but only after I promised the goddess of Paris that he would give his wife the most beautiful woman, Helen, wife of King Menelaus. War was as stated.

Apple culture in the Roman Empire testify us many ancient authors. Pliny the Elder in the encyclopedia "Naturalis Historia" describes about 17 varieties of apple in Rome. Cato treatise "De re rustica" describes six varieties of apple. Pliny the Elder, quoting Virgil recalls as Rome and Italy spread the process of grafting trees. They went so far in the choice of rootstock that was used even brambles. The choice was stopped by grafting thistles belief that attracts lightning. [6] The whole Roman Empire are grown about 40 varieties of apple [20].

Apple through its nutritional qualities star remained exceptional throughout European history. There are numerous cases when painters considered a success out of play on the canvas the beauty and roundness apple.

In the fairy tale world, the apple has retained the same status as the narcissistic show enchanted apple queen of the fairy tale "Snow White" or golden apples from the Garden of the King of Ispirescu's fairy tale "Prâslea the Brave and the Golden Apples". As a visual delight, an apple orchard in bloom stands next to a grove of cherry blossoms or a chain of waves in the breeze.

In science, legend apple sits at the base of an idea that changed almost all precepts of physics. The fall of an apple on Newton's head would have induced its concept of gravity. Newton's treaty "Mathematical principles of natural philosophy" developed "the first true universal law of nature" that explains the orbits of celestial bodies using mathematical formulas and it was based on the fact that every object in the universe attracts the rest of the objects. It is the universal law of gravitation [19].

Apple nutrition force consists of its contents in various sugars, natural multi-vitamins, especially in the apple peel, minerals, fiber, digestive and still others. These nutrients make the apple to be a part of the daily human diet. The prescription of "an apple a day" reflects the importance of eating apples in different forms and maintaining a state of full health. Ideal and healthy it is as each inhabitant to consume at least an amount of 20 kg of apples per year. Orchards in Romania offers this amount of apples produced by the 40 varieties of apple tree.

In Romania, the apple crop was an economic concern ever since Dacia testify as reliefs on Trajan's Column in Rome. Cantemir in "Descriptio Moldaviae" speaks about true forest trees [19].

In this context, the objective of the paper was to study the agroecosystem entomofauna in the apple orchard of Rusciori didactic farm belonging to the "Lucian Blaga" University from Sibiu, Romania.

MATERIALS AND METHODS

The study wildlife in the apple orchard was carried out between: 2014-2015;

The location investigations were made was Rusciori didactic farm belonging to the "Lucian Blaga".

The purpose of the study and knowledge of agroecosystem entomofauna studied following methods were used in the orchard: direct observation on the plant, along with entomological collection of attacked organs of plants, using entomological jar, using photography. The entomofauna caught with

entomological jar was determined in the laboratory. IOR was used, a magnifier loupe 1983 IPM Scope.

For damage assessment were used two indicators: attack frequency and intensity of the attack which determines the pest attack. By attack frequency means the ratio of the number of plants or organs attacked (n) and total number of plants or organs attacked (N). Expressed as a percentage formula:

$$F\% = \left(\frac{n}{N} \right) \cdot 100$$

Intensity of the attack is the proportion in which a plant is attacked or one of its organs:

$$I\% = \sum \left(\frac{i \cdot f}{n} \right) \text{ where:}$$

i- share the plant was attacked;
f-number of plants attacked in the same proportion;
n -the total number of attacked plants.

The degree of infection was determined during the growing period and it was calculated as follows:

$$G_a\% = \left(\frac{f\% - i\%}{100} \right)$$

RESULTS AND DISCUSSIONS

Seated, 3 km from localiatea Sura Mica and 7 km from Sibiu, the Rusciori village is a part part of the microregion called " Secaşelor Country ". The Didactic Farm is located on the Rusciori village land, even on the Sibiu-Rusciori road (Photo 1).

Photo 1. Rusciori village location (Google Earth)

Farmland has 41.69 ha of which 37.78 ha are occupied by orchards. Apple varieties grown in the farm are: Golden Delicious, Jonathan, Starkrimson, Red Melba, Wagner rewarded. The trees are distributed into three plots as follows: Plot I 46 rows of trees, Plot 2 with 67 and Plot 3 with 52 rows of apple trees.

Over the time and untill 1977, the Apatin Farm belonged to the Sura Mica State Agricultural Enterprise, and then passed its heritage to the Cisnădie Fruit Growing Station. Afterwards, it belonged until 1990 to Cristian Montanology Institute. For nine years 1990-1999, the activity of the fruit growing farm declined. The lack of funds led to its degradation: maintenance-free and without any appropriate treatment. The farm was taken over in 1999 by "Lucian Blaga" University until 2004. Immediately after taking the farm, periodic monitoring visits were made to identify pests and their attack manner on the various organs of the fruit trees. In this period, there were identified the pests presented in Table 1.

Table 1. The harmful fauna from educational Rusciori farm

Nr. crt.	Borer	Stage of attack
Ord. Homoptera		
1.	Fam. *Aphididae* *Aphis pomi* De Geer	Larva, adult
2.	Fam. *Diaspididae* *Quadraspidiosus perniciosus* Comst.	Larva, adult
3.	Fam. *Schizoneuridae* *Eriosoma lanigerum* Hansm.	Larva, adult
Ord. Coleoptera		
4.	Familia *Curculionidae* *Anthonomus pomorum* L. (Photo 2)	Larva, adult
5.	Familia *Curculionidae* *Scolytus mali* Becht.	Larva, adult
	Ord. Lepidoptera	
6.	Fam. *Geometridae* *Operophtera brumata* L.	Larva
7.	Fam. *Tortricidae* *Adoxophyes reticulana* Hb.	Larva
Ord. Acari		
8.	Fam. *Tetranychidae*	Larva, adult
Ord. Rodentia		
9.	Fam. *Muridae* *Microtus arvalis* Poll.	Adult

Photo 2. *Anthonomus pomorum* L. – adult (Original photi)

The main target species of the university farm belong to three classes: Insecta (7 species), Arachnida (1 species) and Mammalia (1 species). Insects are the most and are represented by three orders: Homoptera 3 species (*Aphis trees, Quadraspidiosus perniciosus, Eriosoma lanigerum*), Coleoptera two species (*Anthonomus pomorum, Scolytus mali*) and Lepidoptera 2 species (*Operophtera frosted, Adoxophyes reticulana*). Fauna harmful in attack mode [12], and the amount of damage the attack without serious damage to orchards are presented in Table 2.

Table 2. The economic importance of the analyzed species

Species	Ioss
Aphis pomi De Geer	Polyphagous species, attacking mainly apple. Lice are mounted to the underside of the leaves from the top shoots. The leaves pierced twist, turn yellow and dry. The frequency of attacks is poor, but present in all varieties of apple farm. The degree of infection (G. A.) is East.
Quadraspidiosus perniciosus Comst.	The species locates all plant organs, preferring woody parts. The degree of infection of apple trees in the orchard Rusciori has averaged over all cultivars except Jonathan variety of 3rd plot where the attack is weak.
Eriosoma lanigerum Hansm.	The attack is manifested in the form of stems and branches swelling. Trees dried over time. Colonies of lice are obvious due to the waxy secretions white covering colony (Photo 3). The degree of woolly aphid attack in the orchard teaching is extremely strong Starkrimson varieties, winning Wagner, Jonathan and Golden Delicious and the Red varieties Melba and Starkrimson of only three strong plot.
Anthonomus pomorum L.	Preferentially attack the apple. Rusciori attack at producing major damage is caused by larvae that consume fully reproductive organs of the flower. The degree of attack is extremely powerful, especially Jonathan and Golden varieties presenting flowers antonomate (as cloves) (Fig. 4). The degree of attack is extremely powerful, fruits were very little, almost no trees belonging Starkrimson varieties, Wagner Awarded Red Melba - showed no flowers.
Scolytus mali Becht.	Adults dig galleries between bark and wood, fruit larvae wooden, galleries even deeper. The larvae attack mode is dangerous because they may disrupt the movement of sap in the tree. With time the plant is dried. Part of the apple orchard has many channels and outlets of adults on the trunk. The degree of infection is still rated one easily.
Operophtera brumata L.	Pest is polyphagous, but also occurs in apple. The strong attack caterpillars can destroy a tree in full leaf table. This species was identified on all apple varieties grown on the farm. Grage attack was assessed by middle attack.
Adoxophyes reticulana Hb.	Polyphagous species is found and apple. Larvae were observed in the trees attacked by twisting them in the form of a cone. When the fruit is ripe can chew their epicarp (peel), producing qualitative damage. The degree of infection in the farm is average for all varieties of apple.
P*anonychus ulmi* Koch.	Polyphagous species that attacks all species of fruit. In the orchard Rusciori degree of attack is high. They were found on all apple varieties studied. The mites suck sap sting and leaves. The tissue at the site of attack depigmentează, culoritul go from silvery-white to rusty. Attacked leaves dry and fall.
Microtus arvalis Poll.	Climatic conditions in recent years have favored the growth of populations of Microtus arvalis in fruit tree orchards. At Rusciori mice gnawed the bark from the neck and roots. The degree of infection in the orchard is very strong all over them.

Photo 3. *Eriosoma lanigerum* Hansm. – attack (Original photo)

Photo 4. *Anthonomus pomorum* L. – attack (Original photo)

In our country, there known about 12-15 species of pests and if they are not kept under control, the varieties of apple production can be compromised even by 100%. Of these species, nine are found in Rusciori orchard where they produce major damages. The degree of pest of fruit trees generally ranges from moderate to extremely loud. Of the nine species identified in the interval 2014-2015, with the highest degree of pest are *Eriosoma lanigerum* Hansma., *Anthonomus pomorum* L., *Microtus arvalis* Poll. In the category of medium degree of damage, there are: *Aphis trees* De Geer, *Quadraspidiosus perniciosus* Comst., *Operophtera frosted* L. *Adoxophyes reticulana* Hb., *Panonychus ulmi* Koch. *Quadraspidiosus perniciosus.* A special attention was drawn to the species considered not numerous, but a massive attack of them may reduce the quantity and quality of fruit, and dry the orchard in a few years. The species with the lowest degree of attack is Scolytus mali Becht. (Photo 5). The increased number of pests is due to the lack of hygiene measures on plant, the mechanical works, and agro and phytosanitary treatments.

Photo 5. *Scolytus mali* Becht. – attack (original)

CONCLUSIONS

The varieties of apple trees in the Ruscori Farm were attacked by 9 major animal pest species (insects, mites,and rodents).

The degree of attack achieved by the studied pest species ranged from weak (species) to extremely strong (three species).

Jonathan is the most attacked variety. On it there were identified almost all pests present in the farm.

The climatic conditions in recent years have favored the growth of populations *Eriosoma worrying lanigerum*, *Anthonomus pomorum*, and *Microtus arvalis* in the orchard and fruit and compromised the culture.

The integrated protection by means of measures to preventive and treat pest play an important role, being the number one technological factor in the fruit growing practice. Higher yields and cost-efficient plant protection is based on applied science.

Similar studies to monitor the pests in agricultural crops have been carried out and in Sibiel Village, Sibiu County, in a private orchard of apple trees using pheromone traps to limit *Cydia pomenella* population, [7,8] but it was about other species like lepidoptere [10,11] damaging crops [9].

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RECENT EVOLUTIONS OF LIVESTOCK AT REGIONAL LEVEL IN ROMANIA

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Abstract

In Romania the livestock sector is well developed and presents specific characteristic for each region of development. This paper analysis the livestock sector at regional level, following a previous research made by the authors for all animal species considered for production. For the research method, based on regional analysis has been considered statistical approach, based of national database for the years 2011 and 2015. The results indicates changes in the concentration of livestock at regional level. While the poultry, sheep, goats and cattle sectors increased in terms of livestock, significant decreases were recorded in relation with pigs and horses livestock.

***Key words*:** *livestock, regions of development, Romania*

INTRODUCTION

The livestock sector in the EU member states, including Romania faced a continuous transformation. The livestock production started to be translated from the developed countries to the developing countries. In the recent years the sector faced challenges in relation with the environmental issues [4], food safety regulations and the market conditions. At the EU level was set up a system of identification and registration, which allow to identify the origin and destination of livestock. In the EU, the evolving of the livestock production various and can be related with the evolution of the consumer demand and the economic level of each country [5]. The principal meat production in the EU was pig meat, which indicates the importance of the pigs livestock. [2]. This paper aimed to identify the recent changes of livestock in Romania, based on a regional analyse. The paper compare the present results with similar studies made in 2011 and published in the same journal in 2013 [1]. As in the case of pigs livestock [3], each type of livestock is influenced by a range of factors: number of animals per farm, extensive of intensive growing technology, quality of the biological material, feeding, local technical and economical conditions.

MATERIALS AND METHODS

In this paper we quantified the number of each type of livestock and their density per 100 ha. This analyse is made on regional level and national level. The study evaluate the evolution of the livestock from 2011 to 2015
The data are provided by National Institute of Statistic Romania and Ministry of Agriculture and Rural Development, and have been statistically processed and interpreted.

RESULTS AND DISCUSSIONS

The poultry production is the main livestock production in terms of number of heads at national level. The poultry sector didn't developed too much in terms of livestock level since 2011. The number of poultry increased at national level from 78.64 million heads in 2011 to only 79.84 million heads in 2015, which led to the increase of poultry livestock per 100 ha at national level from 552.93 heads/100 ha in 2011 to 562.92

heads/100 ha in 2015.

Table 1. Poultry livestock per 100 ha of land at regional level in Romania in 2011

Regions	Heads	Percent from total (%)	Poultry livestock per 100 ha at region level (heads/100 ha)
Total, 2015	79,841,651	100	562.92
Total, 2011	78,648,098	100	552.93
North West Region, 2011	8,626,527	10.80%	425.68
North West Region, 2015	8,963,865	11.39%	440,73
Centre Region, 2011	8,060,624	10.10%	436.44
Centre Region, 2015	8,840,224	11.24%	470.88
North East Region, 2011	13,906,237	17.42%	670.62
North East Region, 2015	13,952,506	17,74%	672, 60
South East Region, 2011	12,488,619	15.64%	562.97
South East Region, 2015	11,594,847	14.74%	521.81
South Region, 2011	20,563,160	25.75%	870.71
South Region, 2015	20,462,181	26.01%	865.50
Bucharest Ilfov Region,2011	586,022	0.73%	571.80
Bucharest Ilfov Region,2015	524,272	0.66%	509.32
South West Region Oltenia 2011	10,170,919	12.74%	591.69
South West Region Oltenia 2015	8,231,376	10,46%	478.87
West Region, 2011	5,439,543	6.81%	296.45
West Region, 2015	6,078,827	7.72%	332.17

Source: Own calculations based on data NIS Romania

The farmers had financial difficulties since the Russia imposed the embargo on EU food origin and the farmers were affected by the conditions of accessing subsidies under animal welfare commitments. In this sector there are huge gaps between the slaughterhouse price and supermarkets price, which put pressure on producers and advantage the traders.

The South Region of Development remains in 2015 the main area for the poultry production. The Călărași County is the larger poultry producers, with 4.5 millions heads, followed by Prahova County with 3.5 millions heads and Dâmbovița County with 3.2 millions heads. If in 2011 Dâmbovița County was the first producer in the region, with a share of 18.4 % of total poultry livestock of region, in 2015, The Călărași County took its place with a share of 22.14 % from the region poultry production.

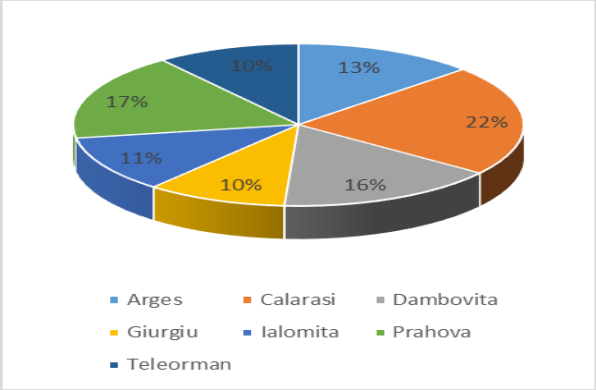

Fig.1. Poultry livestock distribution between counties of South East Region in 2015

Table 2. Sheep livestock per 100 ha of land at regional level in Romania in 2011

Regions	Heads	Percent from total (%)	Sheep livestock per 100 ha at region level (heads/100ha)
TOTAL,2011	**8,533,434**	**100**	**60.16**
TOTAL, 2015	**9,809,512**	**100**	**68.96**
North West Region, 2011	1,330,825	15.60%	65.67
North West Region, 2015	1,649,303	16.81%	81.09
Centre Region, 2011	1,931,589	22.64%	104.59
Centre Region, 2015	2,117,936	21.59%	112.81
North East Region, 2011	1,258,352	14.75%	60.68
North East Region, 2015	1,395,954	14.23%	67.29
South East Region, 2011	1,302,978	15.27%	58.74
South East Region, 2015	1,508,528	15.37%	67.89
South Region, 2011	812,676	9.52%	34.41
South Region, 2015	935,565	9.53%	39.57
Bucharest Ilfov Region, 2011	25,352	0.30%	24.74
Bucharest Ilfov Region, 2015	30,341	0.30%	29.47
South West Region Oltenia, 2011	610,385	7.15%	35.51
South West Region Oltenia, 2015	679,271	6.92%	39.51
West Region, 2011	1,261,277	14.78%	68.74
West Region, 2015	1,492,614	15.21%	81.56

Own calculations based on data NIS Romania

The sheep livestock which take the second place in terms of number of livestock at national level, increased almost year by year, as you can see it represented in Table 2. In 2015 were recorded 9.8 million heads of sheep at national level, compared to 8.5 million heads which were recorded in 2011. The sheep livestock per 100 ha at national level increased from 60.16 heads/100 ha in 2011 to 68.96 heads/100 ha in 2015.

The Centre Region of Development, remains the main area for sheep livestock, due its natural condition favourable to sheep production, its tradition and due the organisations of the farmers in active organisations of sheep breeders. Within the Centre Region, the Sibiu County remains the main pool of sheep livestock, with a share of 21.59 % of the total sheep heads from the region, but this percentage decrease from 29% which was recorded in 2011.

The sheep livestock in the Sibiu County increased from 558 thousands heads in 2011 to 574 thousands heads in 2015.

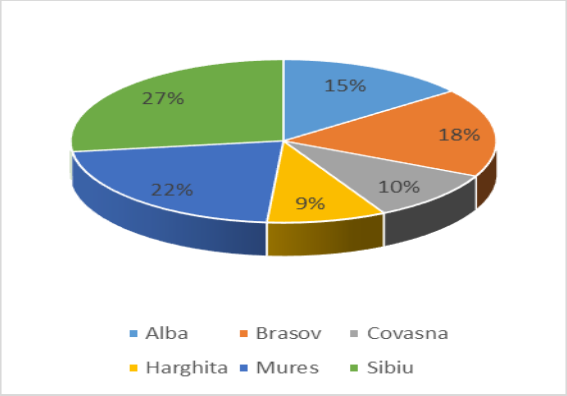

Fig.2. Sheep livestock distribution between counties of Centre Region in 2011

Meanwhile, in Mureș County, the second larger sheep producers of the region, the sheep livestock increased from 409 thousands heads in 2011 to 457 thousands heads in 2015, buts its share on sheep livestock in the region remains around 21%.

The pig production was relaunched after 2007 in Romania, this time based on competitive conditions. The producers made high efforts to assure the EU standards for production. But from 2011 to 2015, the pig livestock continued to decrease in Romania. The international market conditions were not favourable for this sector, and the intern production faced strong competition in terms of quality and price with the similar products from European Union.

Table 3. Pigs livestock per 100 ha of land at regional level in Romania in 2011

Regions	Heads	Percent from total (%)	Pigs livestock per 100 ha at region level (heads/100 ha)
TOTAL, 2011	**5,363,797**	**100**	**37.82**
TOTAL, 2015	**4,926,928**	**100**	**34.63**
North West Region, 2011	681,074	12.70%	33.61
North West Region, 2015	663,666	13.47%	32.63
Centre Region, 2011	534,442	9.96%	28.94
Centre Region, 2015	479,522	9.73%	25.54
North East Region, 2011	580,468	10.82%	27.99
North East Region, 2015	525,687	10.66%	25.34
South East Region, 2011	869,479	16.21%	39.19
South East Region, 2015	772,094	15.67%	34.74
South Region, 2011	948,429	17.68%	40.16
South Region, 2015	885,263	17.96%	37.44
Bucharest Ilfov Region, 2011	126,677	2.36%	123.60
Bucharest Ilfov Region, 2015	28,129	0.57%	27.32
South West Region Oltenia, 2011	690,887	12.88%	40.19
South West Region Oltenia, 2015	620,505	12.59%	36.09
West Region, 2011	932,341	17.38%	50.81
West Region, 2015	952,062	19.32%	52.02

Own calculations based on data NIS Romania

While in 2011 the South Region of Development, had the largest livestock of pigs between regions, in 2015 the main concentration of pig at regional level can be found in the West Region. The livestock of pigs has decreased these years from 948 thousands in 2011 heads to 885 thousands heads in 2015 in the South Region, while in the West Region their number increased from 932 thousands heads to 952 thousands heads. In 2015 in Timiș County were recorded 638 thousands pigs, which represent 67 % of total

number of pigs from the West Region of Development.

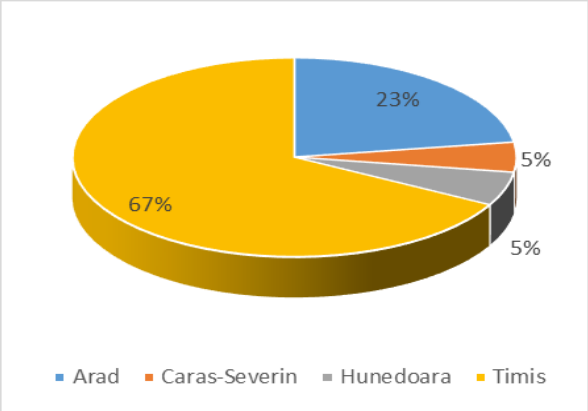

Fig.3 Pigs livestock distribution between counties of South Region

Table 4. Cattle livestock per 100 ha of land at regional level in Romania in 2011

Regions	Heads	Percent from total (%)	Cattle livestock per 100 ha at region level (heads/100 ha)
TOTAL, 2011	**1,988,939**	**100**	**14.02**
TOTAL, 2015	**2,092,414**	**100**	**14.71**
North West Region, 2011	347,662	17.48%	17.16
North West Region, 2015	369,130	17.64%	18.14
Centre Region, 2011	313,255	15.75%	16.96
Centre Region, 2015	339,579	16.22%	18.08
North East Region, 2011	510,817	25.68%	24.63
North East Region, 2015	534,001	25.52%	25.74
South East Region, 2011	231,879	11.66%	10.45
South East Region, 2015	245,110	11.71%	11.03
South Region, 2011	237,696	11.95%	10.06
South Region, 2015	241,650	11.54%	10.22
Bucharest Ilfov Region, 2011	7,171	0.36%	7.00
Bucharest Ilfov Region, 2015	6,756	0.32%	6.56
South West Region Oltenia, 2011	196,712	9.89%	11.44
South West Region Oltenia, 2015	196,841	9.40%	11.45
West Region, 2011	143,747	7.23%	7.83
West Region, 2015	159,347	7.61%	8.70

Own calculations based on data NIS Romania

The major producers from this region have developed the trade with meat within the EU countries, and their effort for export in the Asia can develop the production in the next years.

The cattle livestock in Romania increased from 1.98 million in 2011 to 2.09 million in 2015. These led to a concentration of cattle livestock per 100 ha from 14.02 heads/100 ha in 2011 to 14.71 heads/100 ha in 2015. The North East Region of Development continued to have the largest number of cattle, with an increase from 510 thousands heads in 2011 to 534 thousands heads in 2015. The West Region of Development which has also important tradition in cattle livestock, recorded an increase of cattle livestock from 347 thousand heads in 2011 to 369 thousands heads in 2015. At the opposite part is situated the Bucharest Ilfov Region, with a decreasing which seems that will led soon to the abandon of cattle livestock production in this region.

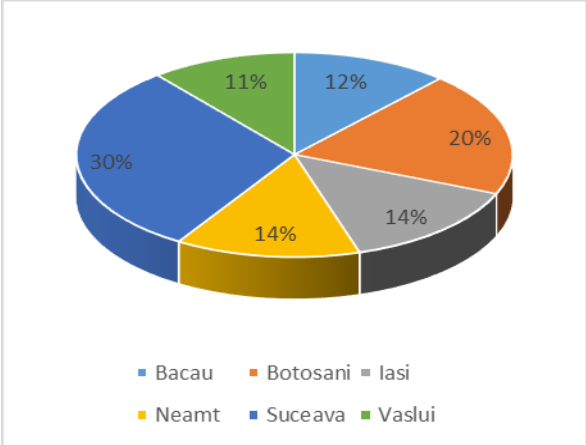

Fig.4. Cattle livestock distribution between counties of North East Region

The Suceava County continued to have the largest livestock of cattle within the North East Region of Development, and the number of heads increase from 155 thousand in 2011 to 161 thousand in 2015.

Due to increase share of market for the goat products, the goat livestock Romania increased from 1.23 million heads in 2011 to 1.44 million heads in 2015. The goat livestock per 100 ha at national level increased in these conditions from 8.72 heads/100 ha to 10.12 heads/100 ha.

The South East Region of Development, continue to have the largest livestock of goats between regions in 2015. The number of goats

increased in this region from 317 thousands heads in 2011 to 367 thousands heads in 2015.

Table 5. Goats livestock per 100 ha of land at regional level in Romania in 2011

Regions	Heads	Percent from total (%)	Goat livestock per 100 ha at region level (heads/100ha)
TOTAL, 2011	**1,236,143**	**100**	**8.72**
TOTAL, 2015	**1,440,151**	**100**	**10.12**
North West Region,2011	90,643	7.33%	4.47
North West Region,2015	107,415	7.45	5.28
Centre Region, 2011	105,768	8.56%	5.73
Centre Region, 2015	130,551	9.06%	6.95
North East Region, 2011	198,332	16.04%	9.56
North East Region, 2015	224,245	15.57%	10.81
South East Region, 2011	317,218	25.66%	14.30
South East Region, 2015	367,808	25.53%	16.55
South Region, 2011	224,370	18.15%	9.50
South Region, 2015	256,864	17.83%	10.86
Bucharest Ilfov Region, 2011	8,935	0.72%	8.72
Bucharest Ilfov Region, 2015	12,101	0.84%	11.75
South West Region Oltenia, 2011	235,949	19.09%	13.73
South West Region Oltenia, 2015	270,292	18.76%	15.72
West Region, 2011	54,928	4.44%	2.99
West Region, 2015	70,875	4.92%	3.87

Own calculations based on data NIS Romania

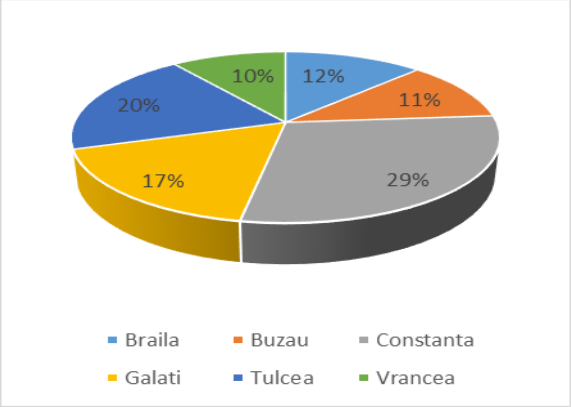

Fig.5. Goats livestock distribution between counties of South East Region

The Constanţa County had 29 % of the total goats livestock of the South East region in 2015, while Tulcea County was ranged in the second place with 19 % of the total number of goats from this region.

The horse's livestock has dramatically decreased in the last years from 1.2 million in 2011 to 504 thousands heads in 2015.

Table 6. Horses livestock per 100 ha of land at regional level in Romania in 2011

Regions	Heads	Percent from total (%)	Horses livestock per 100 ha at region level (heads/100 ha)
TOTAL, 2011	**1,236,143**	**100**	**8.72**
TOTAL, 2015	**503,466**	**100**	**3.53**
North West Region, 2011	90,643	11.88%	4.47
North West Region, 2015	61,242	12.16%	3.01
Centre Region, 2011	105,768	12.22%	5.73
Centre Region, 2015	64,250	12.76%	3.42
North East Region, 2011	198,332	26.21%	9.56
North East Region, 2015	135,571	26.92%	6.53
South East Region, 2011	317,218	16.25%	14.30
South East Region, 2015	75,758	15.04%	3.40
South Region, 2011	224,370	13.89%	9.50
South Region, 2015	73,974	14.69%	3.12
Bucharest Ilfov Region, 2011	8,935	0.61%	8.72
Bucharest Ilfov Region, 2015	1,657	0.32%	1.60
South West Region Oltenia, 2011	235,949	13.60%	13.73
South West Region Oltenia, 2015	64,953	12.90%	3.77
West Region, 2011	54,928	5.35%	2.99
West Region, 2015	26,061	5.17%	1.42

Own calculations based on data NIS Romania

In The North East Region of Development, which had the largest livestock of horses between Romanian regions of Development in 2015, the Iaşi County has 22 % of total livestock of region with 30 thousand heads,

while Vaslui County was in second place with 20 %, corresponding to 26 thousand heads.

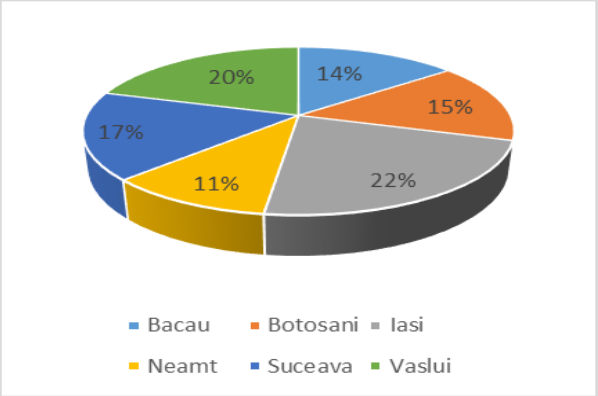

Fig.6. Horses livestock distribution between counties of South East Region

The livestock level is in relation with the feed resources at regional level. The total area of land that served for the all livestock increased form 9.35 million ha in 2011 to 9.39 million ha in 2015.

Table 7. The land fond by use at regional level in Romania in 2015 (ha)

Regions	Arable	Hayfields	Pastures	Total
TOTAL, 2015	**9,395,303**	**1,556,246**	**3,272,165**	**14,223,714**
North West Region, 2015	1,021,392	401,608	610,850	2,033,850
Centre Region, 2015	750,930	480,899	645,549	1,877,378
North East Region, 2015	1,381,790	200,983	491,639	2,074,412
South East Region, 2015	1,829,009	63,809	329,195	2,222,013
South Region, 2015	1,968,944	108,792	286,449	2,364,185
Buch. - Ilfov Region, 2015	100,646	58	2,230	102,934
South West Region Oltenia, 2015	1,251,902	89,136	377,876	1,718,914
West Region, 2015	1,090,690	210,961	528,377	1,830,028

Source: NIS Romania

CONCLUSIONS

The evolution of the livestock at region level in Romania suffered important changes from 2011 to 2015. While some region as Bucharest Ilfov seems to completely lose its role in the livestock production, some category of livestock, as horses had a negative trend which will also lead in time to the elimination of the role of this species in the agriculture production.

Some types of livestock as goats and sheep had increased their number within regions due a good demand of their products on the market, while pig's livestock continue to decrease, due the quality and prices which are not competitive with the external offer which presses the internal markets. New efforts are made in supporting the Romanian products, by offering a minim space of 50 % in any supermarket, which can led to the increase of livestock at the region level after these regulation will be implemented on the market.

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THE ECONOMETRIC ANALYSIS OF THE CONTRIBUTION OF THE CAPITAL INVESTED IN TOURISM AND OF THE TOURISM CONTRIBUTION TO GDP

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Abstract

For our country, tourism is an important sector. With the resources we train and we undertake interconnections with other branches of the national economy, signifies an important factor in sustainable development. For the existence of quality tourism it is essential to apply some concrete measures for sustainable development. The interest in tourism is justified in all countries by the economic idea that identifies a particular type of income, thus participating in the external balance of payments but also to create important jobs. The primary role of capital investment in tourism activity, entrepreneurial initiative, is logically regarded as sustainable economic solution to achieve a gross domestic product increase in the overall context of sustainable economic development. The increase in capacity of the activity of tourism will propagate an effect of increasing the income and the gross value added. The dissemination of the results shows in a comparative form the real levels of the direct contribution of tourism to the gross domestic product and the levels estimated on the basis of the linear regression equation as well as the series and the levels of the variable waste. The model developed discusses and supports the statistical arguments, the primary role of capital investment in tourism activity, the entrepreneurial initiative as consistent economic solution to secure an increase in gross domestic product in the overall context of sustainable economic development.

Key words: *gross domestic product, invested capital, sustainable development, tourism*

INTRODUCTION

The concept of *"sustainable development/ sustainability"* was born as a result of proposals made by global organizations in environmental protection, in the idea of changing the fundamentally life style of the population.

Analyzing the related literature, we can say that globally are developed over 100 definitions of sustainable development. Six of these are highlighted in the report "Our Common Future", where the full definition of sustainable development refers to the idea that there is a development that allows satisfying present needs without compromising the ability of future generations to meet their own needs [6].

Over time, the sustainability term has acquired multiple meanings. One of the reasons would be the interest of economists, ecologists, sociologists, architects, parliamentarians, local authorities or international organizations.

Regarding the contribution to achieve the targets imposed by the European Union, the branch of tourism shows a crescendo bringing and thus contributing to durability, a healthy economic sustainability but also increasing employment and to the socio-economic cohesion [13].

The most studies on sustainable tourism development are descriptive, based on qualitative and subjective data in their conclusions, without a rigorous methodology for assessing the sustainability aspects of eco-tourism [10]. The analyze carried out over time in this segment have led to a demonstration of the fact that an economic growth may not result only in the balance of the territorial space but also to the increase it. At the national level, land is primarily due to

the main documents used in the European community specific to tourism. In fact, these documents highlight plans and programs that use sustainable policies, equitable, sustainable tourism activity that creates a balance and a link between certain areas of the country. The connection with the environment does nothing but to strengthen the idea that the emergence of problems in this sector can create a unit in the development of certain areas.

If we refer to the idea of tourism planning we only notice that we are actually referring to a spatial overall and items that provide a certain identity data of stay, tourist circuit and the tourist flow and smooth operation of management resources, which are actually sights [5].

The phenomenon of sustainability that is both studied but especially inserted in the structures of tourism activity is understood mainly through the prism of the effective management of natural and anthropogenic resources [4]. Due to this idea of sustainable development in tourism, we can highlight internationally the inclusion of an area in some circuit efficiency programs that aim to improve the smooth running of the sector. Natural and anthropogenic environmental determinants are offering attractions necessary for the implementation of development plans for tourism industry [7]. A good management of tourism resources can lead to economic growth. A poor management of tourism product can converge to a decline in economic activity but the most serious the exhaustion of the values provided by this sector [8].

In this context, this research is focused on the effects of the tourism activity on sustainable development.

MATERIALS AND METHODS

In the present research we can identify statistics attesting to the role of business travel by contributions propagated on gross domestic product, which covers 10 European countries neighboring Romania, in the year 2013 *(data processed by the information provided by Eurostat)*.

Identifying and understanding the significance of statistical regularities that are formed between the amount of capital invested and its contribution to gross domestic product, increase revenue and the number of jobs, it presents an interest of knowledge of political and economic factors.

The methods of investigation that can provide scientific support to formulate viable conclusions with practical utility designed to give the necessary support basing any decisions on intervention and capital allocation, are statistical and econometric.

Therefore, information and data related to this research are processed via the shaping of econometric modeling, analysis, evaluation and comparison, having a high coefficient of synthetic truth. They may be used statistical techniques, but also mathematical techniques.

Their systematization was done through an extensive documentation, with a real applicative impact ensuring proper understanding of the discussed subject. The research was conducted by three figures and three tables. They allow easy identification of the conclusions to be drawn, which hold necessary arguments, identifying the relations of the approached concepts.

This research started from the vision of the methodological approach on sustainable tourism in order to identify the effects of tourism activities on sustainable development.

RESULTS AND DISCUSSIONS

The size and increase in capital invested in a branch of the national economy fosters economic growth result of the branch simultaneously with the increase in employment, falling unemployment and an increasingly greater contribution to gross domestic product [11].

Activity circumscribed tourism as an economic activity, creative of gross domestic product has joint development and other branches of the national economy is based on sustained investment policy and a stimulating legislation to ensure a favorable operating environment and development [4].

The direct contribution of tourism to gross domestic product according to capital invested in tourism.

The first role of capital investment in tourism

activity, entrepreneurial initiative, is logically regarded as sustainable economic solution to achieve a gross domestic product increase in the overall context of sustainable economic development. The increase in capacity of the activity of tourism will propagate an effect of income increase and gross value added [5].

Calculation and the graphical representation of the econometric indicators.

The mathematical expression of the correlation model of the direct contribution of capital invested in tourism on the GDP by simple linear regression equation is the least squares method. Thus, it is obtained the following form of the linear regression equation [2]: $\hat{y}_1 = -6.242788 + 7.460584 \cdot x$.

Table 1. Synoptic picture of indicators for assessing the viability of representation econometric model interdependence direct contribution of tourism to GDP depending on the capital invested in tourism

Dependent Variable: SER (y_1): The direct contribution of tourism to GDP (bln. USD)				
Method: Least Squares				
Included observations: 10				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SER(x): Capital invested in tourism (billion $) „b”	7.460584	0.824127	9.052706	0.0000
C „a”	-6.242788	3.325025	-1.877516	0.0973
R-squared (The coefficient of determination)	0.911063	Mean dependent var		14.05000
R- The ratio of the correlation	0.954496			
Adjusted R-squared	0.899946	S.D. dependent var		24.55127
S.E. of regression: $\hat{\sigma}_{y_1,\hat{y}_1}$	7.765887	Akaike info criterion		7.114215
Sum squared resid	482.4720	Schwarz criterion		7.174732
Log likelihood	-33.57107	F-statistic		81.95149
Durbin-Watson stat	3.003469	Prob(F-statistic)		0.000018

Source: Processing personal data from 2013 provided by Eurostat

Unifactorial model parameter values that define linear direct contribution of tourism to the GDP capital invested in tourism are presented in a synoptic picture of the results, in Table 1.

Also, the "synoptic picture of econometric indicators representation" is at the core indicators econometric information necessary to conclude on the viability of the model (Table 1).

The results which indicate in a comparative form the real level of the direct contribution of tourism to the gross domestic product and the levels estimated on the basis of the linear regression equation as well as the series and the levels of residual variable are listed in Table 2.

The beach looming alternating residues of them in relation to the origin of the autocorrelation between variants not confirm the absence of residual variable, statistically quantified by Durbin-Watson coefficient [1].

Table 2. Series actual levels, the levels estimated on the dependent variable (the direct contribution of tourism to GDP) based on the capital invested in tourism and the series and the beach of the residual term *(data collected in 2013)*

Country	Actual levels of direct contribution of tourism to GDP (bln. USD) y_1	The estimated direct contribution of tourism to GDP $\hat{y}_1$	The series of residual levels	Residual Plot
1. Albania	0.60000	-5.49673	6.09673	| . | * . |
2. Austria	19.3000	21.3614	-2.06137	| . *| . |
3. Bulgaria	2.00000	-1.02038	3.02038	| . | * . |
4.The Czech Republic	5.60000	8.67838	-3.07838	| . * | . |
5. Croatia	6.10000	2.70991	3.39009	| . | * . |
6. Greece	14.2000	20.6153	-6.41531	| .* | . |
7. Italy	81.9000	74.3315	7.56848	| . | *. |
8. Romania	3.20000	19.8693	-16.6693	|* . | . |
9. Slovakia	2.20000	-1.02038	3.22038	| . | * . |
10. Hungary	5.40000	0.47174	4.92826	| . | * . |
Total	140.5000	140.5000	0.0000	

Source: www.eurostat.ro, Accessed in 2015 [14]

Graphical representation displayed in Figure 1 is able to certify the viewing position of the series of values related to the direct contribution of tourism to real and projected gross domestic product, and residues listed in Table 2.

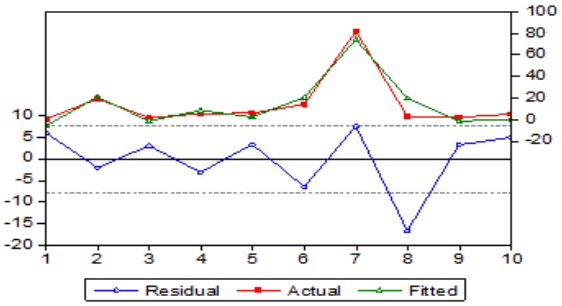

Fig. 1. Graphical presentation of residues *(residual)*, the actual levels *(current)* levels and estimated *(fitted)* for the direct contribution of tourism to GDP depending on the capital invested in tourism
Source: Processing personal data from 2013 provided by Eurostat

It is obvious that outlines a positive assessment on the spot near levels predicted from the equation compared with actual levels of direct contribution of tourism to gross domestic product [3], and the term residual values are positioned in an acceptable range defined by a mean error of the regression equation, with one exception that is allocated to Romania, ($\hat{\sigma}_{y_1,\hat{y}_1}$ = 7.765887).

Table 3. Synoptic picture of "White Heteroskedasticity Test"

White Heteroskedasticity Test:				
F-statistic	0.759247	Probability		0.503006
Obs*R-squared	1.782585	Probability		0.410125
Test Equation: Dependent Variable: RESID^2				
Method: Least Squares				
Included observations: 10				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-6.820640	52.13933	-0.130816	0.8996
SER02	37.82121	31.78138	1.190043	0.2728
SER02^2	-2.936838	2.795131	-1.050698	0.3283
R-squared	0.178259	Mean dependent var		48.24720
Adjusted *R*-squared	-0.056525	S.D. dependent var		82.53471
S.E. of regression	84.83527	Akaike info criterion		11.96262
Sum squared resid	50379.17	Schwarz criterion		12.05340
Log likelihood	-56.81312	F-statistic		0.759247
Durbin-Watson stat	2.040100	Prob(F-statistic)		0.503006

Source: Processing personal data from 2013 provided by Eurostat

In Table 2 and the graph presented in Fig. 2 is defined the indicator *"coefficient of irregularity/inequality of Thiel" (Th= 12.9832%)*, which by its size exceeds the limit of 5% provides information that is unsuitable for linear model developed perform calculations interpolation or extrapolation.

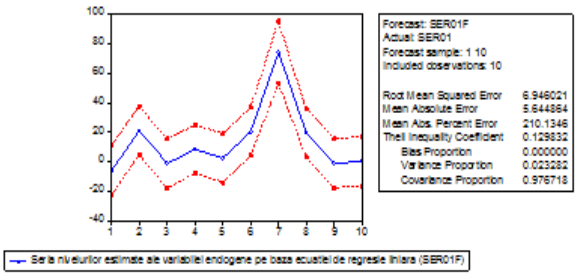

Fig. 2. Graphical representation of the series with the levels estimates of the direct contribution of tourism to the gross domestic product depending on the capital invested in tourism (SER01F = $\hat{y}_1$) and the limits which they fit into the conditions of estimation error of the average of the linear regression equation (on the basis of the law of the Student distribution with a bilateral arrangement of the threshold of significance of 5 % and 8 degrees of freedom)
Source: Processing personal data from 2013 provided by Eurostat

The histogram from Fig. 3 presents the statistical description of the series of the error term *(residual)* as well as the following indicators: mean, median, maximum, minimum, standard deviation *(standard deviation)*, the coefficient of asymmetry *(Skewness)*, kurtosis-flattening *(Kurtosis)*, Jarque-Bera statistical coefficient *(JB = 17 101)* and the related probability coefficient JB *(P = 0.000193%)* allowing to check the assumption of normality of the distribution of the residual variable.

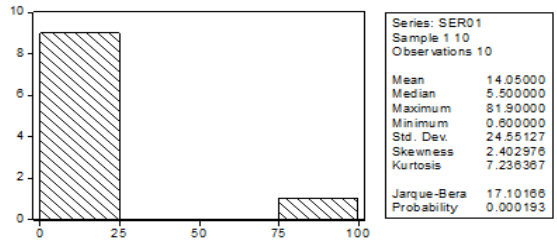

Fig. 3.Statistical description of the residual variable and test for normality of the distribution of the residual variable on Jarque-Bera statistical criterion
Source: Personal processing

It follows, then, that we have no reason to believe that the residual variable statistic is distributed asymptotically normal, Jarque-Bera statistical coefficient has a magnitude exceeding 0.9 evident affordable size.
In the case of the interdependence between

the direct contribution of tourism to the GDP and capital invested in tourism the hypothesis of heteroscedasticity the residual variable by applying *"White Test"*.

The synoptic picture of Table 3 provides the information necessary to perform this test on two criteria, *"Criterion F"* and *"Criterion* χ^2 *"*. Therefore it can be concluded that the residual variable is homoscedastic because F and calculated values *(statistical)* have sizes lower tabular values to a materiality threshold of 5% and thus rejecting the hypothesis of heteroscedasticity.

CONCLUSIONS

"Sustainability" means the property of a system which focuses on maintaining a certain state of the system in time [12].

Analysis of results displayed in the picture synopsis *(Table 1)* as well as on other testing and statistical calculations performed provides an opportunity to make the following conclusions:

- The econometric model of the direct contribution of tourism to gross domestic product according to capital invested in tourism is expressed through the linear regression

equation: $\hat{y}_1 = -6.242788 + 7.460584 \cdot x$;

- The size of the regression coefficient "b" allows us to specify that in the system of the 10 European countries included in the survey at the level of 2013, an increase of 1 billion USD of capital invested in tourism is causing an increase in the direct contribution of tourism the gross domestic product by 7.460584 bln. USD;
- The viability of the model is confirmed by the fact that the ratio of the correlation is statistically certified as being significantly different from zero, meaning *"Criterion F"* materiality in this case, it is very close to zero. The correlation between the variables studied system is significantly interrelated in statistical terms, and strong intensity, because the correlation has a size ratio very close to 1, $R_{y_1 x} = 0.954496$;
- The coefficient of determination shows that 91.11% of the variance of the endogenous variable - Y1 - *(direct contribution of tourism to gross domestic product)* is explained by the variation of exogenous - x - *(capital invested in tourism)* as a percentage difference hundred percent is the proportion of residual component or proportion of influence caused by other factors not considered in the analysis of the proposed correlation system;
-The capital invested in tourism is a significant variable correlation in the studied system, meaning *"Criterion t"* because the threshold for statistical significance testing of regression coefficient *"b"* is of a very small size, close to zero;
- The parameter *"a"* is not confirmed, in statistical terms, as different from zero, because materiality of testing exceeds the critical threshold of 5% *(9.73%)*. It is a conclusion that is influenced by the low number of observations underlying the development model;
- *"Coefficient Durbin-Watson statistic", DW = 3.003469*, has a size which is unacceptably at a long distance from the ideal value 2. It confirms the hypothesis of non-existence of autocorrelation between levels of the error term *(residual)*. Under these circumstances, it is considered that the parameters of the equation do not provide a good efficacy for extrapolation;
- The expression of the relative size of the standard error estimation of the linear regression equation in relation to the average value of the endogenous variable has a size of 55.27% and needs additional information support to invalidate the model in order to be used in the calculation of extrapolated values, because it is by 10% higher, the limit considered acceptable. It is obvious that this conclusion is correctly formulated because it has a statistical support by the size of the *"Coefficient of irregularity of Theil"*, which is located above the threshold of 5 % *(Th = Bonuses ranging 12.98%)*;
- The information relating to the test Jarque-Bera lay at the basis of the rejection of the hypothesis of layout of the values of the error according to the law of the normal distribution *(test of normality of the distribution of the residual variable in Fig. 4)*, because the

probability associated with the coefficient j-B is very small 0.0193 %. It is obvious that through this statistical finding the model developed shows vulnerability and alerts, at the same time that the number of observations is reduced. The visible discrepancy position of Italy expands the mathematical form of the model;

- The results shown in the instrument synopsis of the *"White Heteroskedasticity Test"*, provides the ability to conclude that the residual variable is homoscedastic and in these conditions are statistical premises to ensure the viability of the required model and may be carried out the following recognitions: The dispersion of error is constant; the application of the *„Criterion t"* for checking the parameters of the significance of the linear regression equation is fully conclusive, the econometric model attach the utmost importance to all non-discriminatory comments made by the residual variable.

The synthetic conclusion of the study of econometric modeling is based on the results of calculations and shows a regression equation linear [9], which imposes certain vulnerabilities to be considered as a model fully viable correlation between the direct contributions of tourism to gross domestic product according to capital invested in tourism.

The model developed brings into discussion and supports, with statistical arguments, the crucial role of investment of capital in the tourism activity, of entrepreneurial initiative that the economical solution is to obtain an increase in the gross domestic product in the general context of economic growth.

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MODELLING NIGERIA'S URBAN AND RURAL INFLATION USING BOX-JENKINS MODEL

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Abstract

This is time series paper modelling Nigeria's urban and rural inflation using monthly CPI data from January 2001 to December 2015. Consumer Price Index (CPI) is a measure of the average change overtime in the prices of consumer items, that is, goods and services that people buy for day-to-day living. Box-Jenkins ARIMA Model was used to model 180 monthly CPI data and was forecasted to 29 CPI monthly data which actually fitted with two quarterly CPI data. The model identified that the data are dependent and not identically distributed, both the mean and variance are increasing through time. ARIMA (0, 1, 0), ARIMA (0, 1, 13) were selected and proved to be correct, residuals were showing insignificant auto-correlated residual and followed a normal distribution with mean zero and constant variance. This research finds of high inflation in urban and rural areas of Nigeria which serves as an indicator to the economy situation of Nigeria.

Key words**:** *consumer price index (CPI), time series, autoregressive integrated moving average (ARIMA), forecast*

INTRODUCTION

A consumer price index (CPI) measures changes in the price level of consumer goods and services purchased by households. The CPI uses data from survey of consumption pattern of households to produce a timely and precise average price change for the consumption sector of any economy like the Nigerian economy. The CPI is a statistical estimate constructed using the prices of a sample of representative items whose prices were collected periodically. It is one of several price indices calculated by most national statistical agencies. Inflation is a persistent rise in the general price levels of goods and services in an economy over a period of time. Inflation rate has been regarded as one of the major economic indicators in any country. Inflation is undeniably one of the leading and most dynamic macro-economic issues confronting almost all economies of the world [9]. It will be one of the obstacles for development and hurt people's living standard. The high inflation will also bring unemployment crisis and even social crisis. It has been pointed that core inflation has played an important role in the deliberations of monetary policymakers [13]. Upward or downward movements in CPI sometimes persist for a very long period and also tend to retrace back and forth. As a result, world economies witness periods of boom and recession or downturn. Consequently, it is of importance to analyze and forecast CPI.

Nigeria's CPI contains the following thirteen categories: All Items, All Items less Farm Produce, All Items less Farm Produce and Energy, Imported Food, Food, Food and Non Alcoholic Beverage, Alcoholic Beverage, Tobacco and Kola, Clothing and Footwear, Housing water, Electricity, Gas and Other Fuel, Furnishings and Household Equipment Maintenance, Health, Transport, Communication, Recreation and Culture, Education, Restaurant and Hotels and Miscellaneous goods and services. Many researchers and economists apply various time series and econometric models to forecast or model inflation rates of countries because of CPI importance to countries' economic growth. The dynamic and simultaneous interrelationship between inflation and its determinants – growth rate of Gross Domestic Product (GDP), growth rate of money supply (M2), fiscal deficit, exchange rate (U.S dollar

to Naira), importance and interest rates was determined using econometric time series model [8]. This study will not just research on composite CPI data rather will look at urban and rural CPI data as to have an in-depth understanding for good forecast. The error levels will be critically assessed to select the best which will guide prediction and policy formulation and implementation in Nigeria. At the end of this research, this study would provide answer to the following question; 1. What is the model for Nigeria urban and rural inflation? The main objective of this study is to model and forecast Nigeria inflation rate with Box-Jenkins ARIMA Model using urban and rural CPI of 2001-2015. Other specific objectives of the study are as follows;

1.Model identification/selection for urban and rural CPI data.

2.Model estimation for urban and rural CPI data.

3.Model checking/diagnostic for urban and rural CPI data.

4.Predicting and forecasting urban and rural inflation.

Factors affecting inflation in Nigeria had been examined using cointegration and descriptive statistics and were observed to have variations in the trend pattern of inflation rates and some variables considered were significant in determining inflation in Nigeria [9]. These variables include annual total import, annual consumer price index for food, annual agricultural output, interest rate, annual government expenditure, exchange rate and annual crude oil export.

Therefore, this study uses expert modeller in selecting the best fitted model for Nigeria urban and rural CPI that will serve as an indicator of rate of inflation, used to adjust wages to compensate for lost purchasing power due to inflation, used to convert a price or wage to a real price or real wage to show the equivalent amount in a base period after adjusting for inflation. Though this work was on Nigeria Urban and Rural All Items Consumer Price Index (NURAICPI) data, the comparisons are also relevant to other situations where data contain a trend, seasonal, or other cyclic, pattern, for example in geology [11], biology [1], atmospheric science [12] [5] [4].

MATERIALS AND METHODS

The study was conducted in Nigeria. Nigeria is located at the extreme inner corner of the Gulf of Guinea on the west coast of Africa, occupies an area of 923,768 sq. km (356,669 m^2), extending 1,127 km (700 m) East-West and 1,046 km (650 m) North-South with total population of 184,635,279 people [10]. It has 36 states and FCT Abuja. Its currency is Naira. Consumer Price Index Data of urban and rural Nigeria All Items for the period of January 2001 to December 2015 were collected from National Bureau of Statistics publication as at March 2016 [6]. It is a monthly time series data. The sample size of 180 was used. Statisticians George Box and Gwilym Jenkins developed a practical approach to build ARIMA model, which best fit to a given time series and also satisfy the parsimony principle.

$$\phi(B)\Phi(B)\nabla^d\nabla_S^D Y_t = \theta(B)\Theta(B)a_t \quad (1)$$

$$X_t = \nabla^d\nabla_S^D Y_t \quad (2)$$

Box-Jenkins Model was used to make sure data is stationary (check a time plot. If not, differentiate), used ACF & PACF, guess small values for p & q, estimate order p, q and run diagnostic tests on residuals. Also whether there is noise, If not, add lags (p or q, or both). Then if order choice not clear, use AIC, AIC Corrected (AICc), BIC, or HQC.

RESULTS AND DISCUSSIONS

This study is to model Nigeria's urban and rural inflation rate from 2001-2015 CPI data using Box-Jenkins' model. The model fitting of this data can provide a better understanding of the dynamics of Nigerian economy through solid underlying theory, stable estimation of time-varying trends, relatively few parameters and the summary Statistics (Table 1).

The NURAICPI time series plot indicates local trends from 2001 to 2015 and a general most likely linear upward trend from 2001 to 2015 (Fig. 1).

The positive significant skewness of 0.329 for urban CPI and 0.417 for rural CPI suggest that NURAICPI is a normal distribution and right skewed. Kurtosis measures the extent to which observations cluster around a central point. The value of the kurtosis statistic is zero for a normal distribution. Negative kurtosis of -1.073 for UCPI and -1.117 for RCPI indicates that, relative to a normal distribution, the observations cluster less and have thicker tails.

Table 1. Summary of descriptive statistics of NURAICPI data

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
UCPI	180	94.290	42.5968	0.329	0.181	-1.073	0.360
RCPI	180	95.911	42.5544	0.417	0.181	-1.117	0.360
Valid N (listwise)	180						

Source: Own determination.

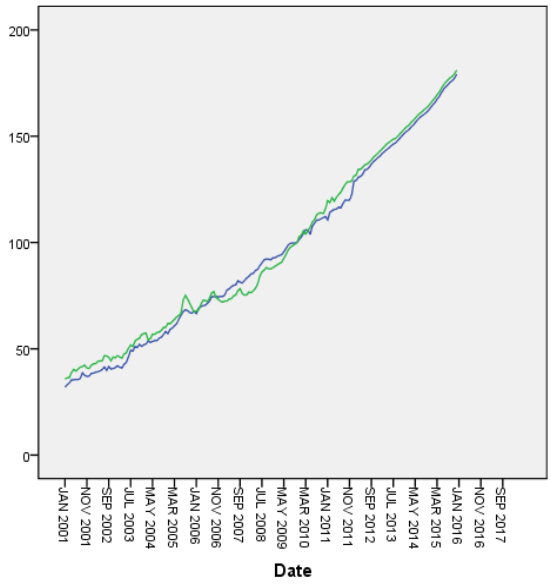

Fig. 1. Nigeria Urban and Rural Inflation Rate from2001-2015
Source: Own calculation

Model identification

The ACF and PACF do not tail off, but instead have values that stay close to 1 over many lags (Fig. 2, Fig. 3, Fig. 4 and Fig. 5). The series is non-stationary and differencing will be needed. First difference will be tried and then look at the ACF and PACF of the differenced data. Haven taken first differences the series become stationary and all autocorrelations are non-significant (Fig. 6, Fig. 7, Fig. 8 and Fig. 9). The series is now called a random walk. A possible model for a random walk is $x_t = \delta + x_{t-1} + w_t$. The data are dependent and are not identically distributed; in fact both the mean and variance are increasing through time.

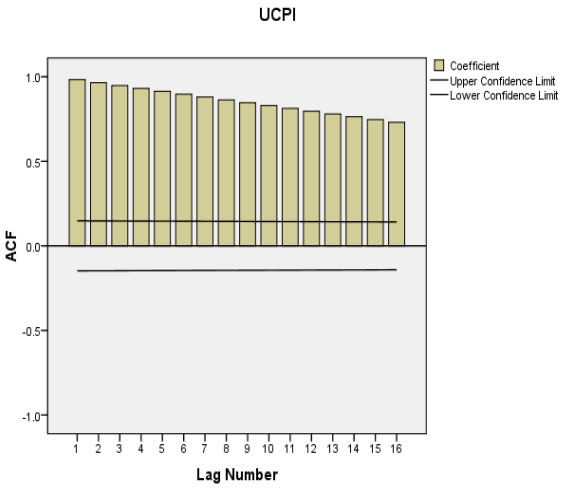

Fig. 2. UCPI ACF
Source: Own calculation

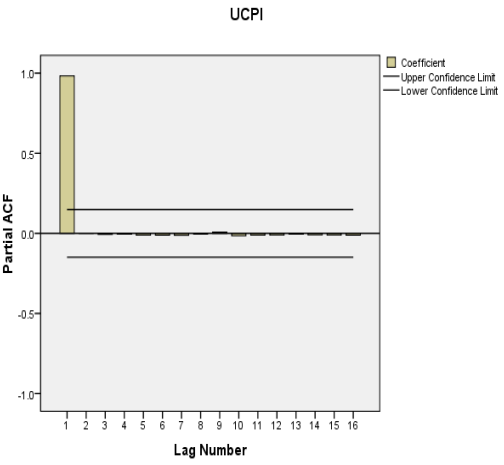

Fig. 3. UCPI PACF
Source: Own calculation.

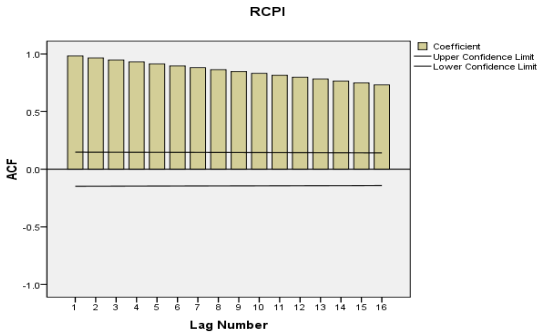

Fig. 4. RCPI ACF
Source: Own calculation.

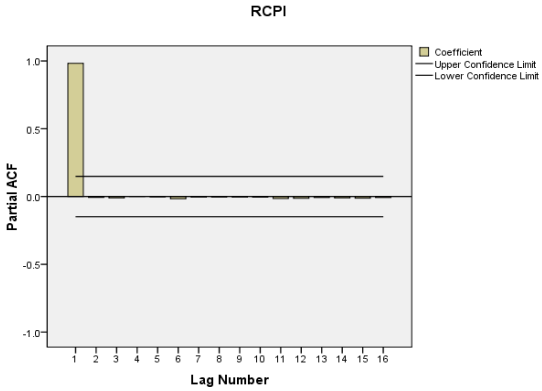

Fig. 5. RCPI PACF
Source: Own calculation.

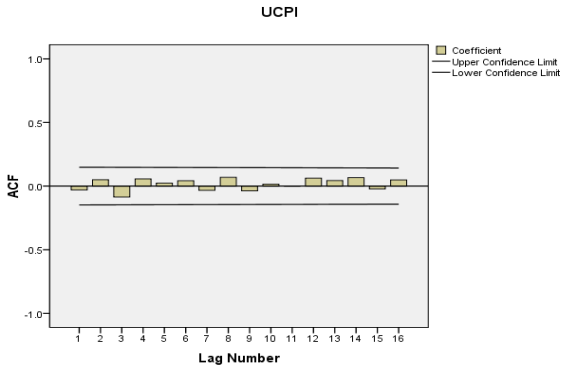

Fig. 6. UCPI differenced ACF
Source: Own calculation

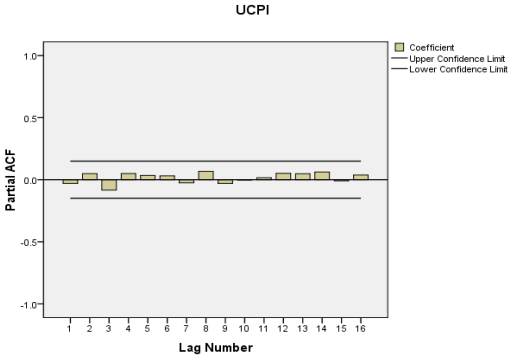

Fig. 7. UCPI differenced Partial ACF
Source: Own calculation

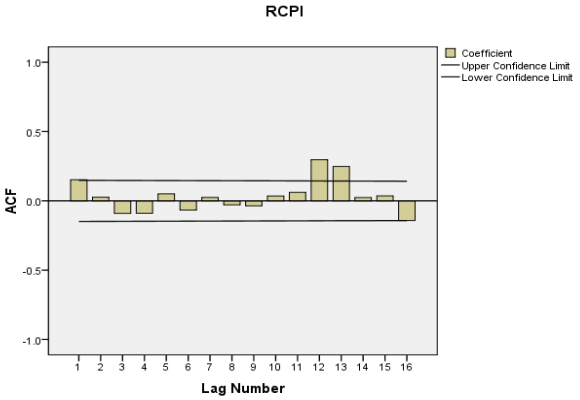

Fig. 8. RCPI differenced ACF
Source: Own calculation

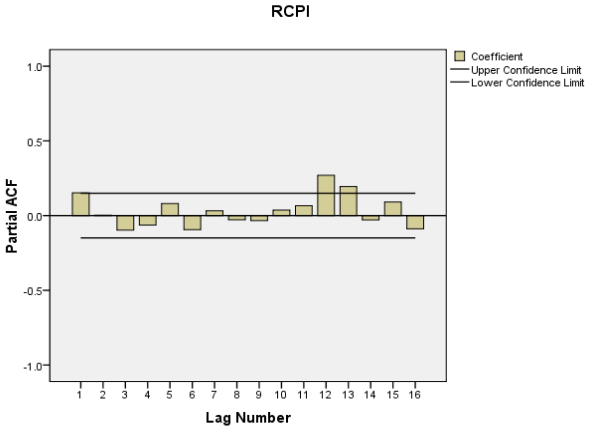

Fig. 9. RCPI differenced Partial ACF
Source: Own calculation.

Model estimation

At this stage the parameters of all the selected models that seem to provide statistically adequate representation of the available data were estimated by the maximum likelihood method as advocated by Box and Jenkins model using standard computer packages like SPSS 16.0 [2]. ARIMA (0, 1, 0), ARIMA (0, 1, 13), were selected by expert modeler (Table 2). For all these models values of R^2, RMSE, MAPE, MaxAPE, MAE, MaxAE and normalized BIC were calculated and compared.

Table 2. Result of the Model Description

			Model Type
Model ID	UCPI	Model_1	ARIMA(0,1,0)
	RCPI	Model_2	ARIMA(0,1,13)

Stationary R^2 value revealed the stationarity of the model. Further the value of Ljung-Box

Q (18) was compared to critical values from chi-square distribution. If model is correctly specified residuals should be uncorrelated and Q should be small (the probability value should be large). A significant value indicated that the chosen model did not fit well. All these criteria revealed that ARIMA (0, 1, 0) and ARIMA (0, 1, 13) were the best fitted models for forecasting of the CPI (Table 3).

There are various sets of rules to guide p and q fitting in lower order processes, but generally the statistical software was allowed to fit up to 12-14 orders for AR and MA, and suggest combinations that minimize an AIC or BIC criterion.

This part is as much as an art-form as it is a structured process. The goal during this phase is to minimize the AIC/BIC criterion. Positive values of Stationary R-squared (0.098) mean that the model under consideration is better than the baseline model.

R-squared (0.999) shows that 99.9% variation in UCPI and RCPI series is explained by the regression model and the model fit the model fit the data well.

RMSE (1.055) shows that UCPI and RCPI varies from its model-predicted level by ₦1.05k.

MAPE (1.012) indicates that UCPI and RCPI varies from its model-predicted level by ₦1.01k and can be used to compare series with different units.

The MaxAPE (6.551) indicates that 6.6% is largest forecasted error and show the worse-case scenario for the forecast.

MAE (0.734) indicates that UCPI and RCPI used 73k to vary from its model-predicted level.

MaxAE (5.579) indicates that the largest forecast error is ₦5.58k.

Normalized BIC (0.192) the overall model shows the overall fit of the model that attempts to account for model complexity and well fitted.

It is a score based upon the mean square error and includes a penalty for the number of parameters in the model and the length of the series.

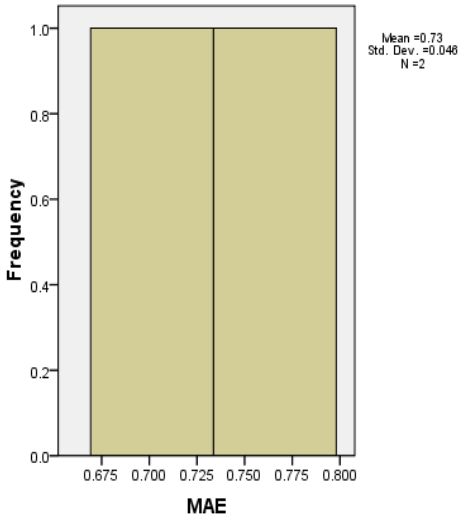

Fig. 10. Mean Absolute Error
Source: Own calculation.

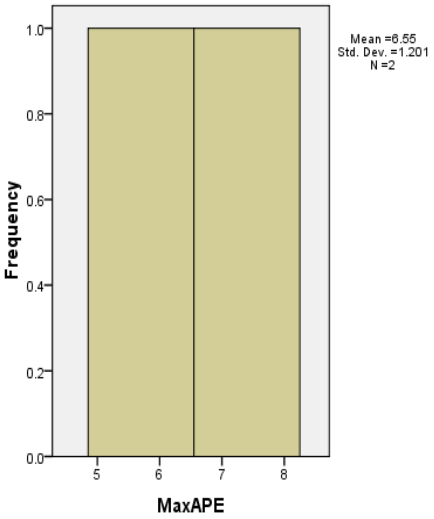

Fig. 11. Maximum Absolute Percentage Error
Source: Own calculation.

Diagnostic Checking

Some residual analysis was done to test for the goodness of fit (Fig. 12 and Fig. 13). Boxplot histogram residual ACF and PACF and their correlogram were analyzed (Fig.14). The model is correct, since the residuals were uncorrelated and followed a normal distribution with mean zero and constant variance. Secondly the model is adequate since, the autocorrelations of the residuals were not significantly different from zero i.e. Most of the sample autocorrelation coefficients of the residual are within the limits $\pm 1.96/\sqrt{N}$ where N is the number of

observations upon which the model is based then the residuals are white noise indicating that the models are correct and are good fit.

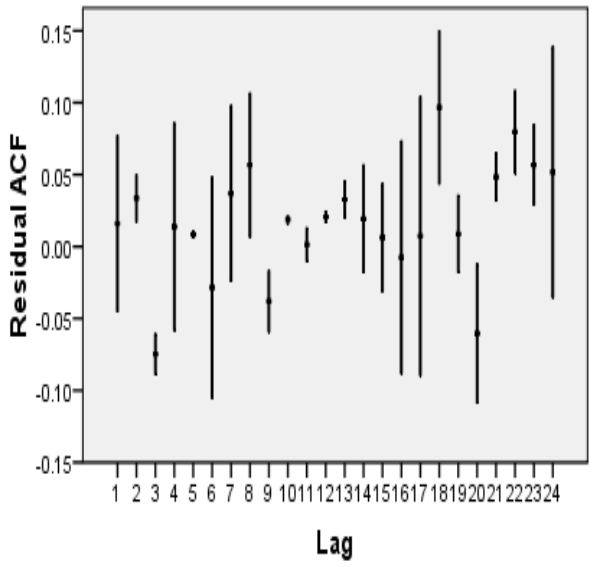

Fig. 12. Residual ACF
Source: Own calculation.

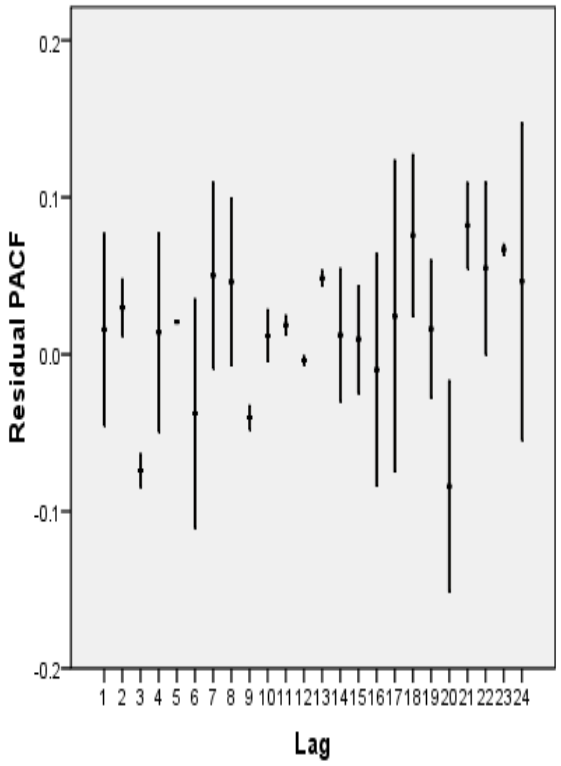

Fig. 13. Residual PACF
Source: Own calculation.

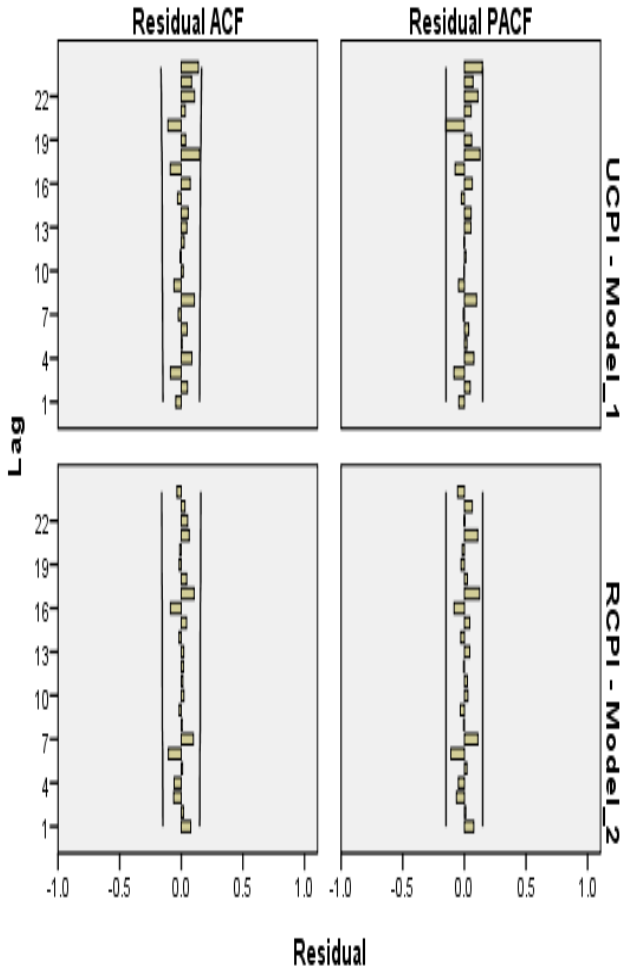

Fig. 14. Residual Histogram.
Source: Own calculation.

Forecasting

Since the models are assured to be stationary and fitted such that there is no information in the residuals, forecasting is carried out. Forecasting assesses the performance of the model against real data. Usually the utility of a specific model or the utility of several classes of model to fit actual data can be assessed by minimizing a value of such as root mean square (Table 3).

Table 3. Presents the forecast from January 2016 to May 2018 and it fitted the actual series.

	Forecast Model		UCL Model		LCL Model	
	UCPI-Model_1	RCPI-Model_2	UCPI-Model_1	RCPI-Model_2	UCPI-Model_1	RCPI-Model_22
Jan 2016	180.0	182.1	181.9	184.3	178.0	179.9
Feb 2016	180.8	183.0	183.5	186.2	178.0	179.9
Mar 2016	181.5	184.1	184.9	187.9	178.1	180.2
Apr 2016	182.3	185.1	186.2	189.5	178.4	180.6
May 2016	183.1	186.1	187.4	191.1	178.7	181.2
Jun 2016	184.6	187.3	189.3	192.7	179.8	181.9
Jul 2016	185.3	188.8	190.5	194.7	180.2	183.0
Aug 2016	186.1	189.6	191.6	195.9	180.6	183.4
Sep 2016	186.9	190.5	192.7	197.1	181.0	183.9
Oct 2016	187.6	191.2	193.8	198.2	181.4	184.3
Nov 2016	188.4	192.1	194.9	199.4	181.9	184.8
Dec 2016	189.2	193.2	195.9	200.8	182.4	185.5
Jan 2017	189.9	194.1	197.0	202.2	182.9	186.0
Feb 2017	190.7	194.9	198.0	203.6	183.4	186.1
Mar 2017	191.5	195.6	199.0	204.9	183.9	186.3
Apr 2017	192.2	196.4	200.0	206.3	184.4	186.5
May 2017	193.0	197.1	201.0	207.5	184.9	186.7
Jun 2017	194.5	197.9	202.8	208.8	186.2	187.0
Jul 2017	195.3	199.4	203.8	210.8	186.7	188.0
Aug 2017	196.0	200.1	204.8	212.0	187.3	188.3
Sep 2017	196.8	200.9	205.7	213.2	187.8	188.6
Oct 2017	197.6	201.7	206.7	214.4	188.4	188.9
Nov 2017	198.3	202.4	207.7	215.5	188.9	189.3
Dec 2017	199.1	203.2	208.7	216.7	189.5	189.6
Jan 2018	199.8	203.9	209.6	217.8	190.1	190.0
Feb 2018	200.6	204.7	210.6	219.0	190.7	190.4
Mar 2018	201.4	205.4	211.5	220.1	191.2	190.8
Apr 2018	202.1	206.2	212.5	221.2	191.8	191.2
May 2018	202.9	207.0	213.4	222.3	192.4	191.6

Source: Own calculation.

CONCLUSIONS

The NURAICPI data have been fitted with Box-Jenkins ARIMA model successfully with the urban inflation model is ARIMA(0,1,0) while the rural inflation model is ARIMA(0,1,13) (Table 2). The upward trend of CPI from 2001-2015 and positive significant skewness proves the report that Nigeria inflation rate hits 16.5% in June 2016 which is highest in almost 11 years [7]. As at June 2016, inflation rate hits 16.5% year-on-year from 15.6% May 2016 and 1.7% month-on-month from 2.8% May 2016. Urban index hits 18.1% year-on-year from 17.1% May 2016, 2.9% month-on-month from 2.2% May 2016. While rural index hits 15.1% year-on-year from 14.3% May 2016, 2.5% month-on-month from 1.4% May 2016.

The fluctuation in food prices lead to variation of wages. The trend in urban CPI and rural CPI can be said that economic policies, activities, implementation of policies, budgets, etc of government administration influence inflation rates in Nigeria. Economists have confirmed that an expansionary budgetary provision cum other factors increase inflation rates [3]. November 2006 and July 2008 shows trend in urban CPI and rural CPI while there is a persistence increase inflation rate from July 2013 which might be caused by transition in government, economic policies, withdrawals of foreign investors etc. (Fig. 1).

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RELATIONSHIP EXISTING AMONG NIGERIA URBAN AND RURAL CONSUMER PRICE INDEX (CPI)

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Abstract

This is time series analysis of Nigeria urban CPI and rural CPI to find out whether there exist relationship among urban and rural areas inflation. The CPI uses data from survey of consumption pattern of households to produce a timely and precise average price change for the consumption sector of any economy like the Nigerian economy. A total of 180 samples were used from monthly urban and rural CPI data from January 2001 to December 2015. Johansen Cointegration Test and Granger Causality Test were carried on, Vector Autoregression VAR model constructed to find out that there exist relationship among Nigeria Urban and Rural All item Consumer Price Index (NURACPI). Finally, impulse response function was used to check the response of urban (rural) CPI to the impulse of rural (urban) CPI and they were positive. This study finds out that there is high inflation rural area of Nigeria than urban area, the possible causes of it and how they affected each other.

Key words**:** *consumer price index (CPI), Nigeria urban and rural all item consumer price index (NURACPI), impulse response, time series*

INTRODUCTION

The consumer price index (CPI) is a measure that examines the weighted average of prices of a basket of consumer goods and services, such food, energy, education, transportation, medical care etc. It is a measure of changes in the purchasing power of a currency and the rate of inflation. It expresses the current prices of a basket of goods and services in terms of prices during the same period in a previous year, to show the effect of inflation on purchasing power. It has been the best known lagging indicator. The CPI market basket is developed from detailed expenditure of information provided by families and individuals on what they actually bought. The CPI reflects spending pattern for urban and rural population, it is frequently called a cost-of –living index but it differs in several important ways from a complete cost-of –living measure. A cost-of-living index is a conceptual measurement goal and not a straight forward alternative to CPI. Several works have investigated the relative accuracy of alternative inflation forecasting models [11], in their study of the best models to use in forecasting inflation rates in Nigeria identified areas of future research on inflation dynamics to include re-identifying ARIMA models, specifying and estimating VAR models and estimating a P-Star model, amongst others that can be used to forecast inflation with minimum mean square error.

China monthly CPI data recorded from 2001 to 2010 was analyze using impulse response function to explain the relationship that exist between China urban and rural area and forecasted on the CPI [2]. He constructed a Vector autoregression (*VAR*) model and carry on Granger causality test. Hylleberg-Engle-Granger-Yoo (HEGY) test was used to examine whether there are seasonal unit roots. Decomposition of inflation and its volatility and according to the traditional quantity theory of money, the rate of inflation is decomposed into three components: the rate of change in the money supply, plus the rate of change in the velocity of circulation, minus the rate of change in real output [10]. They derived a generalization of this decomposition by postulating that the rate of change of money supply, velocity, and output follow diffusion equations. Using stochastic calculus

techniques, two expressions are obtained decomposing inflation and its volatility as a sum of several economically important terms. Two sets of U.S. data are used to illustrate these decompositions with actual numbers.

ARIMA models for forecasting the Irish inflation used two alternative approaches to identifying ARIMA models, namely, the Box-Jenkins approach and the objective penalty function methods [8]. The emphasis was on forecast performance, which suggests that ARIMA forecast outperformed the other approach. Two time-varying parameter models for Chilean inflation rates was carried out and the study discovered that ARIMA models outperformed the two other models considered in that paper for short-term out-of-sample forecasts. However, this superiority diminishes in longer forecasts [12]. Upon the discovering similar results confirmed that simple ARIMA models do well in predicting inflation rates [14]. An autoregressive model with a deterministically shifting intercept was introduced [3]. This implies that the model has a shifting mean and is thus non stationary but stationary around a nonlinear deterministic component. The shifting intercept is defined as a linear combination of logistic transition functions with time as the transition variables. The number of transition functions was determined by selecting the appropriate functions from a possibly large set of alternatives using a sequence of specification tests. This selection procedure is a modification of a similar technique developed for neural network modelling [20].

Analysis of Nigeria monthly CPI data using seasonal ARIMA model and a multiplicative seasonal autoregressive integrated moving average (ARIMA) model , (0, 1, 1)x(0, 1, 1)12 [1]. While Nigeria All Item Consumer price Index from 1960 to 2008 was modelled using ARIMA model and Fourier Series Model [18]. He found the model well fitted using normal probability plot and quantie-quantile plot but when APE and RMSE values were used ARIMA (1,1,0) model outperformed the Fourier Series Model. Fourier Series model comprising the trends, seasonal and error component is fitted to Nigeria monthly CPI from 2003 to 2011 [15]. The model was used to forecast inflation rates for thirteen months. Also, Nigeria urban and rural monthly CPI was modeled and forecasted using Box-Jenkins Model (0, 1, 0)x(0, 1, 13) [17]. This work sees the need to critically look at the relationship exiting among urban area and rural area inflation and stands to provide answer to this question; Are there relationship existing between urban area inflation and rural area inflation?

The main objective of this study is to check whether there exist relationships among urban and rural area CPI. Other specific objectives of the study are as follows;

1.To run Johansen Cointegration Test on NURACPI and check whether there exist cointegration relationship among urban and rural CPI.

2.To run Granger Causality Test on NURACPI and check if urban CPI can play a role in determining rural CPI and vice versa.

3.To construct Vector Autoregression VAR Model on NURACPI and look at lag order criteria selection, lag exclusive, residual and residual normality, inverse root graph, exogeneity of NURACPI

4.To check Impulse Responses of NURACPI.

The investigation of the existence and timing of changes in U.S. inflation persistence was examined [7]. To do so, they developed an unobserved components model of inflation with Markov-switching parameters and measured persistence using impulse response functions based on the model. An important feature of their model is its allowance for multiple regime shifts in parameters related to the size and propagation of shocks. The urban and rural dwellers have different consumption habit because their surrounding and may affect the standards of consumption [2]. This work analyzed Nigeria urban and rural CPI and checked whether there exist relationships among them. It ran impulse response function thereby used urban (rural) CPI to predict rural (urban) CPI. Furthermore, vector autoregressive (VAR) model was constructed for more analysis and prediction of the existing relationship among urban CPI and rural CPI.

MATERIALS AND METHODS

The study was conducted in Nigeria. Nigeria is located at the extreme inner corner of the Gulf of Guinea on the west coast of Africa, occupies an area of 923,768 sq. km (356,669 m^2), extending 1,127 km (700 m) East-West and 1,046 km (650 m) North-South with total population of 184635279 people [18]. It has 36 states and FCT Abuja. Its currency is Naira. Consumer Price Index Data of urban and rural Nigeria All Items for the period of January 2001 to December 2015 were collected from National Bureau of Statistics publication as at March 2016 [13]. It is a monthly time series data. The total sample used was 180.

Johansen Cointegration Test

VAR-based cointegration tests methodology was developed by Johansen (1991, 1995) using a Group object or an estimated VAR object [4][5]. The Johansen tests may be performed using a Group object or an estimated VAR object. The residual tests may be computed using a Group object or an Equation object estimated using nonstationary regression methods.

Let's look at a VAR of order (*p*):

$$y_t = A_1 y_{t-1} + ... + A_p y_{t-p} + Bx_t + \varepsilon_t \quad (1)$$

where y_t is a –k vector of non-stationary I(1) variables, x_t is a -vector of deterministic variables, and ε_t is a vector of innovations.

Vector autoregression

Vector autoregression (*VAR*) models which were introduced into empirical economics by Sims (1980) provide a method to estimate dynamic relationships between economic variables and forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables [16]. We will use *VAR* models to analyze relevance between UCPI and RCPI. Vector autoregression is a statistical model used to represent the linear interdependencies among multiple time series. A *VAR* model describes the development of a set of *n* variables over the same sample period ($t = 1,\ldots,T$) as a linear function of only their past evolution. The variables are collected in a $n \times 1$ vector t y_t, which has as the i^{th} element $y_{i,t}$, the time t observation of variable y_i . A *VAR(p)* (the p -th order vector autoregression model), is

$$y_t = c + \Phi_1 y_{t-1} + ... + \Phi_p y_{t-p} + \varepsilon_t \quad (2)$$

where c is a $(n \times 1)$ vector of constants, i Φ is a $(n \times n)$ coefficient matrix for every $i = 1,\ldots, p$ and ε_t is a $(n \times 1)$ vector of error terms satisfying

$E\varepsilon_t = 0$, $E\varepsilon_t \varepsilon_\sigma = \Omega$ if $t = \sigma$ and $E\varepsilon_t \varepsilon_\sigma = 0$ if $t \neq \sigma$ (Ω is a $n \times n$ positive definite matrix). The *1*-periods back observation y_{t-1} is called the *1*-th *lag* of *y*. Thus, a *p*-th order *VAR* is also called a *VAR* with *p* lags. Or,

$$y_t = A_1 y_{t-1} + ... + A_p y_{t-p} + Bx_t + \varepsilon_t \quad (3)$$

where y_t is a –k vector of endogenous variables, x_t is a d vector of exogenous variables, $A_1, \ldots, A_p$ and B are matrices of coefficients to be estimated, and ε_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables. Since only lagged values of the endogenous variables appear on the right-hand side of the equations, simultaneity is not an issue and OLS yields consistent estimates. Moreover, even though the innovations ε_t may be contemporaneously correlated, OLS is efficient and equivalent to GLS since all equations have identical regressors.

Granger Causality Test

Based on the vector autoregression part, it is good to know how useful each variable is for forecasting the other one. That means to know whether rural (urban) part plays a role in predicting UCPI (RCPI) series, which is the primary objective of this research. Thus in this section, we will discuss the forecasting relation between RCPI and UCPI using Granger causality test proposed by Granger (1969) [6]. Granger causality is a statistical conception of causality that is based on the thought that the past cannot be caused by the present or future. It is decided by observing whether including the past values of a variable in the information set can improve the

forecast of another variable. Let *x* and *y* be stationary time series. To test the null hypothesis that *x* does not Granger-cause *y*, we should first find the proper lagged values of *y* to contain a univariate autoregression of *y*:

$$y_t = a_o + a_1 y_{t-1} + a_2 y_{t-2} + ... + a_m y_{t-m} + \varepsilon_t \quad (4)$$

where ε is the disturbance.

Here y_{t-j} is reserved in the regression if and only if it has a significant *t* -statistic, *m* is the largest lag length for which the lagged dependent variable is significant.

Secondary, the autoregression is extended by including lagged values of *x* :

$$y_t = a_0 + a_1 y_{t-1} + a_2 y_{t-2} + ... + a_m y_{t-m} \varepsilon_t \quad (5)$$

where ε is the residual.

In this regression, these entire *x* are individually significant according to their *t* -statistic, provided that they add explanatory power to the regression according to an *F* -test. In the above augmented regression item, *p* is the shortest and *q* is the longest, lag length for *x* is significant. The null hypothesis that *x* does not Granger-cause *y* is accepted if and only if no lagged values of *x* are retained in the regression, that is, $b_p = b_{p-1} = ... = b_q = 0$.

This research wants to determine whether there exists granger causality between rural and urban CPI data. It is known that some urban wage earners come to the city, there may be more pressure on prices and high inflation than villages. This research is to know whether the inflation in city will influence that in the rural areas.

Impulse Responses Function

A shock to the *i*-th variable not only directly affects the *i*-th variable but is also transmitted to all of the other endogenous variables through the dynamic (lag) structure of the VAR. The *VAR* models are usually emerged by impulse responses. Impulse response function (*IRF*) is widely used to reveal the dynamic relationship between macroeconomic variables within *VAR* models by tracing the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables and describes the reaction of the system as a function of time or possibly as a function of some other independent variable that parameterizes the dynamic behavior of the system. If the innovations are contemporaneously uncorrelated, interpretation of the impulse response is straightforward. The *i*-th innovation is simply a shock to the *i*-th endogenous variable. Innovations, however, are usually correlated, and may be viewed as having a common component which cannot be associated with a specific variable. In order to interpret the impulses, it is common to apply a transformation to the innovations so that they become uncorrelated. This study will use impulse response function to study the CPI whether it has feedback from urban (rural) area to rural (urban) district. A vector $MA(\infty)$ representation was written as

$$y_t = \mu + \varepsilon_t + \Psi_1 \varepsilon_{t-1} + \Psi_2 \varepsilon_{t-2} + ... + \Psi_p \varepsilon_{t-p} \quad (6)$$

Thus, the matrix Ψ_s has the interpretation $\Psi_s = \frac{\partial y_{t+s}}{\partial \varepsilon_t}$; that is, the row *i*, column *j* element of Ψ_s identifies the consequences of a one unit increase in the *j*-th variable's innovation at date *t* (ε_{jt}) for the value of the *i*-th variable at time $t+s(y_{i,j+s})$, holding all other innovation at all dates constants. The term $\Psi_s = \frac{\partial y_{t+s}}{\partial \varepsilon_t}$, as a function of *s* is called the impulse response function which represents the response of $y_{i,j+s}$ to a one time impulse in y_{jt} with all other variables dated *t* or earlier held constant.

Or, $$\upsilon_t = p\varepsilon_t - (0, D) \quad (7)$$

where *D* is a diagonal covariance matrix. Several options for the choice of *P* will be given by EViews.

RESULTS AND DISCUSSIONS

The present study is to research whether if they exist relationship between urban and rural inflation. The summary Statistics of these data are given in Table 1. The NURAICPI time series plot in Figure 1 indicates local trends from 2001 to 2015 and a general most likely linear upward trend from

2001 to 2015. The positive significant skewness of 0.329 for urban CPI and 0.417 for rural CPI suggest that NURAICPI is a normal distribution and right skewed. Kurtosis which measures the extent to which observations cluster around a central point has the value of zero for a normal distribution. Negative kurtosis of -1.073 for UCPI and -1.117 for RCPI indicates that, relative to a normal distribution, the observations cluster less and have thicker tails.

Table 1. Summary of descriptive statistics of NURAICPI data

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
UCPI	180	94.290	42.5968	0.239	0.181	-1.073	0.360
RCPI	180	95.911	42.5544	0.417	0.181	-1.0117	0.360
Valid N (listwise)	180						

Source: Own calculation.

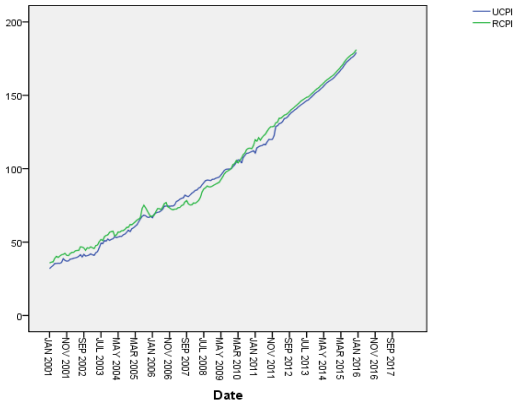

Fig. 1. Nigeria urban and rural inflation rate from 2001 to 2015.
Source: Own calculation.

Johansen Cointegration Test

Figure 1 shows that UCPI and RCPI plot have a similar trend. In regards to this, Urban and Rural CPI series can be cointegrated.

The cointegrating relationship can be interpreted as the long run equilibrium and is of great importance in economics.

If two series are individually integrated but some linear combination of them has a lower order of integration, then the series are said to be cointegrated.

The Johansen test which permits more than one lower order of integration, then the series are said to be cointegrated.

The Johansen test which permits more than one cointegrating relationship is a procedure for testing cointegration.

There are two types of Johansen test, either with trace or with eigenvalue. Table 2 results reject the null hypothesis. This shows that UCPI series and RCPI series are stationary and have relationship of similar trend.

Table 2. Result of the Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical value	0.05 Prob.**
None *	0.060463	15.55550	15.49471	0.0490
At most 1 *	0.030310	5.140007	3.841466	0.0234

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level.
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values [9].
Source: Own calculation.

Granger Causality Test

The p-value of UCPI and RCPI rejected the null hypothesis. This suggested that there exist granger causality between urban and rural area. The variation of UCPI may affect the variation of RCPI.

Table 3. Result of the Granger Causality Test of UCPI and RCPI

Null Hypothesis:	Obs	F-Stat	Prob.
RCPI does not Granger Cause UCPI	168	1.08809	0.3745
UCPI does not Granger Cause RCPI		1.84212	0.0467

Lag Length Criteria

Table 4 result selected lag order 1, 2 and 9. Lag order 1 and 2 will be used.

Table 4. Result of the VAR Lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1316.661	NA	22529.78	15.69835	15.73554	15.71344
1	-491.7647	1620.332	1.284056	5.925771	6.037341*	5.971051*
2	-485.2858	12.57213	1.246751*	5.896260*	6.082210	5.971728
3	-484.0873	2.297303	1.289111	5.929610	6.189940	6.035265
4	-479.4914	8.699279	1.280138	5.922517	6.257227	6.058359
5	-478.3100	2.208032	1.324047	5.956072	6.365162	6.122101
6	-477.4019	1.675785	1.374026	5.992879	6.476350	6.189095
7	-475.2801	3.864732	1.405563	6.015239	6.573090	6.241642
8	-474.3023	1.757653	1.457691	6.051218	6.683449	6.307808
9	-466.8074	13.29447*	1.399062	6.009612	6.716223	6.296389
10	-464.0471	4.830586	1.420835	6.024370	6.805361	6.341334
11	-462.4388	2.776242	1.463087	6.052843	6.908214	6.399994
12	-461.8148	1.062317	1.524600	6.093033	7.022784	6.470371

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion
Source: Own calculation

AR Roots Graph

Figure 2 shows that UCPI and RCPI series are stationary since all roots have absolute value less than one and lie inside the unit circle. Therefore influence of the shock for some variables may not decrease over time.

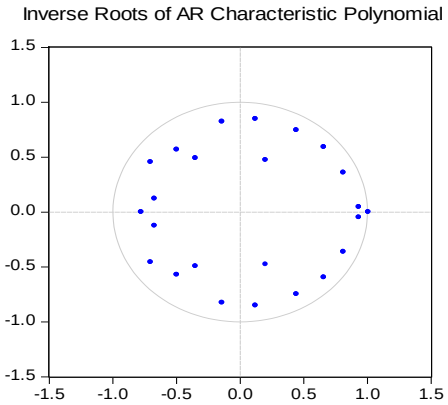

Fig. 2. VAR inverse root graph
Source: Own calculation

Exogeneity Tests

The result of Chi-sq (x^2) and Prob (p-value) statistics suggests that the series can be treated as exogenous variable.

Both UCPI and RCPI are independent variable having effect on the model but not affected by the model.

Table 5. Result of the VAR Granger Causality Test/ Exogenity Tests

Dependent variable: UCPI			
Excluded	Chi-sq	Df	Prob.
RCPI	13.05707	12	0.3649
All	13.05707	12	0.3649
Dependent variable: RCPI			
Excluded	Chi-sq	Df	Prob.
UCPI	22.10540	12	0.0364
All	22..10540	12	0.0364

Source: Own calculation

Lag Exclusion Test

The test of Table 6 suggests that jointly all four lags of all endogenous variables are statistically significant and there is no need of excluding any lag.

Residual test

Figure 3 displays the matrix of pairwise cross-correlograms for the estimated residuals for the 12 lags.

VAR Residual Normality Tests

The below table 7 reports the multivariate extensions of the Jarque-Bera residual normality test, which compares the third and fourth moments of the residuals to those from the normal distribution.

For the multivariate test, a factorization of the residuals that are orthogonal to each other was chosen. Therefore, the hypothesis that residuals are normally distributed is rejected.

Table 6. Result of Chi-squared test statistics for lag exclusion (Numbers in are p-values)

	UCPI	RCPI	Joint
Lag 1	112.7924 [0.000000]	166.7801 [0.000000]	251.3684 [0.000000]
Lag 2	0.915182 [0.632806]	0.555638 [0.757434]	1.649679 [0.799837]
Lag 3	2.737722 [0.254397]	2.357352 [0.307686]	3.969697 [0.410122]
Lag 4	1.786980 [0.409225]	0.206355 [0.901967]	2.281958 [0.684056]
Lag 5	0.395402 [0.820615]	2.203020 [0.332369]	2.259553 [0.688142]
Lag 6	0.138471 [0.933107]	1.678366 [0.432063]	1.735971 [0.784173]
Lag 7	0.232037 [0.890459]	3.958061 [0.138203]	4.245078 [0.373853]
Lag 8	1.760986 [0.414579]	3.124067 [0.209709]	6.823123 [0.145536]
Lag 9	1.864879 [0.393592]	4.092366 [0.129227]	6.262281 [0.180398]
Lag 10	0.264895 [0.875949]	0.315618 [0.854013]	0.467854 [0.976554]
Lag 11	0.461560 [0.793914]	0.038014 [0.981172]	0.588662 [0.964315]
Lag 12	0.455930 [0.796152]	0.438978 [0.802929]	1.064863 [0.899806]
Df	2	2	4

Source: Own calculation.

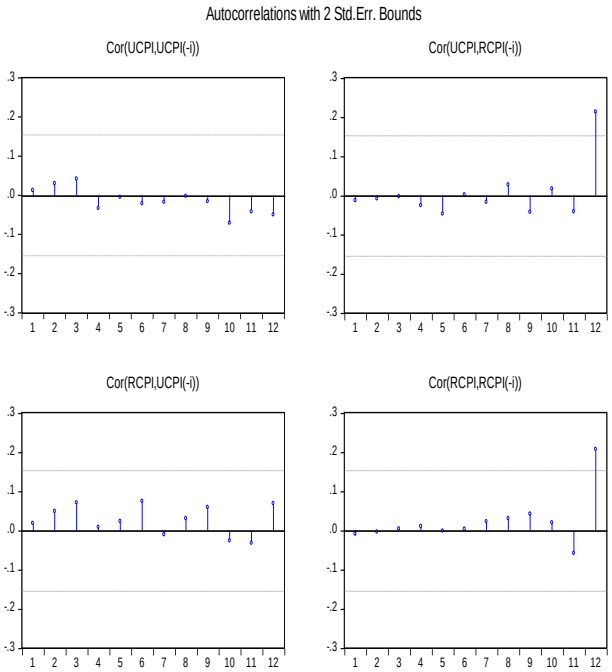

Fig. 3. Graphical result Residual Tests
Source: Own calculation

Table 7. Result of the VAR Residual Normality Tests.

Component	Skewness	Chi-sq	df	Prob.
1	0.512215	7.346203	1	0.0067
2	0.955832	25.58120	1	0.0000
Joint		32.92741	2	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	6.256721	74.24360	1	0.0000
2	10.46572	390.1590	1	0.0000
Joint		464.4026	2	0.0000

Component	Jarque-Bera	df	Prob.
1	81.58981	2	0.0000
2	415.7402	2	0.0000
Joint	497.3300	4	0.0000

Source: Own calculation.

Impulse Response

Figure 4 below shows that when the impulse is from rural, the response of urban is positive except in the last quarter of a year and highest effect emerges in the third month. Also, figure 5 below shows that when the impulse is from urban, the response of rural is positive with a smooth trend.

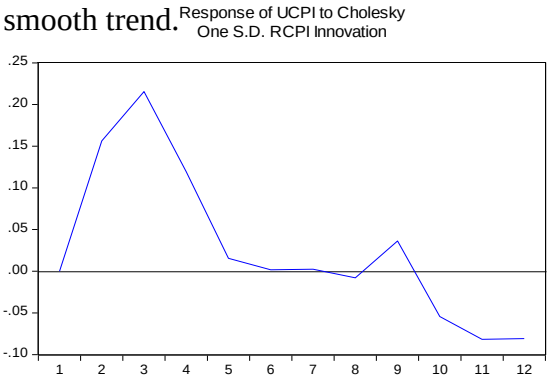

Fig. 4. Impulse Response from Rural to Urban
Source: Own calculation

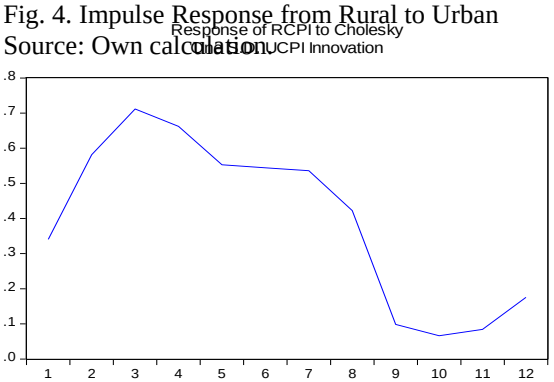

Fig. 5. Impulse Response from Urban to Rural
Source: Own calculation.

CONCLUSIONS

The similar trend among urban and rural series while looking at the graph leads to running of Johansen Cointegration test which rejected the null hypothesis too like analysis of China urban and rural CPI data [2].

Granger Causality test, Vector autoregression and impulse response function all show urban inflation and rural inflation affect each other. Urban and rural dwellers have different consumption habits and most food products are produced in rural area while those in urban area bought from rural area [2]. The fluctuation in food prices may lead to variation of wages. In Nigeria urban CPI and rural CPI, figure 1 shows that there are high inflation in rural area. This seems unlikely, even the service inflation for rural not only food inflation is higher to urban inflation. The possible explanation to this is higher trade margins in supplying to rural, higher transportation cost in servicing rural etc. Also, there are periods where urban CPI is higher than rural CPI which explains the lower purchasing power and lower standard of living in the rural. Surprisingly the general higher rural inflation in Nigeria is actually worrisome.

Though, there is a contrarian view to this because we normally view inflation negatively. It can be viewed positively also to mean better prices and rural public. It can be viewed as increasing prosperity due to increase in prices of agricultural produce and are in a position to enhance the purchasing power of the urban, which can also be a sign of higher rural inflation. Service inflation for rural increasing can also be viewed as better nominal wages in rural areas. If wages go up, they tend to impact services sector. Therefore, it is difficult to explain whether it is due to higher prosperity or higher penalties the rural are forced with higher rural inflation. However, the overall inflation needs to get moderated to improve the standard of living in Nigeria.

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FERTILIZERS CONSUMPTION ON LITHUANIAN FAMILY FARMS

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Abstract

The paper aimed to evaluate the differences of fertilizers consumption and land productivity across family farm types and farm size classes in Lithuania. Lithuanian FADN data from 2014 were obtained for the analysis. The research draws on a sample of 616 family farms. The analyses are carried out for specialist cereals, oilseeds and protein crops farm type (TF 15), general field cropping farm type (TF 16), horticulture farm type (TF 23) and various permanent crops combined farm type (TF 38). Results are presented in weighted averages by using weighting factors to achieve estimation for the total Lithuanian family farms. An overview of fertilizers consumption in Europe countries is presented. The results revealed that in 2010 fertilizers consumption averaged 90 kg/ha UAA in Europe, the highest level was recorded in Netherlands (more than 140 kg/ha UAA) and Romania reported the lowest level of fertilizers consumed, at just above 30 kg/ha UAA. In Lithuanian family farms the consumption of fertilizers averaged 169.9 kg/ha UAA across considered farm types and ranged from 20.2 kg/ha UAA on permanent crop farms to 195.4 kg/ha UAA on conventional field cropping farms in 2014. Nitrogen-based fertilizers accounted for 52% of the fertilizers consumed and 88.2 kg/ha UAA indicated large consumption level. Therefore, developing a suitable nutrient management system that optimize crop yields while minimizing nutrient losses is still needed as efficient fertilizers consumption management should ensure both enhanced and sustainable agricultural production and safeguard the environment.

Key words**:** *fertilizers, consumption, land productivity, family farms, FADN*

INTRODUCTION

Links between the natural environment and farming practices are complex: farming has contributed over the centuries to creating and maintaining a variety of valuable semi-natural habitats within which a wide range of species rely for their survival; on the other hand, inappropriate agricultural practices and land use can have an adverse effect on natural resources, through the pollution of soil, water and air, or the fragmentation of habitats and a subsequent loss of wildlife [2]. Fertilizers are an important factor in modern day agriculture. They are responsible for substantial increases in crop yields, and allow crops to be planted in soil that would otherwise be nutrient deficient. Therefore, fertilizers are widely used in agriculture to maintain soil fertility and to increase crop yields [5]. FAO [3] projected, that fertilizer consumption could increase to 263 million tonnes in 2050. Cereals, in particular wheat, rice and maize, account at present for some 60% of global fertilizer use, and are expected to still account for just over half of fertilizer consumption by 2050.

Going back shortly, as noticed by Fodor et al. [4] from the 1960s in many countries in the world production has gone through tremendous improvement due to introduced new, intensive cultivars and hybrids. Though, one of the main factors behind this development was the enormous increase in fertilizer use. The same trend could be observed in Lithuania. According to Central Statistical Office of Lithuania, in 1980, compared to 1960, fertilizers consumption in agriculture in terms of kg per hectare per year increased by 4.2 times (from 233 kg/ha to 996 kg/ha). Due to the geo-political and mostly the economic changes in the late 1980s and early 1990s fertilizers consumption decreased and accounted 227 kg/ha [6]. In Lithuania, in order to limit the environmental damage associated with excess nutrient application a number of legislative measures have been taken after the accession to the EU. As pointed by Velthof et al. [8], the Nitrates Directive has the most dominant influence. As

a result of implemented measures, according to Eurostat, in 2010 the consumption of fertilizers decreased to 73.2 kg/ha of UAA, and it is rather low as compared to top fertilizers consumer countries in the EU. Though, during the period of 2004–2015, the number of cattle decreased by 8.8% in Lithuania. Obviously this trend limits the consumption of organic fertilizers and cause higher inputs of chemical fertilizers. According to Lithuanian FADN (Farm Accountancy Data Network) data, in 2014, as compared to 2004, the costs of fertilizers in the structure of costs per hectare of UAA in family farms, increased by 2.5 times.

Lithuanian farmers are obliged to keep records of consumed fertilizers according to the EU Common Agricultural Policy support rules. Though the latest statistics about nitrogen, phosphorus and potassium consumption at a farm level was recorded in 2008 [1], as consequence of Order No. 3D-38 of 1 February 2007, issued by the Lithuanian Minister of Agriculture "On the information about used fertilizers in holding". In this document, it is declared that farmers from the year of 2007, having more than 10 ha of UAA, must record the amount of total fertilizers consumed on farms.

Whereas, data related to fertilizers consumed on farms is important for monitoring, the collection of information on the quantities of chemical fertilizers (nitrogen, phosphorus, potassium) applied on farms was launched on 1 January 2014 in Lithuania by FADN under the framework of the European Council Regulation (EU) No. 1320/2013.

MATERIALS AND METHODS

The aim of the paper is to evaluate the differences of fertilizers consumption and land productivity across family farm types and farm size classes in Lithuania. In the beginning, an overview of fertilizers consumption in Europe countries is presented. Lithuanian FADN data from 2014 were obtained for fertilizers consumption analysis in family farms. In this paper it was focused on four groups of farms depending on their production specialisation, based on the EU standard classification of 'Type of Farming' (TF). The criterion for farms' classification in TF is that at least 75 percent of their standard output must come from the specific production of the TF. Here the analyses are carried out for specialist cereals, oilseeds and protein crops (COP) farm type (TF 15), general field cropping farm type (TF 16), horticulture farm type (TF 23) and various permanent crops combined farm type (TF 38). Table 1 presents farms sample distribution according to the specialization.

Table 1. Farms sample distribution according to farm type and farm size classes

Farm types, classes	Number of farms	Average farm size (ha UAA)
COP farms (total)	453	87.5
Farm size classes of UAA		
Less than 30 ha	39	20.0
From 30 to50 ha	39	37.0
From 50 to 100 ha	103	69.0
From 100 to 200 ha	87	143.0
From 200 to 500 ha	126	287.0
500 ha or over	59	741.0
Conventional COP farms	428	89.1
Farm size classes of UAA		
Less than 30 ha	37	19.5
From 30 to50 ha	35	37.0
From 50 to 100 ha	96	70.6
From 100 to 200 ha	80	143.5
From 200 to 500 ha	122	289.8
500 ha or over	58	748.4
General field cropping farms	99	54.0
Farm size classes of UAA		
Less than 50 ha	22	20.5
From 50 to 200 ha	43	87.4
200 or over	34	412.1
Conventional field cropping farms	94	50.7
Farm size classes of UAA		
Less than 50 ha	21	20.2
From 50 to 200 ha	39	83.1
200 or over	34	412.1
Horticultural farms	39	6.8
Conventional horticultural farms	38	8.4
Permanent crops farms	25	36.8
Conventional permanent crops farms	16	36.7
Total (TF15,TF16, TF23, TF38)	616	76.2

For calculations data of 616 family farms were used. Alongside, the differences across farm size classes expressed in utilized agricultural land area (UAA hectares) were completed. Different farm size classes for COP and for field cropping farm types were estimated as any farm type (or size class) have to be large enough (it is advisable to present the results for a group of at least 15 farms) to comply with FADN confidentiality restrictions. Results are presented in weighted averages by using weighting factors to achieve estimation for the total Lithuanian family farms (COP, general field cropping, horticulture and various permanent crops combined). In addition, statistics were

averaged also for conventional farms only, as chemical fertilizer was not purchased by organic farms. ANOVA test was used to measure statistical significance of the difference in the consumed fertilizers and land productivity values between the farm size classes. In addition there have been few attempts to assess relationship between land productivity and fertilizers consumption. Therefore, statistical analyses included non-parametric Spearman rank correlations between mentioned variables. The statistical package for social science (SPSS 21) was employed for processing and analysis of the data.

RESULTS AND DISCUSSIONS

According to Eurostat data, in 2011–2012 the consumption of manufactured fertilisers by agriculture in the EU amounted 13.6 million tonnes, of which nitrogen (N) accounted for 76.4%, potassium (K) – 16.0% and phosphorus (P) – 7.6%. Velthof et al. [8] stated that there are large differences among the EU of the nitrogen consumption. Total nitrogen inputs range from less than 50 kg nitrogen per hectare per year in regions in Central Europe (e.g. in Bulgaria, Estonia, Latvia, and Romania) to more than 300 kg nitrogen per hectare per year in regions with intensive livestock systems in Belgium, France, Germany, Ireland, Italy, Spain and the Netherlands.

Mažeika, Lazauskas and Staugaitis [7] the consumption of N in the Europe Union divided into four categories: 1) countries consuming very large amounts of N (up to 150 kg/ha); 2) countries consuming large amounts of N (up to 100 kg/ha); 3) countries consuming average amounts of N (ranged from 50 to 80 kg/ha); 4) countries consuming small amounts of (from 25 to 50 kg/ha); 5) countries consuming very small amounts of N (less than 25 kg/ha). In 2010 nitrogen-based fertilizers accounted for the vast majority of the fertilizers consumed, with an estimated consumption of 68 kg/ha UAA across the Europe countries, ranging from 120.1 kg/ha UAA in the Netherlands to 27.0 kg/ha UAA in Romania (Table 2).

Table 2. Fertilizer consumption by agriculture in Europe, 2010

Country	Nitrogen (N), tonnes	Phosphorus (P), tonnes	Potassium (K), tonnes	UAA 1000 hectares*	Nitrogen (N) kg/ha UAA	Phosphorus (P) kg/ha UAA	Potassium (K) kg/ha UAA
Belgium	143,500	5,500	-	1,350	106.3	4.1	-
Bulgaria	199,000	17,000	15,000	3,548	56.1	4.8	4.2
Czech Republic	270,500	13,500	32,000	3,464	78.1	3.9	9.2
Denmark	190,000	11,000	40,000	2,548	74.6	4.3	15.7
Germany	1,569,000	102,500	360,000	16,493	95.1	6.2	21.8
Estonia	28,500	2,500	7,000	832	34.3	3.0	8.4
Ireland	362,500	29,500	74,000	4,130	87.8	7.1	17.9
Greece	196,000	29,000	40,000	3,000	65.3	9.7	13.3
Spain	941,000	147,500	295,000	18,106	52.0	8.1	16.3
France	2,080,000	177,000	454,000	25,693	81.0	6.9	17.7
Italy	589,500	88,000	123,000	11,320	52.1	7.8	10.9
Cyprus	4,000	1,000	2,000	117	34.2	8.5	17.1
Latvia	59,500	7,000	12,000	1,291	46.1	5.4	9.3
Lithuania	144,000	15,500	36,000	2,672	53.9	5.8	13.5
Luxembourg	13,500	500	-	131	103.1	3.8	-
Hungary	281,500	20,000	41,000	3,988	70.6	5.0	10.3
Netherlands	219,500	13,500	30,000	1,828	120.1	7.4	16.4
Austria	105,000	12,500	28,000	2,321	45.2	5.4	12.1
Poland	1,027,500	154,000	378,000	14,163	72.5	10.9	26.7
Portugal	103,000	18,000	21,000	2,333	44.1	7.7	9.0
Romania	306,000	54,000	29,000	11,332	27.0	4.8	2.6
Slovenia	28,000	3,500	10,000	433	64.7	8.1	23.1
Slovakia	106,500	7,000	11,000	1,801	59.1	3.9	6.1
Finland	156,500	12,500	33,000	2,268	69.0	5.5	14.6
Sweden	168,000	10,000	21,000	3,021	55.6	3.3	7.0
United Kingdom	1,016,000	80,000	235,000	11,865	85.6	6.7	19.8
Norway	84,000	8,000	25,000	851	98.7	9.4	29.4

Note:* excluding common land units, rough grazing and permanent grassland no longer used for production. Common land is included in for a minor part in Spain, Italy and Germany (minor part) and in its total in Slovenia, Cyprus and Norway.
Source: Eurostat

The consumption of phosphorus averaged 6.2 kg/ha UAA across considered Europe countries in 2010, ranging from 11 kg/ha UAA in Poland to 3.0 kg/ha UAA in Estonia. The consumption of potassium fertilizers averaged 14.1 kg/ha UAA, ranging from 2.6

kg/ha UAA in Romania to 29.4 kg/ha UAA in Norway. According to the 2009 data, the consumption of potassium was also high in Belgium and Netherlands (more than 30 kg/ha UAA).

Total fertilizers consumption in Europe calculated by summing up the consumption of nitrogen, phosphorus and potassium averaged 90 kg/ha UAA, the highest level was recorded in Netherlands (more than 140 kg/ha UAA). In contrast, Romania reported the lowest level of fertilizers consumed, at just above 30 kg/ha UAA.

In Lithuania in 2013, as compared to 2010, was observed an increase of consumption of fertilizers. The consumption of nitrogen-based fertilizers increased by 4.2% and comprised 56.1 kg/ha UAA. Although the consumption of phosphorus fertilizers was lower by 6% in Lithuania, than the average in considered Europe countries. In 2013 the consumption of phosphorus increased by 12%, as compared to 2010, and accounted for 6.5 kg/ha UAA. The use of potassium fertilizers in considered period increased by 15% and averaged 15.5 kg/ha UAA.

The results of analysis on the fertilizers consumption in Lithuanian family farms are presented below in Tables 3-7. The results of fertilizers consumption on COP farms across farm size classes are shown in Table 3. The fertilizers consumption averaged 170.6 kg/ha UAA, ranging from 71.7 kg/ha UAA in the small-sized farms less than 20 ha UAA to 255.7 kg/ha UAA in large-sized farms 500 ha or over. Respectively, the consumption of fertilizers in small-sized farms comprised 42% of average consumption, and the large-sized farms consumption was by 50% higher than average. Nitrogen-based fertilizers accounted for 52% of the fertilizers consumed, with an estimated consumption of 89 kg/ha UAA, ranging from 37.1 kg/ha UAA on farm class less than 30 ha UAA to 134.7 kg/ha UAA on the largest-sized class 500 ha UAA or over. The highest land productivity level expressed by total output per hectare of UAA was reached in large-sized farms. As compare to the lowest result obtained by small-sized farms, it was by 2.1 times higher, and by 38% higher as compared to average land productivity of COP farms.

Table 3. Fertilizers consumption and land productivity of COP farms by farm size classes

Farm size classes of UAA	N	P	K	Total fertilizers	Total output EUR/ha UAA
Specialist cereals, oilseeds and protein crops					
Less than 30 ha	37.1	14.4	20.2	71.7	389.6
From 30 to 50 ha	41.9	16.0	15.8	73.7	346.8
From 50 to 100 ha	76.3	31.9	40.1	148.3	476.6
From 100 to 200 ha	78.2	30.7	40.7	149.6	570.6
From 200 to 500 ha	106.5	43.9	55.7	206.1	685.3
500 ha or over	134.7	56.5	64.5	255.7	820.7
Total	**89.0**	**36.4**	**45.2**	**170.6**	**593.5**
$F_{(5,447)}$	13.9	7.7	8.4	13.4	20.3
Significance	***	***	***	***	***
Index (total specialist cereals, oilseeds and protein crops=100)					
Less than 30 ha	42	40	45	42	66
From 30 to 50 ha	47	44	35	43	58
From 50 to 100 ha	86	88	89	87	80
From 100 to 200 ha	88	84	90	88	96
From 200 to 500 ha	120	121	123	121	115
500 ha or over	151	155	143	150	138

Note: *p<0.05; **p<0.01; ***p<0.001; ****p>0.05.
Source: own calculation.

Analysing the results of the conventional COP farms it was observed the same fertilizers consumption trends, as compared to all COP farms (Table 4). The fertilizer consumption in considered farms averaged 182.9 kg/ha UAA, i.e. by 12.3 kg/ha UAA more than in all COP farms. Nitrogen-based fertilizers consumption ranged from 40.2 kg/ha UAA on farm class less than 30 ha UAA to 139.3 kg/ha UAA on the largest-sized class 500 ha UAA or over. According to the nitrogen consumption classification presented by Mažeika, Lazauskas and Staugaitis [7] the conventional COP farms consume large and very large amounts of nitrogen, except for the first two farm size classes.

Table 4. Fertilizers consumption and land productivity of conventional COP farms by farm size classes

Farm size classes of UAA	N	P	K	Total fertilizers	Total output EUR/ha UAA
Specialist cereals, oilseeds and protein crops (organic farms excluded)					
Less than 30 ha	40.2	15.6	21.8	77.6	408.3
From 30 to 50 ha	46.7	17.8	17.6	82.1	357.9
From 50 to 100 ha	83.2	34.8	43.7	161.7	499.7
From 100 to 200 ha	87.1	34.2	45.3	166.6	595.4
From 200 to 500 ha	111.6	46.0	58.4	216.0	704.7
500 ha or over	139.3	56.3	67.0	262.6	843.0
Total	**95.5**	**38.8**	**48.6**	**182.9**	**617.5**
$F_{(5,423)}$	12.9	6.7	7.6	12.4	19.0
Significance	***	***	***	***	***
Index (total specialist cereals, oilseeds and protein crops(organic farms excluded)=100)					
Less than 30 ha	42	40	45	42	66
From 30 to 50 ha	49	46	36	45	58
From 50 to 100 ha	87	90	90	88	81
From 100 to 200 ha	91	88	93	91	96
From 200 to 500 ha	117	119	120	118	114
500 ha or over	146	145	138	144	137

Note: *p<0.05; **p<0.01; ***p<0.001; ****p>0.05.
Source: own calculation.

The results of fertilizers consumption on farms specialized in field cropping across

farm size classes are presented in Table 5. The consumed fertilizers amounts differ significantly in considered farm size classes. In small-sized farms estimated the lowest level and in the large-sized farms the highest level of fertilizers consumption, 62.8 kg/ha UAA and 353.0 kg/ha UAA, respectively. The indicated highest level of fertilizers consumption, as compared to lowest level, was by more than 2 times higher.

Table 5. Fertilizers consumption and land productivity of field cropping farms by farm size classes

Farm size classes of UAA	N	P	K	Total fertilizers	Total output EUR/ha UAA
Field cropping					
Less than 50 ha	36.6	12.0	14.2	62.8	457.7
From 50 to 200 ha	64.5	26.8	31.6	122.9	494.6
200 ha or over	174.2	80.6	98.3	353.0	1358.8
Total	**87.1**	**37.6**	**45.3**	**170.0**	**719.7**
$F_{(2,96)}$	11.3	5.7	8.7	10.9	5.7
Significance	***	**	***	***	**
Index (field cropping=100)					
Less than 50 ha	42	32	31	37	64
From 50 to 200 ha	74	71	70	72	69
200 ha or over	200	214	217	208	189

Note: *p<0.05; **p<0.01; ***p<0.001; ****p>0.05.
Source: own calculation.

Table 6 contains results of applied fertilizers on conventional farms specialized in field cropping. The fertilizer consumption on conventional field cropping farms averaged 195.4 kg/ha UAA, i.e. by 25.4 kg/ha UAA more than in all field cropping farms.

Table 6. Fertilizers consumption and land productivity of conventional field cropping farms by farm size classes

Farm size classes of UAA	N	P	K	Total fertilizers	Total output EUR/ha UAA
General field cropping (organic farms excluded)					
Less than 50 ha	37.7	12.4	14.7	64.9	461.6
From 50 to 200 ha	87.0	36.1	42.6	165.7	594.8
200 ha or over	174.2	80.6	98.3	353.0	1358.8
Total	**100.2**	**43.2**	**52.0**	**195.4**	**795.2**
$F_{(2,91)}$	10.2	5.6	8.2	10.3	4.6
Significance	***	**	**	***	*
Index (general field cropping (organic farms excluded)=100)					
Less than 50 ha	38	29	28	33	58
From 50 to 200 ha	87	84	82	85	75
200 ha or over	174	186	189	181	171

Note: *p<0.05; **p<0.01; ***p<0.001; ****p>0.05.
Source: own calculation.

Nitrogen-based fertilizers accounted for 51% of the fertilizers consumed. The nitrogen consumption ranged from 37.7 kg/ha UAA on farm class less than 50 ha UAA to 174.2 kg/ha UAA on the largest-sized class 200 ha UAA or over. Average value of nitrogen of conventional field cropping farms indicates large consumption level with regard to the nitrogen consumption classification presented by Mažeika, Lazauskas and Staugaitis [7]. Land productivity differs considerably across the farm size classes, particularly between small-sized and large-size farms. The highest productivity level was achieved on farm size class of 200 ha UAA or over and, as compare to the average value, it was by 1.7 times higher.

Table 7 presents the results of fertilizers applied and land productivity on horticultural and permanent crops farms. The consumption of fertilizers of conventional farms specialized in horticulture averaged 156.3 kg/ha UAA and comprised 85% of total (TF 15, TF 16, TF 23, TF 38) fertilizers consumption.

Table 7. Fertilizers consumption and land productivity of specialist horticulture and permanent crops combined farms

Type of farming	N	P	K	Total fertilizers	Total output EUR/ha UAA
Horticulture	58.2	31.9	54.7	144.7	2974.5
Conventional horticulture	62.8	34.4	59.1	156.3	3109.8
Permanent crops	10.5	4.9	4.8	20.2	387.4
Conventional permanent crops	20.3	9.5	9.2	39.0	518.8
Total (TF 15,TF 16, TF 23, TF 38)	88.2	36.4	45.1	169.6	620.9
Index (TF15, TF16, TF23, TF 38=100)					
Horticulture	66	88	121	85	479
Conventional horticulture	71	95	131	92	501
Permanent crops	12	13	11	12	62
Conventional permanent crops	23	26	21	23	84

Source: own calculation.

The fertilizer consumption on conventional permanent crops farms averaged 39.0 kg/ha UAA and it made just 23% of total (TF 15, TF 16, TF 23, TF 38) fertilizers consumption. Land productivity in conventional horticultural farms was by 5.0 times higher than in considered farm types. In contrast, permanent crops farm type, recorded just 62% of average land productivity.

The applied fertilizers on farms calculated for considered in farm types averaged 169.6 kg/ha UAA. Nitrogen-based fertilizers accounted for 52% of the fertilizers consumed and recorded 88.2 kg/ha UAA of nitrogen indicates large consumption level.

The Spearman's rank correlation coefficient between fertilizers consumption and land productivity was conducted. The total fertilizers amounts applied on farms per hectare of UAA (kg/ha UAA) and total output per hectare (EUR/ha UAA) were employed as variables for correlation (Table 8).

Table 8. Spearman's rank correlation coefficients between fertilizers consumption and land productivity in farms

	COP farms	Field cropping farms	Horticultural farms	Permanent crops farms
Spearman's rank correlation coefficient	0.719	0.745	0.357	0.097
Significance	***	***	*	****

Note: *p<0.05; **p<0.01; ***p<0.001; ****p>0.05.
Source: own calculation.

A positive statistically significant correlation was found for COP, field cropping and horticultural farms. The use of chemical fertilizers indicated its influence on crop growth and productivity.

CONCLUSIONS

The results of an overview of fertilizers consumption in Europe countries revealed, that total fertilizers consumption in Europe averaged 90 kg/ha UAA, the highest level was recorded in Netherlands (more than 140 kg/ha UAA). In contrast, Romania reported the lowest level of fertilizers consumed, at just above 30 kg/ha UAA.

In Lithuania in 2013, as compared to 2010, was observed an increase of consumption of fertilizers. The consumption of nitrogen-based fertilizers increased by 4.2% and comprised 56.1 kg/ha UAA. The consumption of phosphorus increased by 12% and accounted for 6.5 kg/ha UAA and the use of potassium fertilizers increased by 15% and averaged 15.5 kg/ha UAA.

The results of analysis on the consumption of fertilizers across considered farm types in Lithuania showed, that consumption of fertilizers averaged 169.9 kg/ha UAA and ranged from 20.2 kg/ha UAA on permanent crop farms to 195.4 kg/ha UAA on conventional field cropping farms in 2014.

Nitrogen-based fertilizers accounted for 52% of the fertilizers consumed and 88.2 kg/ha UAA indicated large consumption level. Therefore, developing a suitable nutrient management system that optimize crop yields while minimizing nutrient losses is still needed as efficient fertilizers consumption management should ensure both enhanced and sustainable agricultural production and safeguard the environment.

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CHANGES AND TRENDS IN GRAIN PRODUCTION IN LITHUANIA AFTER ACCESSION TO THE EU

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Abstract

The aim of this paper is to disclose the main changes and trends of Lithuanian grain production. Using quantitative statistical methods, the paper proposes an economic analysis of grain production changes in the period 2004-2015. This analysis revealed that the importance of grain sector in terms of the share of gross agricultural output has increased in Lithuania. Over the analysed period the yielding capacity of grain and the area under crops went on increasing. These in turn lead to an increase of the usable production by 2.2 times, the beginning stocks by 54% and self-sufficiency level reached 318%. In 2015 just 31% of the usable production has been used for domestic needs, as compare to 2004, decreased by more than 50 percentage points. Over the period exports of grain increased significantly by 6.2 times. This confirmed the improved competitiveness of the grain sector. The Common Agricultural Policy direct payment scheme was favourable to grain farms, as the farm net income per family work unit gained by family farms specialist in cereals, oilseeds and protein crops was even by 2.0 times higher than the average in all farms. In order to ensure the income these farms need to use internal or/and external risk management measures.

***Key words*:** *balance, grain crops, prices, production*

INTRODUCTION

The world is experiencing rising demands for crop production, stemming from three key forces: increasing human population, meat and dairy consumption from growing affluence, and biofuel consumption [5]. Global cereal production has doubled in the past 40 years, mainly from the increased yields resulting from greater inputs of fertilizer, water and pesticides, new crop strains, and other technologies of the Green Revolution. The supply of agricultural products and ecosystem services are both essential to human existence and quality of life. However, recent agricultural practices that have greatly increased global food supply have had inadvertent, detrimental impacts on the environment and on ecosystem services. Though the crop production will become more difficult with climate change, resource scarcity (e.g. land, water, energy, and nutrients) and environmental degradation (e.g. declining soil quality, increased greenhouse gas emissions, and surface water eutrophication) [3, 6, 8].

Lithuanian grain sector after the accession to the EU faced with changes and challenges in the new market. In Lithuania the grain sector became one of the main branches of agricultural production as the highest share (38.5%) of the gross agricultural output consisted of cereals in 2015. In 2015, as compared to 2004, this share increased significantly, by 16.5 percentage points. Lithuania by wheat export ranks fifth among the EU countries. The production of grains constitutes source of income to 13.8% of all farms. The importance of the grain sector in Lithuania has prompted the researchers' attention in this area.

Jedik, Namiotko [4] focussed on family farmers' behaviour of specialist cereals, oilseeds and protein crops farms when alternative objectives are presented. The authors found that not all Lithuanian specialist cereals, oilseeds and protein crops' farms consider gross margin as its primary objective. Maximization of gross margin is the most important attribute of medium and large farms, though small-scale farmers are more concerned on the risk minimization. The

researches also conclude that this study area is still not fully investigated.

Volkov, Droždz [10] suggest that Common Agricultural Policy direct payment scheme has contributed to structural change in Lithuanian agriculture. Authors' findings revealed that economic support system prompted attractiveness of specialist cereals, oilseeds and protein crops farming and alongside stimulated farmer reorientation towards this most economically attractive type of farming. Authors emphasize that without the production support, cereals/rape sector would have been less economically attractive.

Baležentis [1] identified the prospective paths for development of Lithuanian cereal farms. According to the author an important direction for maintaining efficiency and productivity of cereal farms is the proper balance between investment support for smaller and larger farms.

Biekša [2] evaluated cereals farms sustainability using sustainable process index and found out that the most significant environmental impacts arise from the use of fertilizers and agricultural machinery.

The above mentioned studies highlight the importance of the grain sector in Lithuania and imply further scientific discourse towards its sustainability.

MATERIALS AND METHODS

The purpose of this research is to identify the main trends and changes of grain production in 2004–2015. In order to realize this scientific research the main attention was paid to the relevant data, such as crop area and yield of grain crops, production of grain crops and other supply and demand indicators, average purchase prices of grain, retail prices of rye bread and of white bread made from wheat flour, farm net income family farms were taken in consideration. At the national level the data was taken from Eurostat, European Commission, Central Statistical Office of Lithuania and AIRBC. At the farm level the data of Lithuanian Farm Accountancy Data Network (FADN) was employed.

RESULTS AND DISCUSSIONS

According to data provided by European Commission (EC), in 2015, in terms of total grain crops area, Lithuania took the twelfth place at the EU-28 level. The area under grain crops in Lithuania in 2015, as compared to 2004, increased by 64% (Fig. 1). Areas under winter wheat increased most of all: within the last year by 60% and during the reference period 87%. Over the period of 2004–2015, most of all increased the areas under wheat (2.4 times), rape (64%), buckwheat (67%) and triticale (46%), whereas the areas under barley (31%) and rye (30%) decreased. In 2015, in the structure of crops, the areas under winter cereals comprised 53%.

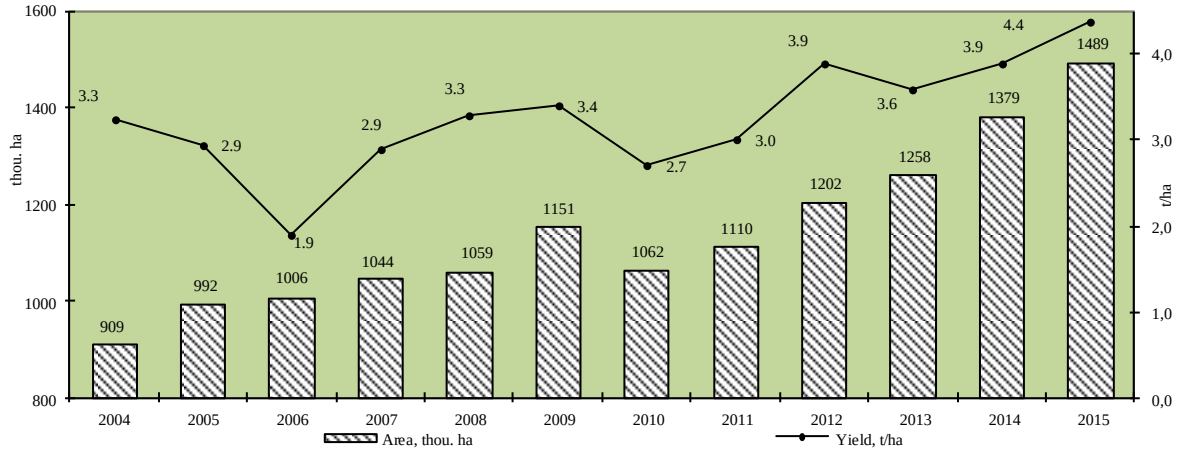

Fig. 1. Crop area and yield of grain crops in 2004–2015
Source: Central Statistical Office of Lithuania (http://osp.stat.gov.lt/en/temines-lenteles57)

The yielding capacity of grain crops has been increasing each year. The favourable climatic conditions and investments contribute to the increase of the yielding capacity, even though the potential has not been used fully, i.e. the yielding capacity of cereals as well as productivity of cereals (output of cereals per hectare) has not reached the EU-28 average. The yielding capacity of cereals in Lithuania in 2014 was lower than the EU-28 average: barley by 21%, wheat by 12%, and rape by 8%. Over the period of 2004–2015, the highest yielding capacity was reached in 2015. Thus, in the past year, as compared to 2004, the yielding capacity increased by 37% (Table 1).

Table 1. Yield of grain crops in 2004–2015, tonnes per hectare

Kind of grain crops	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change 2015 compared to 2004,%
Grain crops	3.21	2.89	1.88	2.94	3.29	3.38	2.70	2.98	3.94	3.62	3.89	4.39	36.8
cereals	3.25	2.94	1.99	3.01	3.35	3.45	2.76	3.03	4.02	3.68	3.98	4.56	40.3
winter cereals	3.76	3.46	2.25	3.65	4.14	3.89	3.06	3.03	4.73	4.09	4.35	5.33	41.8
wheat	4.12	3.85	2.42	4.16	4.76	4.40	3.40	3.32	5.17	4.56	4.81	5.71	38.6
triticale	3.18	2.73	1.88	2.82	3.27	3.16	2.43	2.54	3.82	3.18	3.36	4.08	28.3
rye	2.54	2.12	1.81	2.37	2.76	2.53	1.76	2.02	2.81	1.96	2.26	2.79	9.8
barley	3.78	3.24	2.17	3.15	3.94	3.83	2.52	2.95	4.42	3.60	4.11	4.40	16.4
spring cereals	2.75	2.53	1.74	2.53	2.69	2.87	2.45	3.03	3.27	3.22	3.75	3.69	34.2
wheat	3.45	3.24	2.13	3.08	3.01	3.41	3.06	3.47	3.89	3.71	4.31	4.21	22.0
barley	2.93	2.70	2.06	2.64	2.88	3.03	2.36	3.01	3.38	3.27	3.80	4.00	36.5
triticale	2.72	2.33	1.47	2.82	2.33	2.73	2.11	2.40	2.91	2.88	3.12	3.08	13.2
oat	2.23	1.92	1.30	1.94	2.07	2.23	1.62	2.04	2.31	2.24	2.42	2.55	14.3
buckwheat	0.59	0.55	0.20	0.90	0.76	0.67	0.73	0.96	0.90	0.93	0.95	1.00	69.5
grain maize	2.20	3.08	1.57	4.82	4.24	4.33	6.68	7.48	6.10	7.37	6.06	4.81	118.6
dried pulses grain	1.18	1.64	0.81	1.39	1.70	1.80	1.41	1.72	1.89	2.02	2.20	2.29	94.1
Rapeseed	2.03	1.84	1.12	1.79	2.04	2.17	1.65	1.94	2.43	2.13	2.33	3.13	54.2

Source: Central Statistical Office of Lithuania (http://osp.stat.gov.lt/en/temines-lenteles57)

In 2015, the production of grain crops amounted to 6521.4 thou. t or by 2.2 times more than in 2004 (Table 2). According to data provided by EC, in 2015, in terms of total cereal production, Lithuania took the thirteenth place at EU-28 level. In the year 2015 the production of winter crops was higher even by 80% than in 2014, and spring crops by 24% lower. Wheat comprised the major share in the structure of harvested cereals 72%, of which 75% winter crops. The production of grain crops in Lithuania in 2015, as compared to 2014, was higher by 22.5%. The production was reached due to 8% larger grain crop area and 12.9% higher yielding capacity. In USDA Gain report stated that the good export opportunities to countries outside the EU were the main driver for increased wheat plantings in 2015. Also good purchase wheat prices induced some farmers to switch production from less profitable rapeseed to wheat [9].

Table 2. Production of grain crops in 2004–2015, thousand tonnes

Kind of grain crops	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change 2015 compared to 2004,%
Grain crops	2,917	2,870	1,893	3,073	3,484	3,892	2,867	3,304	4,737	4,550	5,324	6,521	2.2
cereals	2,859	2,811	1,858	3,017	3,422	3,806	2,797	3,226	4,657	4,459	5,123	6,067	2.1
winter cereals	1,663	1,458	822	1,553	1,921	2,440	1,592	1192	2,810	2,623	2,120	3,773	2.3
wheat	1,263	1,149	620	1,151	1,381	1,749	1,250	912	2,257	2,119	1,708	3,272	2.6
triticale	242	176	98	199	286	394	218	187	370	385	292	379	56.8
rye	141	108	90	165	205	208	87	85	155	94	84	107	-24.2
barley	17	26	14	38	49	89	37	8	28	25	37	15	-11.6
spring cereals	1,196	1,353	1,036	1,464	1,501	1,366	1,204	2,034	1,847	1,836	3,003	2,294	91.7
wheat	167	231	189	240	341	351	460	957	742	744	1,523	1,109	6.6
barley	843	923	730	976	922	770	513	752	714	656	982	796	-5.5
triticale	22	26	13	29	25	31	41	50	65	66	103	89	4.1
oat	118	114	63	120	141	143	94	128	164	163	184	163	38.8
buckwheat	13	16	9	21	21	15	14	26	31	28	36	37	2.8
mixed cereals	32	39	27	53	19	33	35	47	50	55	58	42	33.2
grain maize	3	5	5	26	32	24	47	72	79	121	115	56	18.8
Rapeseed	205	201	170	312	330	416	417	484	633	550	502	512	2.5

Source: Central Statistical Office of Lithuania (http://osp.stat.gov.lt/en/temines-lenteles57)

Over the period of 2004–2015, the yielding capacity of grain crops and the area under crops went on increasing; therefore, the grain resources increased considerably (by 2.1 times), beginning stocks (by 54%), and self-sufficiency level increased to 318%. Over the considered period exports of grain and grain products increased significantly, by 6.2 times.

In the year of 2004 20% of production of grains was exported, whereas in the period of 2013–2015, the export comprised 62%. In 2015 the largest share of exported grain (76%) consisted of wheat. In the last few years Lithuania appeared as an important wheat exporter on the global market [9]. In 2014–2015 year, Lithuanian common wheat export was positioned in the fifth place, in terms of exported quantity in the EU-28. The major share of common wheat (30%) was exported to Saudi Arabia. Whereas, in 2004, the main export of common wheat destination was Belarus (47%).

The use of grains for domestic purposes decreased by 18%, mainly due to decreased the grain use for animal fodder. The cattle herd decreased by 9% in 2015, as compared to 2004. Just 31% of the production has been used for domestic needs in 2015. Since production increased more rapidly than consumption for domestic needs, in 2015, as compared to 2004, the share of consumption for domestic needs decreased by 54 percentage points. Due to increased capacities of private storage the endings stocks were much higher in 2015 (Table 3). It is worth noticing that storage capacities made farmers less dependent on grain prices volatility.

Table 3. Balances of grain and grain products in 2004–2015, thousand tonnes

Indicators	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015*	Change 2015 compared to 2004,%
Beginning stocks	1,466	1,508	1,027	756	1,084	1,300	1,273	866	1,255	2,036	2,041	2,250	53.5
Production	2,917	2,870	1,893	3,073	3,484	3,892	2,867	3,304	4,737	4,567	5,324	6,521	2.2**
Import***	207	187	271	294	415	199	294	409	477	425	488	283	37.0
Total resources	4,371	4,565	3,191	4,123	4,983	5,392	4,434	4,579	6,469	7,028	7,852	9,054	2.1**
Export***	583	1,181	838	906	1,840	2,068	1,709	1,475	2,438	2,931	3,557	3,639	6.2**
Domestic uses	2,499	2,356	1,597	2,133	1,843	2,052	1,859	1,849	1,995	2,057	2,046	2,049	-18.0
seeds	258	216	220	228	214	231	221	229	240	250	281	303	17.8
animal fodder	1,571	1,504	823	1,263	1,019	1,194	981	1,036	1,142	1,197	1,162	1,119	-28.8
losses	93	71	38	62	52	57	53	52	54	52	68	69	-25.8
industrial uses	148	155	134	169	176	179	243	179	204	206	181	204	37.9
human consumption	430	410	381	412	382	391	362	353	347	351	354	353	-17.7
Per capita consumption. kg	125	120	112	122	114	117	117	117	116	119	121	121	-3.2
Ending stocks	1,508	1,027	756	1,084	1,300	1,273	866	1,255	2,036	2,041	2,250	3,366	2.2**
Self-sufficiency level. %	117	122	119	144	189	290	154	179	237	222	260	318	201****

Notes:*author calculations; **times; ***in grain equivalent; ****percentage points.
Source: Agriculture in Lithuania 2014.

The purchase prices of grain mostly depend on global prices in Lithuania. In 2015 the purchase prices for grain in Lithuania were by 4.7% higher than in 2014, though have not reached the level of prices recorded in 2011–2012. The highest rise in prices was for buckwheat – by 58%, oats by 21%, and rape by 16% in 2015 (Table 4).

Table 4. Average purchase price of grains in 2004–2015, EUR per tonne

Kind of grain	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average price 2004-2015
Grain total	99	87	111	183	172	115	150	190	205	176	150	157	150
wheat	105	86	117	186	172	115	158	194	208	179	154	160	153
rye	89	76	101	153	139	72	113	175	176	136	117	114	122
barley	99	94	103	186	150	92	129	179	200	178	140	144	141
malt barley	116	118	125	234	191	114	146	208	226	213	172	167	169
triticale	88	79	96	156	127	78	136	161	188	146	126	124	125
oats	80	66	85	145	129	59	89	159	161	118	100	121	109
buckwheat	176	181	239	261	192	163	318	349	297	267	263	415	260
maize	144	123	142	217	249	117	181	181	205	167	146	144	168
Rapeseed	191	181	244	259	363	243	318	422	456	349	293	341	305

Source: Central Statistical Office of Lithuania (http://osp.stat.gov.lt/en/temines-lenteles57)

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In the structure of rye bread and white bread made from wheat flour retail price the farmer's share comprises about 10%. It is worth noticing that just 10% of total grain production is used for human consumption, which remains quite stable in considered years. Though, the purchase prices of grain have not much influence on human consumption and retail prices of grain products. In 2005–2015 retail prices of rye bread and of white bread made from wheat flour increased by 2.2 and 1.9 times, respectively (Fig. 2).

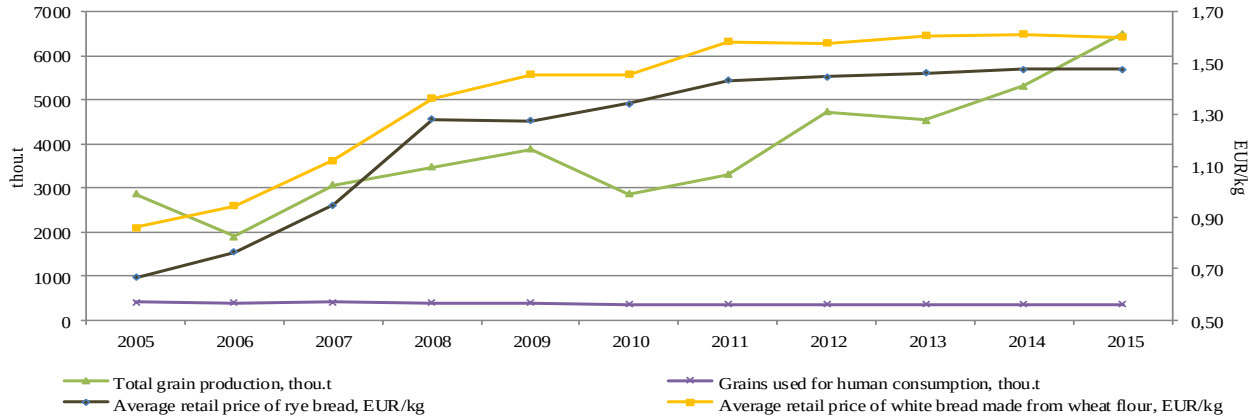

Fig. 2. Grain production, grains for human consumption and retail prices of rye bread and of white bread made from wheat flour, 2005–2015
Source: Central Statistical Office of Lithuania (http://osp.stat.gov.lt/en/temines-lenteles57)

Specialist cereals, oilseeds and protein crops' farms income depends on grain purchase prices as sales revenue composed 75% that farms received for the crops in 2014. It should also be noted that the level of support with subsidies to 1 ha of UAA increased by 80% in 2014, as compared to 2004. The relation of subsidies to family farm net income amounted to as much as 117% in 2014, by 66 percentage points more than in 2004. The average family net income gained by Lithuanian specialist cereals, oilseeds and protein crops' farms per family work unit (FWU) in the period of 2004–2014 was even by 2.0 times higher than the gained income in all farms (Fig. 3). The higher income was one of the factors which made the cultivation of grain crops attractive to Lithuanian farmers.

The grain stocks both in the world and in Lithuania go on increasing; this meaning that under favourable climatic conditions purchase prices will not reach the level of the prices of 2011–2012. Therefore, the farmers specialist in cereals, seeking to retain the permanent family farm income should use the internal or/and external risk management instruments.

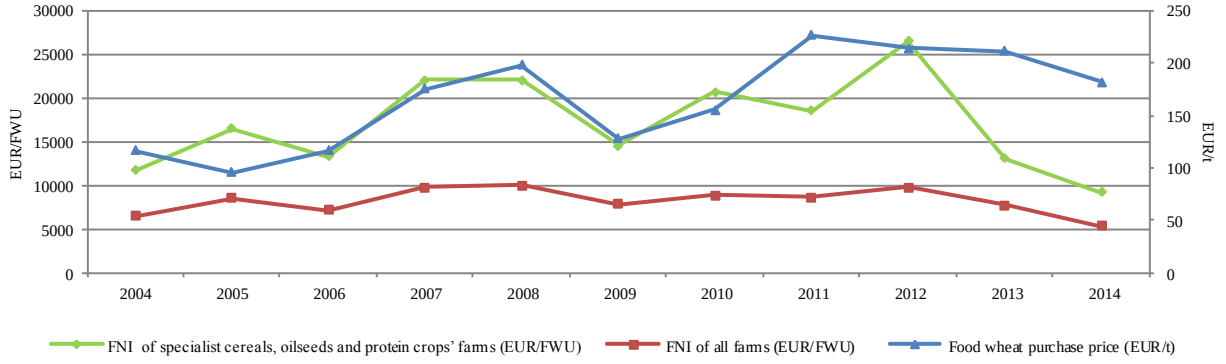

Fig. 3. FNI of specialist cereals, oilseeds and protein crops' farms, of all family farms and food wheat purchase price, 2004–2014
Source: FADN 2004–2014 data; AIRBC data (http://www.vic.lt/?mid=343)

One of the measures for management of external risk of farm income is the insurance of areas under crop, aimed to reduce a risk increased due to the climatic change. Only about 15% of the area under cereals was covered by insurance in 2014. According to the FADN data, specialist cereals, oilseeds and protein crops' farms are highly specialized

. Over the period of 2004–2014 the share of cereals and rape seeds output accounts for about 86% of the total output in these farms. Specialist cereals, oilseeds and protein crops' farms should make more use of the internal farm capacity to reduce the agricultural business risk, for example, the development of other gainful activities like agri-tourism, agricultural services. Specialist cereals, oilseeds and protein crops' farms in 2014, generated the income share from the other agricultural activities made only 2.5% of the total income.

CONCLUSIONS

After the accession to the EU, a significant improvement of grain sector is observed. The main findings of this research as follows:

-the area under grain crops in 2015, as compared to 2004, increased by 64%. Most of all increased the areas under wheat (2.4 times);

-over the period of 2004–2015, the yielding capacity increased by 37%;

-in 2015, the production of grain crops was by 2.2 times more than in 2004. The increase in grain production recorded in 2015 due to 8% larger grains crop area and by 12.9% higher yielding capacity;

-in considered period the grain resources increased considerably (by 2.1 times), beginning stocks (by 54%), and self-sufficiency level reached 318%;

-over the period exports of grain and grain products increased significantly, and in the period of 2013–2015 the export comprised 62% of grain crops production;

-in 2015, the largest share of exported grain (76%) consisted of wheat. In 2014–2015 year, Lithuanian common wheat export was positioned in the fifth place, in terms of exported quantity;

-the main export destination in 2004 of common wheat was Belarus, whereas in 2015, the major share of common wheat was exported to Saudi Arabia;

-the average family net income gained by Lithuanian specialist cereals, oilseeds and protein crops' farms per FWU in the period of 2004–2014 was by 2.0 times higher than the gained income in all farms;

-the grain stocks both in the world and in Lithuania go on increasing; this meaning that under favourable climatic conditions purchase prices of grain will not reach the level of the prices of 2011–2012. Therefore, the farmers specialist in cereals, seeking to retain the permanent family farm income should consider using the internal or/and external risk management measures.

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OPPORTUNITIES FOR TABLE GRAPES PRODUCTION DEVELOPMENT IN BULGARIA IN THE CONDITIONS OF CAP 2014-2020

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Abstract

The article discussed the state and trends in table grapes production development in Bulgaria during the period 2004-2015. The dynamics in the size of the cultivated area, the level of average yields and production were analyzed. The changes in the specialization and concentration of production were outlined. The trends in consumption, imports and exports of table grapes were presented. The main problems defining the low level of profitability of table grapes production were identified. The opportunities for financial support through the mechanisms of the Common Agricultural Policy 2014-2020 were indicated with a view of the prospects for sustainable development of the sub-sector in the mid-term plan.

Key words**:** *table grapes, state, trends, opportunities, Common Agricultural Policy*

INTRODUCTION

The high nutritional value of table grapes, as well as its proven healing properties supplementing the prevention of a number of chronic, cardiovascular and oncological diseases [1] [8] [10] had defined its important place among the most produced fruits globally, subject of international trade. Marketing development, improvement of technologies providing timely transportation and storage of products, growing demand, changes in consumer tastes and desire for convenience and diversity were the main factors determining the rapid development of global production and trade of table grapes. According to official data of the International Organization of Vine and Wine (OIV) table grapes production globally had shown a steady tendency of growth, as in 2014 its share in the total quantity of produced grapes had reached 35% compared to 25% in 2000 [7].

The increased volume of global production was primarily due to the rapid growth of the table grapes viticulture in the Asian countries (China, India) and the Southern Hemisphere countries (Chile, Argentina, Peru, Brazil, South Africa, Egypt), whose participation in international trade exacerbated the competition in the sector.

Bulgaria was among the countries losing their market positions globally.

The market share of our country in the international export during 1961-63 was 22.21% immediately after that of Italy (23.94%), while in 2009-2011 it was only 0.03% [9].

Bulgaria had relevant advantage in the production of table grapes due to the suitable soil and climatic conditions, rich varietal diversity, the existing traditions and research potential [2] [3].

Their implementation in the context of the set social and economic objectives - improving the healthy diet of the nation, generating employment and enhancing the vitality of rural areas depended largely on the opportunities for providing financial support to table grapes growers.

The aim of the study was to analyze and evaluate the state, to outline the trends and to identify opportunities for table grapes production development in Bulgaria under the impact of the mechanisms of the Common Agricultural Policy of the European Union.

MATERIALS AND METHODS

The analysis was based on official statistical data from the Ministry of Agriculture and Food (MAF) Agricultural Statistics Department, National Statistical Institute (NSI) and Eurostat. The trends in the changes of the indicators - cultivated areas, average yield, production, import, export, foreign trade balance, consumption were outlined by the methods of comparative and dynamic analysis. The trends in concentration and specialization of production through the indicators number of farms and average size of the area of table grapes in a farm were established.

RESULTS AND DISCUSSIONS

The area of the cultivated table grapes vineyards in 2015 was 2,254 ha, representing 5.8% of the total area of cultivated vineyards in Bulgaria [6].

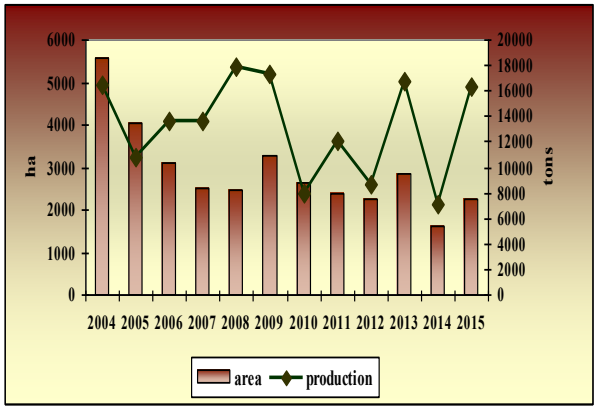

Fig. 1. Dynamics of areas of vineyards and grapes production during the period 2004-2015
Source: MAF, Agricultural Statistics Department

The trend illustrated in Fig. 1 outlined a decline in the size of the cultivated areas by 59.7% in 2015 compared to 2004. The abandonment of plantations of table grapes occurred at a faster pace in the first six years of the analyzed period, when the registered reduction in the size of the vineyards amounted to 35.6% on the average for the period 2007-2009 compared to the average level of the indicator for 2004-2006 (Table 1). From 2007 to 2015 the rates of the negative trend had slowed down as during the last three years of the period the area of the vineyards had decreased by 7.5% compared to the previous three-year period.

Table 1. Areas, production and average yields from vineyards with table grapes varieties

Years	Indicators		
	Area of cultivated vineyards, ha	Produced grapes[1], tons	Average yield, kg/ha
2004	5,591	16,448	2,942
2005	4,062	10,723	2,640
2006	3,096	13,563	4,383
Average (2004-2006)	*4,250*	*13,578*	*3,322*
2007	2,498	13,641	5,460
2008	2,448	17,889	7,305
2009	3,263	17,344	5,315
Average (2007-2009)	*2,736*	*16,291*	*6,027*
2010	2,629	7,989	3,039
2011	2,373	12,080	5,091
2012	2,248	8,659	3,853
Average (2010-12)	*2,417*	*9,576*	*3,994*
2013	2,842	16,770	5,901
2014	1,610	7,079	4,397
2015	2,254	16,320	7,240
Average (2013-15)	*2,235*	*13,389*	*5,846*
2013-15/2004-06 (%)	52.6	98.6	176.0
2007-09/2004-06 (%)	64.4	120.0	181.4
2010-12/2007-09 (%)	88.3	58.8	66.3
2013-15/2010-12 (%)	92.5	139.8	146.4

Source: MAF, Agricultural Statistics Department and own calculations

The average yield of table grapes during the period 2004-2015 was within the range from 2,640 to 7,305 kg/ha. It had been noticed an increase in productivity per unit area of vineyards with table grapes varieties, as the increase amounted to 76.0% according to the average values for the period 2013-2015 compared to 2004-2006 (Table 1). The growth in the level of average yields was due mainly to the elimination of a large part of the area of depreciated, thinned and consequently low-productive table grapes vineyards. Despite the positive trend it should be pointed out that the realized average yields over the analyzed period did not correspond to the biological potential of the table grapes varieties, which was indicative of the worsen agricultural and

[1] Not included grapes from trellis vines

sanitary state of the existing vineyards in the country and not observing the technological requirements for their cultivation. At the constant rate of increase of production costs, the low level of the natural resultant indicator from production activity implied a high prime cost per unit of production and hence lower rate of profitability or even losses, calculated on the basis of the producer price.

The observed negative trend characterizing the development of the areas of table grapes in the country as well as the insufficiently high level of productivity, affected the production of grapes for fresh consumption. The quantity of table grapes produced in 2015 amounted to 16,320 tons, that was almost at the level for the year 2004. The outlined trend of development of that indicator showed that a significant decrease in the produced quantities was observed during the period 2010- 2012, as afterwards the rate of decrease was gradually slowed down (Fig. 1).

The signs of a positive change in the negative rate of development of table grapes production, undoubtedly impacted by the provided after 2007 opportunities for income support to producers in the form of payments per unit of area and national contributions and for subsidizing part of the investment costs for establishment of vineyards with table grapes varieties and purchase of specialized machinery and equipment under the Rural Development Programme (RDP) 2007-2013, were not yet enough so that it could be pointed a reverse in the negative development of the sub-sector. The reasons had been many and complex. Along with the financial difficulties, the most serious argument seemed to be labor shortages resulting from the accelerated pace of depopulation of rural areas, especially in the northern regions of the country. The accelerated emigration processes have led to a deterioration of the age structure of labor resources in agriculture. At the same time, it would hardly be a mistake to point out that the workforce with necessary qualification for the complexity of the technological process in table grapes production was living in countries where the remuneration of labor was much higher, thus helping to maintain competitive advantages of traditional country-producers of table grapes in the EU-28 and suppliers of our domestic market.

The analysis of the distribution of cultivated areas with table grapes per type of specialization of the farms showed that in 2013 the largest share of the area of table grapes was grown in specialized vineyards – 38.5%[2]. That referred to a greater degree of combining wine and table grapes production, as a very small part of farms used all their cultivated area only for table grapes growing [5].

The dynamics of the total number, cultivated area and the average size of farms growing table grapes, grouped according to the size of the utilized agricultural area (UAA) for the period 2003-2013 was presented in Table 2. The number of farms decreased in all groups, as the reduction was the greatest in farms with less than 2 ha UAA - by 84.5%.

The area of grown table grapes in farms decreased in the groups with size less than 2 ha UAA (by 60.8%), from 20 to 30 ha (by 16.7%) and over 100 ha (35.1%). A negative fact was that in large farms having the resources to organize cost effective and competitive production of table grapes the economic interest in this activity had dropped down. In farms with UAA from 2 to 5 ha, 5 to 10 ha; from 10 to 20 ha; from 30 to 50 hectares and from 50 to 100 ha there have been an increase of cultivated areas with table grapes. The positive trend was indicative of the presence of economic incentives having an impact on the entrepreneurial activity in the sector.

The average size of the area of table grapes had increased in almost all groups, except those with an area of 20 to 30 ha and more than 100 ha. The process of production concentration during the six year period was the most intense in farms with UAA from 10 to 20 ha, from 30 to 50 ha and from 5 to 10 ha. It had been observed considerable variation in the average size of table grapes grown per groups of the farms, evidencing for the limited resources of most of table grapes

[2] Own calculations based on data of Eurostat (http://appsso.eurostat.ec.europa.eu)

growers.

Based on these trends it could be concluded that the mechanisms of financial support during the previous programming period of CAP application, mainly as direct payments and under measure 121 "Modernization of Agricultural Holdings", RDP 2007-2013, had impacted positively the processes of production consolidation, however the effect was minimal. The data on the average farm size unequivocally indicated the orientation of the larger agricultural holdings to extensive production. In farms with UAA from 50 to 100 ha and over 100 ha, the average size of cultivated table grapes decreased in 2013 compared to 2007, indicating the intentions of entrepreneurs aimed at reducing production costs and increasing the income based on crops for which the percentage of direct payments calculated on the basis of direct production costs was significantly higher than for table grapes viticulture.

Table 2.Change in the size of farms growing table grapes during the 2003-2013

Indicators	2003	2007	2013	2007/2003 (%)	2013/2007 (%)	2013/2003 (%)
Farms, number	36,400	14,990	6,940	41.2	46.3	19.1
0 ≤ 2 ha	32,560	12,760	5,040	39.2	39.5	15.5
2 ≤ 5 ha	2,660	1,550	1,090	58.3	70.3	41.0
5 ≤ 10 ha	650	300	350	46.2	116.7	53.8
10 ≤ 20 ha	240	120	170	50.0	141.7	70.8
20 ≤ 30 ha	60	70	50	116.7	71.4	83.3
30 ≤ 50 ha	50	60	80	120.0	133.3	160.0
50 ≤ 100 ha	50	40	60	80.0	150.0	120.0
≥ 100 ha	140	90	100	64.3	111.1	71.4
Area, ha	4,090	3,090	2,960	75.6	95.8	72.4
0 ≤ 2 ha	1,990	940	780	47.2	83.0	39.2
2 ≤ 5 ha	410	670	420	163.4	62.7	102.4
5 ≤ 10 ha	120	130	250	108.3	192.3	208.3
10 ≤ 20 ha	50	50	280	0.0	560.0	560.0
20 ≤ 30 ha	60	20	50	33.3	250.0	83.3
30 ≤ 50 ha	30	150	190	500.0	126.7	633.3
50 ≤ 100 ha	80	250	120	312.5	48.0	150.0
≥ 100 ha	1,340	880	870	65.7	98.9	64.9
Average size, ha	0.11	0.21	0.43	190.0	204.8	390.9
0 ≤ 2 ha	0.06	0.07	0.15	116.7	214.3	250.0
2 ≤ 5 ha	0.15	0.43	0.39	286.7	90.7	260.0
5 ≤ 10 ha	0.18	0.43	0.71	238.9	165.1	394.4
10 ≤ 20 ha	0.21	0.42	1.65	200.0	392.9	785.7
20 ≤ 30 ha	1.0	0.29	1.00	29.0	344.8	0.0
30 ≤ 50 ha	0.6	2.5	2.38	416.7	95.2	396.7
50 ≤ 100 ha	1.6	6.25	2.00	390.6	32.0	125.0
≥ 100 ha	9.57	9.78	8.70	102.2	89.0	90.9

Source: Eurostat (http://appsso.eurostat.ec.europa.eu) and own calculations

The limited quantity of production determined the drop in the level of consumption. Because of the low elasticity of demand, determined by the nature of table grapes - fruit satisfying immediate physiological needs and the lengthy period required for the manifestation of structural changes in consumer demand, the consumption of table grapes per capita had remained relatively stable over the period 2004-2015, varying from 1.6 kg to 3.2 kg (Table 3). Fluctuations were observed per years, depending on the variation in the quantity of production, evidencing for the preferences of the Bulgarian consumers mainly to the taste qualities of the national table grapes. The low incomes and high selling prices of table grapes were the factors limiting grapes consumption in the country. The annual variations in the amount of consumed table grapes per capita

corresponded to the variations in the production volumes, indicating potential for growth of consumer demand with increased production.

The constant decline in the table grapes production and the consequent inability to meet the needs of the domestic market necessitated the import of table grapes. The dynamics of development with regard to the physical volume of import had been shown to steadily increase, more pronounced in the period 2012-2015. The quantity of imported table grapes increased by 179.8% in 2015 compared to 2004 and by 26.1% compared to 2014. The value of import had increased by 115.6% for the period from 2004 to 2015. The significant rise in the physical volume of imports observed over the last three years was the result of the decrease in the average level of import price - from USD 0.70 per kilogram of table grapes in 2012 to USD 0.34 per kg in 2015.

Table 3. Consumption, imports, exports and foreign trade balance of trade with table grapes

Years	Consumption		Import			Export			Trade balance, thousand USD
	tons	per capita, kg	tons	thousand USD	Unit price, USD	tons	thousand USD	Unit price, USD	
2004	22,507	2.9	2,893.3	1,259.2	0.44	5.0	6.6	1.31	-1,252.6
2005	12,350	1.6	3,185.9	1,728.4	0.54	4.9	7.9	1.63	-1,720.9
2006	16,894	2.2	2,680.4	1,294.4	0.48	4.4	8.1	1.83	-1,286.3
2007	22,921	3.0	1,626.7	1,240.7	0.76	23.7	45.5	1.92	-1,195.2
2008	23,580	3.1	3,281.3	2,257.2	0.69	519.4	596.8	1.15	-1,660.4
2009	24,204	3.2	3,094.2	1,764.3	0.57	697.9	918.1	1.32	-846.2
2010	15,010	2.0	2,887.9	2,418.9	0.84	949.3	1228.0	1.29	-1,190.9
2011	16,120	2.2	3,953.8	3,553.1	0.90	1,400.5	2215.9	1.58	-1,337.2
2012	16,804	2.3	5,736.8	4,028.1	0.70	965.8	1450.5	1.46	-2,577.6
2013	23,186	3.2	4,942.4	2,497.9	0.51	994.9	1027.0	1.03	-1,470.9
2014	12,964	1.8	6,421.6	3,008.5	0.47	501.9	557.0	1.11	-2,451.5
2015	15,738	2.2	8,095.2	2,714.7	0.34	1,086.1	687.9	0.63	-2,026.8
2015/2004 (%)	69.9	75.9	279.8	215.6	77.3	21722.0	10422.7	48.1	161.8
2015/2007 (%)	68.7	73.3	497.6	218.8	44.7	4582.7	1511.9	32.8	169.6

Source: NSI (http://ftrade.nsi.bg/) and own calculations

While at the beginning of the studied period 2004-2006, exports of table grapes was symbolic within 4.4 to 5 tons, mainly for airplane and ship supply in the years after the country's accession to the EU the exported quantity increased, reaching 1 400.5 tons in 2011. The value of exports also increased under the simultaneous impact of the greater quantities and growth in the average export price - from 1.15 USD/kg in 2008 to 1.58 USD/kg in 2011. Over the past four years, the quantity of exported table grapes remained relatively stable, except in 2014, when the unfavorable weather conditions of the year had a negative impact on the level of the domestic production. Under the influence of the economic situation on the international market, the average price of exports dropped down from 1.46 USD/kg in 2012 to 0.63 USD/kg in 2015. However the export development was much more dynamic compared to the import as the limited quantity of exported products at constantly increasing import was the reason for the negative foreign trade balance of trade with table grapes.

The financial mechanisms to support table grapes producers during the previous programming period of the CAP application in Bulgaria (2007-2013) included:

- support of producers' incomes - direct payments (single area payment scheme and national payments);
- support for building agricultural holdings in the form of a single premium under Measure 112 Setting up of Holdings of Young Farmers under the Rural Development Programme;
- financing part of the investment costs for setting up table grapes vineyards, purchase of agricultural machinery and equipment for the farm, as well as non-financial investment in

the farm - Measure 121 "Modernization of Agricultural Holdings;
- support for restructuring costs of operations, Measure 141 "Support for Semi-Subsistence Farms Undergoing Restructuring".

The allocations under the single area payment scheme did not have a major impact on the profitability of the table grapes production. The sum granted in 2013 amounted to 158.40 EUR/ha covered only 5.5% to 6.8% of the total direct production costs, that was extremely insufficient to ensure the stability of entrepreneurial income and promote the economic interest of the producer [4]. According to data of the State Fund Agriculture - Paying Agency, most approved and paid projects throughout the programming period were registered under Measure 141 (145 projects), for which the grant amounted to 517,192 EUR and represented 15.2% of the total funds allocated for financial support for the sector (3.3 million EUR). Young entrepreneurs started their activities in table grapes production were a total of 46, who received a grant of 0.9 million EUR, while for modernization of production were paid a total of 1.9 million EUR for the implementation of 32 projects. The amount of the subsidy did not cover the needs of the sector related to the expansion of production potential, modernization of production processes and increasing the market orientation of the farms. The small number of approved projects showed that many vine-growers remained without support because of the existing problems of organizational, managerial, administrative and institutional nature, refracted through the prism of the specifics of the investment and the production of table grapes viticulture. The main conclusion derived from the evaluation of the actual effects of the policy during the previous programming period on the development of table grapes viticulture was that to stimulate investment activity in the sector, besides subsidizing investment in setting up of vineyards it should be ensured greater amount of financial support to producers' income during the fruit-giving period of the plantations.

The new multi-layered model of direct payments applicable in the country for the period 2014-2020 aimed to provide more balanced, transparent and equitable distribution of aid between farmers (Table 4). Maintaining the base single area payment scheme as established and relatively efficient and easy system for support was related to the requirement of minimum cultivated area of 0.5 hectares for all crops and was only granted to farmers complying with the statutory conditions for an active farmer. The most serious impact in terms of stable profitability in table grapes production was the chosen in our country Scheme for direct support coupled to production and in particular the Scheme for coupled support for fruits, including table grapes. The rate of payment determined by MAF for Campaign 2015 was in the amount of 990.88 EUR/ha and the supported areas with table grapes were 895 ha. MAF data for 2016 revealed an increased interest by producers of table grapes, as the filed applications for support covered an area of 1,621 ha (+ 81.0%) while the indicative rate was set at 556.95 EUR/ha.

With a view of the need for stabilizing the production of table grapes in mid-term plan a positive element was the continuing in the new programming period subsidizing the investments for setting up and/or replanting of table grapes vineyards provided for under measure 04 Investments in Physical Assets, sub-measure 4.1. Investments in Agricultural Holdings under the Rural Development Programme 2014-2020. Small farms with a standard production volume between 2,000 and 7,999 Euro (according to criteria established in the Thematic Sub-programme for the development of agricultural holdings in Republic of Bulgaria (2014-2020)) could also apply for support when setting up table grapes vineyards, and for acquiring of agricultural machinery or equipment for grapes storage. Starting aid for young farmers, whose business plan could include activities for setting up, replanting or restoration of plantations with table grapes varieties was granted under measure 6.1. of the new RDP.

Table 4. Opportunities to support table grapes production through mechanisms and measures financed by the CAP 2014-2020

First pillar Direct payments and market support	Second pillar Rural Development Programme 2014-2020
A) Direct Payments Single Area Payment Sheme (SAPS); Green payment (payment per hectare for respecting certain agricultural practices beneficial for the climate and the environment); Redistributive payment for the first 30 ha; ***Coupled support for fruit (including table grapes).***	**M01 Knowledge transfer and information actions** - Sub-measure 1.1. Vocational training and skills acquisition - Sub-measure 1.2. Demonstration activities and information actions - Sub-measure 1.3. Short-term farm and forest management exchanges and farm and forest visits.
	M04 Investments in physical assets - Sub-measure 4.1. Investments in agricultural holdings. - Sub-measure 4.1.2. Investments in agricultural holdings in the Thematic Sub-programme for the development of agricultural holdings - Sub-measure 4.2. Investments in processing/marketing of agricultural products - Sub-measure 4.2.2. Investments in processing/marketing of agricultural products in the Thematic Sub-programme for the development of agricultural holdings.
	M06 Farm and business development - Sub-measure 6.1. Business start-up aid for young farmers. - Sub-measure 6.3. Business start-up aid for the development of small farms.
	M09 Setting up of producer groups and organisations
	M11 Organic farming - Sub-measure 11.1 Payments to convert to organic practices and methods per ha of UAA. - Sub-measure 11.2. Payments for maintain organic practices and methods per ha of UAA.
B) Market measures "Fruit and vegetables" Support for creating operational funds of producer organizations (Pos) or associations of Pos. Support for implementing operational programmes. Recognition of interbranch organisations.	**M16 Cooperation** - Sub-measure 16.1. Support for the establishment and operation of operational groups of the EIP for agricultural productivity and sustainability - Sub-measure 16.2. Support for pilot projects and for the development of new products, practices and technologies. - Sub-measure 16.4. Support for horizontal and vertical co-operation among supply chain actors for the establishment and the development of short supply chains and local markets..

Source: http://www.mzh.government.bg/MZH/bg/ShortLinks/SelskaPolitika/direktniplashtaniq2015-2020/Polezninasoki.aspx, http://www.dfz.bg/bg/prsr-2014-2020/prsr--2014-2020/ and http://www.mzh.government.bg/MZH/bg/ShortLinks/PRSR.aspx

The fact that the provided direct income support for farmers growing table grapes in the new programming period was significantly greater in amount than the subsidies received over the past seven years, in addition to the opportunities for financial support for investment in the setting up of new table grapes vineyards, including by the methods of organic farming, preconditioned much more tangible positive impact on the production potential development in the sub-sector. The set threshold for minimum yield would inevitably impose strict observance of agro-technical measures that would have an effect on the quality of produce with a direct impact on the competitiveness of production.

CONCLUSIONS

The results of the analysis clearly indicated slowing down of the negative trend of development of table grapes production in

Bulgaria, under the influence of the mechanisms of the CAP. However, a number of problems in the sub-sector had remained unresolved – the small size of cultivated areas; shortage of skilled labor force; poor investment activity and renewal of the production potential; low degree of association in the sector and the inability of contracting a high level of market price.

The opportunities for support the table grapes production provided under the EU funds in the 2014-2020 period, as aid schemes are broader than those granted during the previous programming period.

That created expectations for positive development, both in terms of production potential and productivity as a result of the total production, and in terms of the degree of supply and access of the population to quality and inexpensive table grapes.

The implementation of the outlined opportunities shall be directly dependent on the degree of administrative and institutional effectiveness of the sub-sector environment.

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LITHUANIAN CONSUMERS' VIEWS ON COUNTRY OF ORIGIN LABELLING FOR MILK AND DAIRY PRODUCTS

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Abstract

This study aimed to investigate Lithuanian consumers' views on country of origin labelling for milk and dairy products. In order to get necessary information, Lithuanian residents were interviewed. A multi-stage stratified random sampling was used to select the respondents. A survey of 1,000 Lithuanian consumers on milk and dairy products was undertaken. The analysis of collected data was performed using the methods of mathematical statistics. The survey results reveal that for two-third of Lithuanian consumers, when buying milk and dairy products, it is important to know the country where the milk is milked. Respondents who perceive origin labelling indicating the country of milking as very important and important information tend to be female, middle-aged and have a higher education. While Lithuanian consumers are interested in origin labelling indicating the country where the milk is milked, they are not ready to buy milk and dairy products at a higher cost to have that additional information. Only one-third of interviewed persons are prepared to pay a price premium to know the country of milking. Respondents who are prepared to pay a little more to have that additional information tend to be young, have a higher education and the highest income.

Key words: *consumers, milk, dairy products, country of origin, labelling, Lithuania.*

INTRODUCTION

Milk and dairy products are traditional components of the Lithuanian kitchen and widely consumed by Lithuanian population. Due to globalization, consumers are confronted with a wide range of dairy products. The majority of dairy products sold on the domestic market are manufactured in Lithuania. Nevertheless, the share of imports is tending to increase. In 2011, the imported dairy products accounted for 14.2% of the total dairy products sold on the Lithuanian market, and in 2015 for 20% [7]. Taking this tendency into account, domestic dairy products face growing competition from other countries. In addition, the dairy processing enterprises lack raw milk purchased in Lithuania, therefore they import certain quantities of this milk from other countries. In 2015, import of raw milk reached 334.6 thousand tonnes and if compared to 2011 increased by 14% [5]. This milk is used for the production of dairy products, which are exported or sold on the domestic market. In this respect, if dairy products are labelled as Lithuanian products it does not mean that the milk in them came from Lithuania.

The results of a survey performed in Lithuania show that the vast majority of consumers regularly buy domestic livestock products. The top reasons for purchasing are freshness, good taste and favourable prices. Consumers consider Lithuanian origin as an important factor when choosing livestock products, but only after freshness, taste, price and healthiness [3].

The concept of country of origin labelling information is widely used in various countries to protect their own products from international competition [8].

A large body of research has studied the effect of country of origin on consumers' preferences. Most confirm that consumers prefer foods produced in their own country or region [12].

Several studies have analysed the effect of the place of production on consumers' willingness to pay a price premium for milk and dairy products. They point out that consumers are willing to pay more for domestic or local milk and dairy products that

contain only milk and milk ingredients produced in their own country [2, 4, 6, 10, 11]. According to these studies, the traceability of milk and dairy products may become an important marketing tool [10].

In the European Union (EU), it is not mandatory to label milk and milk used as ingredient in dairy products with the country of origin. Dairy processors can include this origin information voluntarily. The results of a survey conducted in Sweden, France, Poland and Austria reveal that a substantial majority of consumers want to know the origin of milk and dairy products [1]. According to the Eurobarometer survey 2013, most EU citizens consider necessary to indicate the origin of milk, whether sold as such or used as an ingredient in dairy products [9].

MATERIALS AND METHODS

This study aimed to investigate Lithuanian consumers' views on country of origin labelling for milk and dairy products. In order to achieve this aim and collect data, a survey method was used. In total, 1000 Lithuanian residents aged 18 year and over were interviewed across the country. A multi-stage stratified random sampling was used to select the respondents. All interviewed persons were screened to be consumers of milk and dairy products. The survey was carried out in July 2015 by the market and opinion research centre "Vilmorus Ltd.". Respondents were interviewed face-to face in their homes. A standardized questionnaire containing close-ended questions was employed as the main instrument of the survey. Respondents were asked to express their perception on the importance of origin labelling indicating the country where the milk is milked, willingness to pay a little more to know the country of milking and understanding of the label "Made in Lithuania with 100% Lithuanian milk" when placed on milk and dairy products. Finally interviewed persons were asked to indicate their socio-demographic characteristics (gender, age, educational level and income).

The socio-demographic characteristics of respondents are presented in Table 1. Out of the 1,000 respondents, males and females constituted 46.9% and 53.1% respectively. In relation to the age, the largest proportion of respondents 35.4% was from the 46–65 year age bracket while the smallest proportion 14.1% was from the 18–30 year age bracket. As concerns the educational level, most of respondents (46.9%) had a higher education. Regarding the household income, the majority of respondents (45.6%) indicated a household income per capita of less than 250 EUR per month.

Table 1. Socio-demographic characteristics of respondents

Socio-demographic characteristics (N=1000)	Frequency	Percentage
Gender		
Male	469	46.9
Female	531	53.1
Age		
18–30	141	14.1
31–45	216	21.6
46–65	354	35.4
>66	289	28.9
Educational level		
Incomplete secondary	110	11.0
Secondary	420	42.0
Higher	469	46.9
Not answered	1	0.1
Household income		
<250 EUR	456	45.6
251–500 EUR	390	39.0
501–750 EUR	46	4.6
>751 EUR	30	3.0
Not answered	78	7.8

The statistical analysis was performed using SPSS (Statistical package for the social science). The Chi-square (χ^2) test was used to compare the frequencies of the answers among the different groups. A p value of less than 0.05 was considered to indicate a statistically significant difference ($p<0.05$). In order to make comparisons between all pairs of groups, post hoc tests were conducted.

RESULTS AND DISCUSSIONS

All respondents were asked to indicate, when buying milk and dairy products how important or unimportant it is that milk and dairy products would be labelled with additional information indicating the country of origin of raw milk from which these dairy products are manufactured. The substantial majority of interviewed persons perceived origin labelling indicating the country of milking as very important and important information: 67% shared this view, of which

33% said very important and 34% said important. One fifth of respondents considered it to be unimportant (10%) and very unimportant (10%). The remaining interviewed persons (13%) were indifferent. The perceived importance of origin labelling indicating the country where the milk is milked was significantly different by gender, age and educational level. There was no statistical difference by income (Table 2). Consumers who perceived origin labelling indicating the country of milking as very important and important information tended to be female, middle-aged and highly educated. Consumers who perceived that origin labelling as very unimportant and unimportant tended to be male, the youngest and less educated.

Table 2. Association between social-demographic characteristics of respondents and perception on the importance of origin labelling indicating the country where the milk is milked

Socio-demographic characteristics	Perceived importance of origin labelling indicating the country where the milk is milked			χ^2	p-value
	Very important/ Important Frequency (%)	Neither important nor unimportant Frequency (%)	Very unimportant/ Unimportant Frequency (%)		
Gender				14.37	0.001*
Male	62.0	13.4	24.5		
Female	72.1	12.4	15.4		
Age				13.22	0.040*
18–30	58.9	14.9	26.2		
31–45	69.0	13.4	17.6		
46–65	73.2	10.7	16.1		
>66	63.3	14.2	22.5		
Educational level				30.26	0.000*
Incomplete secondary	51.8	20.0	28.2		
Secondary	62.6	14.0	23.3		
Higher	75.3	10.2	14.5		
Household income				6.21	0.400
<250 EUR	64.9	14.9	20.2		
251–500 EUR	67.7	12.3	20.0		
501–750 EUR	76.1	4.3	19.6		
>751 EUR	76.7	10.0	13.3		

*Statistically significant: $p<0.05$ (Chi-square test).

Women were significantly more likely to perceive origin labelling indicating the country where the milk is milked as very important and important information (72.1%) compared to men (62%) (p=0.001). The highest proportion of consumers who perceived that origin labelling as very important and important information was found for respondents from the 46–65 year age bracket (73.2%). This proportion was significantly greater compared with respondents from the 18–30 year age bracket (58.9%) (p=0.007) and respondents from the 66 year old and over bracket (63.3%) (p=0.027), but not significantly greater compared with respondents from the 31–45 year age bracket (69.0%) (p=0.513). Respondents with higher education (75.3%) were significantly more likely to perceive origin labelling indicating the country of milking as very important and important information than respondents with incomplete secondary education (51.8%) (p=0.000) and respondents with secondary education (62.6%) (p=0.000).

All respondents were asked to indicate whether they would be prepared to pay a little more if milk and dairy products were labelled with information indicating the country of origin of raw milk from which these dairy products are manufactured.

About one-third of interviewed persons declared they would be prepared to pay a little more to know the country where the milk is milked: 32% shared this view, of which 28% would pay up to 2% a premium price, 2% would pay up to 5% a premium price and only 1% would pay more than 5% a premium price. The majority of respondents (68%) would refuse to pay more to have that information.

In the socio-demographic characteristics, three of four characteristics indicated significant differences between consumers who would be prepared to pay a little more to know the country of milking and consumers who would not be prepared to pay a little more to have that information (Table 3). Specifically, there were significant differences between these two groups for age, educational level and income. There was no statistical difference in gender.

Consumers who would be prepared to pay a premium price to know the country where the milk is milked tended to be the youngest, with higher levels of education and income.

Conversely, consumers who would not be prepared to pay a premium price to have that information tended to be the oldest and with lower levels of education and income.

Table 3. Association between social-demographic characteristics of respondents and willingness to pay a little more for information indicating the country where the milk is milked

Socio-demographic characteristics	Willingness to pay for information indicating the country where the milk is milked		χ^2	p-value
	Prepared to pay a little more Frequency (%)	Not prepared to pay a little more Frequency (%)		
Gender			3.01	0.083
Male	29.2	70.8		
Female	34.3	65.7		
Age			8.06	0.045*
18–30	38.3	61.7		
31–45	34.3	65.7		
46–65	32.9	67.1		
>66	26.0	74.0		
Educational level			14.17	0.001*
Incomplete secondary	16.4	83.6		
Secondary	32.9	67.1		
Higher	34.8	65.2		
Household income			10.64	0.014*
<250 EUR	27.6	72.4		
251–500 EUR	35.5	64.5		
501–750 EUR	32.6	67.4		
>751 EUR	50.0	50.0		

*Statistically significant: p<0.05 (Chi-square test).

The highest proportion of consumers who would be prepared to pay a little more was found for respondents from the 18–30 year age bracket (38.3%). This proportion was significantly greater compared with respondents from the 66 year old and over bracket (26.0%) (p=0.009), but not significantly greater compared with respondents from the 31–45 year age bracket (34.3%) (p=0.437) and respondents from the 46–65 year age bracket (32.9%) (p=0.731). The proportion of consumers who would be prepared to pay a premium price was slightly higher for respondents with higher education (34.8%) compared to respondents with secondary education (32.9%), and the difference was not statistically significant (p=0.568). Respondents with higher education and respondents with secondary education were significantly more likely to be prepared to pay a little more than respondents with incomplete secondary education (16.4%) (p=0.000 and p=0.001, respectively). The highest proportion of consumers who would not be prepared to pay a premium price was found for respondents with the highest income (50.0%). This proportion was significantly greater compared with respondents with the lowest income (27.6%) (p=0.009), but not significantly greater compared with respondents with income of 251–500 EUR (35.5%) (p=0.111) and respondents with income of 501–750 EUR (32.6%) (p=0.129).

All respondents were asked to indicate if milk and dairy products had the label "Made in Lithuania with 100% Lithuanian milk" what this label would mean. A list of potential definitions was presented to consumers. The vast majority of interviewed persons thought this label would mean that the product had been produced, processed and prepared in Lithuania. 17% of respondents chose the option "A guarantee of traditional character" and 12% selected the option "A guarantee of specific flavor or taste". 12% of interviewed persons thought this kind of logo on milk and dairy products would be purely for advertising purposes while 19% believed it would not mean anything (Fig. 1).

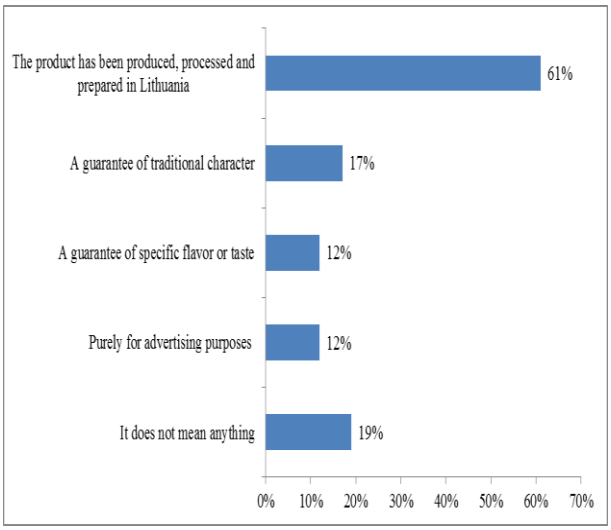

Fig. 1. Meanings of the label "Made in Lithuania with 100% Lithuanian milk" when placed on milk and dairy products

The meaning that the product has been produced, processed and prepared in Lithuania was more indicated by women, the respondents from the 46–65 year age bracket, the consumers with higher education and income of 501–750 EUR. A guarantee of traditional character was more declared by women, the respondents from the 31–45 year age bracket, the consumers with higher education and income of 501–750 EUR. A guarantee of specific flavor or taste was more mentioned by women, the youngest respondents, the consumers with higher education and the highest income.

CONCLUSIONS

The aim of the study is to investigate Lithuanian consumers' views on country of origin labelling for milk and dairy products. The results reveal that for two-third of Lithuanian consumers, when buying milk and dairy products, it is important to know the country where the milk is milked. Those who are female, middle-aged (between 46 and 65 years of age) and have a higher education are significantly more likely to perceive origin labelling indicating the country of milking as very important and important information. While Lithuanian consumers are interested in origin labelling indicating the country where the milk is milked, they are not ready to buy milk and dairy products at a higher cost to have that additional information. Only one-third of interviewed persons are prepared to pay a price premium to know the country of milking. Those who are the youngest (between 18 and 30 years of age), have a higher education and the highest income are significantly more likely to be prepared to pay a little more to have that information.

Most of Lithuanian consumers think that the label "Made in Lithuania with 100% Lithuanian milk" when placed on milk and dairy products would mean that the product has been produced, processed and prepared in Lithuania.

The results of this study are useful to both Lithuanian milk producers and dairy processing enterprises in defining marketing strategies that would help to strengthen the competitiveness of domestic and local production and to grow the market share.

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WHY THE ECONOMICS OF GROUNDNUT PROCESSING IN AKWANGA LOCAL GOVERNMENT AREA, NASARAWA STATE, NIGERIA

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Abstract

Despite Nigeria`s plentiful agricultural resources and oil wealth, poverty is widespread in the Country and has increase since the late 1990`s, neglect of rural infrastructure affects the profitability of agricultural production. The lack of roads impedes the marketing of agricultural communities prevents farmers from selling their produce at reasonable price and leads to spoilage. The study was designed to analyze the economics of groundnut processing in Akwanga Local Government Area of Nasarawa State, Nigeria. A purposive sampling technique was adopted in collecting the data used for the study from a sample of 60 groundnut processors. Descriptive statistics and gross margin analysis was used to analyzed the data collected. The study revealed that 98.3% of the respondents are females who used groundnut seed, firewood, water, labour and grinding machine in processing groundnut. The study estimated the average variable cost per 100 kg of groundnut seed per cycle at ₦27,487.12 while the average total revenue was estimated at N36,340.00 thus, a gross margin of ₦8,852.88 per 100 kg of groundnut seed per cycle. The return per naira invested (ROI) was estimated at ₦0.322. This indicates that groundnut processing is a profitable business in the study area. The study further revealed that majority of the respondents were constrained by inadequate capital, inadequate processing machine, risk of buying low quality raw materials, inadequate capital, unstable prices of inputs and unsteady market for products. Based on the findings the study recommended that groundnut processors should be encouraged to form cooperative societies so that they can speak with common voice in their attempt to acquire input and sell their output, affordable and accessible credit facilities should be made available to processors among others. Farmers should be persuaded to dry their groundnut seed properly before barging them to prevent the seed from spoilage.

Key words**:** *economics, groundnut, processing*

INTRODUCTION

Agro-processing could be defined as a set of techno-economic activities carried out on an agricultural commodity for the purpose of making it usable as food, feed, fibre, fuel or industrial raw material [25]. It is generally a value additional that is being carried out in order to produce same or new product in a more acceptable form and quality. A common and traditional definition of agro-processing industry refers to the subset of manufacturing that processes raw materials and intermediate products derived from the agricultural sector. Agro-processing industry thus, means transforming products originating from agriculture, forestry and fisheries, livestock [9].

According to [25], the agro-processing value chain encompasses all subsequent operations after the stage of harvest till the produce reaches the final consumer in the desired form, packaging, quantity, quality and price. Such activities comprise two major categories; primary and secondary processing operations. The agro-processing industry is of strategic importance to the economy, first, due to its high multiplier effect towards job creation and second, due to its backward linkage with primary agriculture and forward linkage with other tertiary economic sectors such as manufacturing and retail Department of Trade Industry [6].

Department of Agriculture and Forestry [7] asserted that, in 2011 the agro-processing industry contributed 30.5% of real value added (GDP) to the manufacturing sector and 29.8% of output in real terms. In addition it

contributed 39.2% of the total employment in the manufacturing sector [7]. According to [9], most preservation techniques, for example, are basically similar over a whole range of perishable food products, whether they are fruit, vegetables, milk, meat or fish. In fact, the processing of the more perishable food products is to a large extent for the purpose of preservation. Non-food industries, in contrast to the food industries, have a wide variety of end uses. Almost all non-food agricultural products require a high degree of processing. Much more markedly than with the food industries, there is usually a definite sequence of operations, leading through various intermediate products before reaching the final product. Because of the value added at each of these successive stages of processing, the proportion of the total cost represented by the original raw material diminishes steadily. A further feature of the non-food industries is that many of them now increasingly use synthetics and other artificial substitutes (especially fibres) in combination with natural raw materials.

Another useful classification of agro-processing industry is in upstream and downstream industries. Upstream industries are engaged in the initial processing of agricultural commodities. Examples are rice and flour milling, leather tanning, cotton ginning, oil pressing, saw milling and fish canning. Downstream industries undertake further manufacturing operations on intermediate products made from agricultural materials. Examples are bread, biscuit and noodle making, textile spinning and weaving; paper production; clothing and footwear manufacturing; and rubber manufactures [25].

Groundnut (*Arachis hypogeae* Linn) also known as peanuts, earthnuts, gobbers, pinders, manila nuts, monkey nuts, etc originated from Latin America [5, 18]. The Portuguese introduced it into African continent from Brazil in the 16th century [14, 1]. It is a member of the genus Arachis in the family of *leguminosae* (*fabaceae*). Groundnut is the 13th most important food crop of the world. It is the world's 4th most important source of edible oil and 3rd most important source of vegetable protein [13, 27].

Groundnut is grown on 26.4 million hectares worldwide with a total production of 36.1 million metric tonnes, and an average yield of 1.4 metric tons/ha [11]. According to [12], [13] groundnut is grown in nearly 100 countries with China, India, U.S.A, Indonesia, Nigeria, Myanmar and Sudan as major producers. Nigeria account for 25% of world exports [17]. Groundnut accounted for 70% of Nigeria's total export prior to petroleum oil boom World Geography of Peanut [28].

The groundnuts are shelled and cleaned by winnowing to get the seeds. The seeds are roasted and then allowed to cool. The roasted seeds are rubbed against one another in a container to remove the covering. The clean seeds are groundnut into paste. The paste is then mashed with warm water and oil rises to the surface and is skimmed off. The oil with some water is fried over a low fire flame to remove the water from the oil. The remaining chaff (Tunkuza) is then molded into different shapes and fried in the extracted oil to produce groundnut cake (*Kulikuli*) [4]. Groundnut kernels contain 40-50% protein and 10-20% carbohydrates [10], [26]. According to [10] groundnut seeds are nutritional source of Vitamin E, niacin, falacin, calcium, phosphorus, magnesium, zinc, iron, riboflavin, thiamine and potassium. Groundnut kernels are consumed directly as raw, roasted or boiled forms. Oil extracted from the kernels is used as culinary oil. The vines are used as fodder for cattle [15].

Groundnut is useful in treatment of *haemophilia*, and can cure *stomatitis*, prevent *diarrhoea* and is beneficial for growing children, and for both pregnant and nursing mothers [3]. The crop is used as industrial materials for producing oil-cakes and fertilizer. All parts of the groundnut plant are used in one way or the other. These multiple uses of groundnut plant make it important for both food and cash-crop for the available domestic, or worldwide external markets in several developing, and developed countries. Globally, 50% of the produce is used for oil extraction, 37% for confectionery use and 12% for seed purpose [27].

As reported by Rural Poverty in Nigeria [24] despite Nigeria's plentiful agricultural

resources and oil wealth, poverty is widespread in the country and has increased since the late 1990s. Some 70 percent of Nigerians live on less than US$1.25 a day. Poverty therefore, is said to be severe in rural areas, where up to 80 percent of the population lives below poverty line, and social services and infrastructure are limited. The country's poor rural women and men depend on agriculture for food and income. About 90% of Nigeria's food is produced by small-scale farmers who cultivate small plots of land and depend on rainfall rather than irrigation systems. The small scale farmers consider agriculture as an occupation rather than business. The poorest groups eke out a subsistence living but often go short of food particularly during the pre-harvest period. Women play major roles in the production, processing and marketing of food crops, yet women and households headed by them are often the poorest members of rural communities.

Neglect of rural infrastructure affects the profitability of agricultural production. The lack of roads impedes the marketing of agricultural commodities, prevents farmers from selling their produce at reasonable prices, and leads to spoilage. Limited accessibility cuts small scale farmers off from sources of inputs, equipment and new technology, and this keeps yields low (RPN, 2015) [24]. In the face of such severe constraints to livelihood, self-employment in small-scale business presents a constructive option for income generation. In many communities, a high percentage of small-scale businesses that cater for local needs most especially groundnut processing, are controlled or owned by women. These women undertake these small-scale businesses as an alternative means to livelihoods.

The enormous contribution of Small-Scale Enterprises (SSEs) to the social and economic advancement of any locality cannot be over-emphasized. There are quite a number of researches on groundnut production in Nigeria, but researches on groundnut oil processing are few. Moreover, the available ones are broad to some extent. For instance, [16] evaluated groundnut processing among women in North-Central Nigeria. It is against this background that this study intends to address the following research questions.

(1)What are the socio-economic characteristics of the respondents?

(2)What are the resources used in groundnut processing?

(3)What are the costs and returns in groundnut processing in the study area?

(4)What are the constraints to groundnut processing in the study area?

Objectives of the study

The broad objective of the study is to analyze groundnut processing in the study area. The specific objectives of the study are to:

(i)describe the socio-economic characteristics of the respondents;

(ii)identify the resources used in groundnut processing

(iii)estimate the costs and returns in groundnut processing in the study area; and

(iv)identify the constraints to groundnut processing in the study area.

MATERIALS AND METHODS

Description of the Study Area

The study was carried out in Akwanga Local Government Area of Nasarawa State, Nigeria. Akwanga Local Government Area is one of the thirteen Local Government Areas of Nasarawa State located within latitude 8°5' and 9°0' North of the equator and between longitude 8°15' to 8°30' East of the meridian with a point location of 8°55'- 8°25'E [21]. The Local Government Area is bounded in the north by Sanga Local Government of Kaduna State, Nasarawa-Eggon in the South, and Wamba in the East and lastly Kokona in the West. Its Headquarters is in the town of Akwanga. It has an area of 996 km² and a population of 113,430. Male has the total population of 57,430 whereas female has the total population of 56,000 [20]. The major occupation of the inhabitants is farming. The major crops grown are maize, groundnut, yam, cassava, cashew trees, orange trees, mango, sorghum, sesame, millet etc. Major tribes in the area are Mada and Eggon. Others include Hausa/Fulani, Yoruba and Igbo.

Sample Size and Sampling Technique

Three (3) wards out of (11) wards from Akwanga Local Government Area popular for processing groundnut kernels were selected, in each of the wards selected, twenty (20) processors were randomly selected, making a total of 60 respondents as the sample size.

Data Collection

Primary data were used for this study. Primary data were collected with the use of structured questionnaire. Information collected from the respondents was on their socio-economic characteristics such as age, education level, sex, marital status, etc. Information was also collected on inputs used in groundnut processing. The prices of inputs such as groundnut kernels, labour, firewood were also obtained. Revenue information was also collected.

Data Analysis

The data were analyzed using simple descriptive statistics such as frequency counts, means and percentages. Gross Margin (GM) analysis was employed to determine the costs and returns associated to groundnut processing. The descriptive statistics was used to achieve objectives (i), (ii) and (iv) while the Gross Margin (GM) was employed to determine objective (iii).The Gross Margin (GM) model is expressed as:

GM = TR – TVC

Where GM = Gross margin (₦/kg)

TR = Total Revenue (₦/kg)

TVC = Total Variable Cost (₦/kg)

Fixed cost was negligible and so it was ignored in traditional agriculture [22].

The variable cost items considered included cost of transportation, firewood, labour, water, salt and groundnut seed. The Total Revenue for processing 1,000 kg (1 tonne) was from the groundnut oil and groundnut cakes realize from 1,000kg of the groundnut seeds.

RESULTS AND DISCUSSIONS

Socioeconomic Characteristics of the respondents

The distribution of the respondents according to their socioeconomic characteristics including age, sex, marital status, household size, education, experience, membership of association and income is presented in Table 1.

Distribution of the respondents according to their age

The Table shows that majority (50.0%) of the respondents were within the age bracket of 30-39 years. The mean age of the respondents was 34.80. According to [2], age is inversely proportional to performance. Age is an critical factor in determining the level of activity implementation as it influence the volume of physical effort to be put in any economic activity. Young individuals tends to have more and strong body build-up and are highly energetic than the elderly persons.

Distribution of the respondents according to their sex

The sex of the respondents shows that majority (98.3%) of the respondents were females. This agrees with the statement of [16] that, processing of groundnut into various products in Nigeria is mostly done by women either for home consumption or for commercial purposes.

Distribution of the Respondents according to their marital status

The distribution of the marital status shows that majority (73.3%) of the respondents were married, 3.3% of the respondents were single while an equal percentage (11.7%) of the respondent were divorced and widowed, This shows that groundnut processing is a responsible venture through which people make money to support their family.

Distribution of the respondents according to their household size

Table 1 further shows that majority (53.3%) of the groundnut processors in the study area had household size ranging between 1 and 10. [23] opined that household size and number of dependents have influence on agricultural production since they affect consumption and production. On the same note, [8] noted that, business which is labour intensive require big household size that could provide the labour needed at least cost.

Distribution of the respondents according to their education

Educational status of the respondents shows that 31.7% of the respondents had no formal education, 26.7% had primary education, and 31.7% had secondary education while only 10.0% had tertiary education.

Table 1. Distribution of Respondents According to their socioeconomic characteristics

Response	Frequency	Percentage
Age (years)		
20-29	15	25.0
30-39	30	50.0
40-49	15	25.0
Total	60	100
Average= 34.80		
Sex		
Male	1	1.7
Female	59	98.3
Total	60	100
Marital Status		
Single	2	3.3
Married	44	73.3
Widowed	7	11.7
Divorced	7	11.7
Total	60	100
Household size (no. persons)		
1-10		
11-20	32	53.3
21-30	23	38.4
31 – 40	5	8.3
Total	60	100
Average= 12.10		
Education		
No formal education	19	31.7
Primary	16	26.7
Secondary	19	31.7
Tertiary	6	10.0
Total	60	100.0
Experience		
1-5	19	31.7
6-10	20	33.3
11-15	17	38.4
16-20	14	6.7
Total	60	100
Average= 8.73		
Membership of Association		
Members	4	6.7
Non members	56	93.3
Total	60	100

Source: Field survey, 2016

According to [19], people with high educational level are likely to analyze and interpret information than those who have less education or no education at all. In this regards, it is expected an increase in educational level of an individual would positively influence adoption of improved technologies, innovations and practices. This may eventually help in the improvement of any development and business enterprise executed by the entrepreneur. This will eventually lead to improvement in the socio-economic livelihood of the concern individual or group.

Distribution of the respondents according to their experience

The experience of the respondents in groundnut processing activities shows that 38.4% of the respondents had between 11 to 15 years of experience in groundnut processing, 33.3% had between 6 to 10 years of experience, and 31.7% had between 1 to five years of experience whereas 6.7% had between 16 to 20 years of experience.

Distribution of the respondents according to their membership to an association

On the membership of association, majority (93.3%) of the respondents do not belong to any groundnut processing related association. Possibly they might not be aware of the existence of any or might not be interested in joining any. Similarly, the non-membership might equally be due to personal reasons that may only be known to them alone.

Distribution of the respondents according to the resources used in groundnut processing

The resources used by the respondents to process groundnut into various products in the study area are presented in Table 2. The result shows that all the respondents, 60 (100%) used groundnut seed, firewood, water, labour and grinding machine to process groundnut Majority, 57 (95.0%), 52 (86.7%), 58 (96.7%), and 51 (85.0%) of the respondents used salt, sugar, basin and mortar respectively to process groundnut while minority, 16 (26.7%) and 4 (6.7%) of the respondents made use of pepper and oil extractor to process groundnut.

Raw groundnut seed serves as the major resource used in groundnut processing in the sense that the amount and/or quantity of all other resources are dependent on the quantity of raw groundnut seed to be processed. For instance, the amount of labour, quantity of salt, sugar, water, pepper and firewood are all dependent on the quantity of raw groundnut to be processed. Firewood wood played a vital role in groundnut processing as it is the source of heat the processors used in frying the groundnut seeds and extracting the oil from

the groundnut. Salt, pepper and sugar were also essential resources as they add taste and flavour to the product. Labour is necessary in carrying out all the processing operations. Among the fixed resources used in groundnut processing, grinding machine is used to grind the fried groundnut into paste while the oil extractor is used to extract oil from the paste. Processors sometimes use mortar for extraction of oil in the absence of oil extractor.

Table 2. Distribution of the respondents according to the resources used in groundnut processing

Resources	Frequency	Percentage
Variable:		
Groundnut seed	60	100
Firewood	60	100
Salt	57	95
Water	60	100
Sugar	52	86.7
Labour	60	100
Fixed:		
Grinding machine	60	100
Oil extractor	4	6.7
Mortar	51	85
Total	464*	

Source: Field survey, 2016 *Multiple responses

Costs and Returns to groundnut processing in the study area

The costs and returns to groundnut processing in the study area are presented in Table 3. The average variable cost per tonne of groundnut seed per cycle was estimated at ₦274,871.20. The items included were groundnut seed, firewood, transportation, grinding, salt, water, labour and sugar.

Among the variable items included, groundnut seed contributed the bulk of the total variables costs (89.3%).

Table 3 shows that an average value of ₦117,900.00 was realized from groundnut oil while ₦245,500.00 was generated from groundnut cake.

More revenue (67.6%) was realized from groundnut while groundnut oil contributed only 32.4% to the total revenue. Based on gross margin analysis, and average value of ₦88,528.80 was realized as returns to groundnut processing per tonne of groundnut seed per cycle.

Table 3. Costs and returns of processing 1,000kg (tonne) of groundnut seed

Item	Value (₦)/tonne	Percentage
A. Revenues		
i. Groundnut oil	117,900.00	32.40
ii. Groundnut cake	245,500.00	64.60
Total Revenue (TR)	363,400.00	100.00
B. Variable Costs		
i. Groundnut seed	245,516.70	
ii. Firewood	5,108.30	
iii. Transportation	4,588.30	
iv. Grinding	6,525.00	
v. Salt	560.00	
vi. Water	479.20	
vii. Labour	5,308.30	
viii. Sugar	6,785.40	
Total Variable Costs (TVC)/tonne	274,871.20	
Gross margin (A-B) 363,400.00 - 274,871.20 =	**88,528.8**	
G M /Naira invested on groundnut processed	0.322	
Benefit cost ratio 363,400.00 = 274,871.20	1.322	

Source: Field survey, 2016

The benefit cost ratio is 1.322 these indicated that, processing of groundnut is profitable in the study area.

The Gross Margin per Naira invested was estimated at ₦ 0.322 indicating that for every one naira invested in the enterprise, the processor gets 32.2 kobo and this further confirms that groundnut processing is a profitable venture to be engaged in. Though, it is seen that much need to be done in order to improve the revenue by improving the productivity of the resources employed in the processing process.

Constraints to groundnut processing in the study area

The problems faced by groundnut processors in the study Area were ranked according to the magnitude of the problems as stated by the processors. Table 4 below shows that most

common obstacle faced by groundnut processors are risk of buying low quality raw materials, inadequate processing machine, inadequate capital were ranked first, second and third with 57, 57 and 56 respectively. Other constraints indicated by the processors were instable prices of inputs unsteady market for products and drudgery, their responds also point out that their profit will increase if the constraints can be overcome.

Table 4. Constraints to groundnut processing in the study area

Constraints	No. of processors	Rank
Risk of buying low quality raw materials	57	1st
Inadequate processing machine	57	2nd
Inadequate capital	56	3rd
Unstable prices of inputs	52	4th
Unsteady market for products	49	5th
Drudgery	77	6th
TOTAL	348*	

Source: Field survey, 2016 *Multiple responses

Just like any other business enterprise groundnut processing requires capital. Most of the processors indicated their wish to process more bags of groundnut within the processing cycle but they are limited by the amount of capital they have. Also, machine required for grinding and extraction of oil are not readily available to the processors as at when due owing to the limited number of owners of this machine. Some processors prefer buying the shelled groundnut as they believe they realized more profit from buying the shelled groundnut. But, there is high probability that shelled groundnut contain bad seeds with low oil content. Processors are always faced with the tension of buying low quality groundnut seed. The tedious nature of the processing activities and/or operations lowers the morale of the processors, thus, their interest in the operation reduces. Moreover, processors are not certain of the prices for their products as a result of the fluctuation in prices which also discourage them from engaging in groundnut processing operations.

CONCLUSIONS

Most of the respondents were within the active working age and most of them (98%) were female and married with majority having large household size. Major input used in groundnut processing were groundnut seed, firewood, water, sugar, salt, labour and grinding machine. About ₦ 88,528.80 were realized as gross margin from one tonne (₦8,852.88/100kg) of groundnut seed. The major problem faced by the processors include; inadequate capital, drudgery, unstable price of input and output, risk of buying low quality raw material. The study further revealed that all the respondents, 60 (100%) used groundnut seed, firewood, water, labour and grinding machine in processing groundnut while majority of the respondents used salt, sugar, basin and mortar respectively. The study estimated the average variable cost per tonne of groundnut seed per cycle at ₦274,871.20 (₦27,487.12/100kg), while the average total revenue was estimated at ₦363,400.00 (₦36,340.00/100kg).
Thus, a gross margin of ₦88,528.80 per tonne (₦8,852.88/100kg) of groundnut seed per cycle. The outputs which were groundnut oil and groundnut cake were highly valued and fetched a higher income. Reasonable profit was made by the processors even though they were constrained by many factors such as shortage of capital and inadequate processing facilities.

Recommendations

The following recommendations are made to enhance groundnut processing in the study area.
(i)The processors should be encouraged to form cooperative societies so that they can speak with one voice in their attempt to acquire input, and sell their outputs.
(ii)Affordable and accessible credit should be made available to the processors so that they can expand their business and take advantage of large scales production.
(iii)Labour saving machineries be developed and subsidized to the entrepreneurs to sustain them in the processing venture.
(iv)Farmers should be sensitize on the need to dry their groundnut seeds properly before

bagging them, to prevent the seed from spoilage and self-destruction.

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SOCIO-ECONOMIC VARIABLES AND RURAL WOMEN PARTICIPATION IN YAM PRODUCTION IN GWAGWALADA AREA COUNCIL, FEDERAL CAPITAL TERRITORY (FCT), ABUJA, NIGERIA

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Abstract

The study was carried out to investigate the relationship between socio-economic variables and rural women participation in yam production in Gwagwalada Area Council, FCT Abuja, Nigeria. Stratified random sampling technique was used to select a sample of one hundred and fifty (150). Data was collected through the use of interview schedule and analyzed using descriptive statistics and logistic regression. Result showed that 43.3% of respondents were between the ages of 21 and 30 years. Most of the respondents were married (74.5%) with 70% of respondents having farm size of two (2) hectares. About 45% of respondents have no formal education. The result of logit analysis showed that farm size positively affected the participation of women in yam production. The Negalkerke R square was found to be 0.081. This indicates that 8.11% of the variation in the women participation in yam production in the study area is accounted for by the explanatory variables included in the model. Also, the chi-square analysis gave a value of 6.464 which is significant at 10% level of probability. The study recommended that Stakeholders should help in the provision of simple labour saving technologies that could reduce manual labour and energy sapping of the farmers. Government and relevant stakeholders should establish schemes that will enable women have easy access to land and other essential inputs. Credit facilities should also be made available and at affordable rates. Also, processing equipment and storage facilities should be developed and provided to the farmers to minimize waste and losses.

Key words**:** *participation, rural women, socio-economic, variables, yam production*

INTRODUCTION

Yam (Discorea Spp) is an annual root tuber bearing plant with over 600 species out of which six (6) are socially and economically staple in terms of food, cash and medicinal values in the tropics [19]. Some of the species include; Discorea rotundata (white guinea yam), Discorea alata (yellow yam), Discorea rotundata (white yam), Discorea alata (water yam), Discorea esculanta (Chinese yam) and Discorea dumetorun (trifoliate yam) [30]. Out of these, Discorea rotundata - white yam) and Discorea alata (water yam) are the most common species in Nigeria which are grown in the coastal region in rain forests, wood savanna and southern savanna habitats [18].

They are grown in tropical regions and mostly produced in the savannah region of West Africa,with two distinct seasons; wet and dry seasons[9]. The crop is also grown in Latin America and Caribbean countries like Colombia, Brazil, Haiti, Cuba and Jamaica [10].

Nigeria is the largest producer of yams in the world, followed by Ghana, Cote D' Ivoire, Benin, Togo, and Cameroon [10]. Yams are mostly marketed as fresh tubers and prepared for consumption. Transportation and marketing are carried out both by farmers and traders [18]. In the study area (Gwagwalada Area Council,FCT, Abuja) yams are sold by both male and females (youths, , adults and aged males and females).

Yams are the fifth most harvested crops in Nigeria, after cassava, maize, guinea corn, and beans/cowpeas [24]. Yams can withstand stress and hard climatic conditions and is less affected by micro-organism in the soil. Yams do not only serve as the main source of

incomes but also as a major employer of labour in Nigeria and all the yam growing countries worldwide. Despite the significance of yams to people both in the rural and urban areas, the attention given to its production is still far less than it importance [29].

Yam is widely consumed in West Africa as a food crop, the place of yam in the diet of the people in West Africa and Nigeria cannot be over-emphasized. [2] observes that yam contributes more than 200 dietary calories per capita per day for more than 150 million people in West Africa while serving as an important source of income to the people. The guinea white yams (*Dioscorea rotundata*) with its numerous varieties [17] are consumed by majority of Nigerians as a staple prestigious carbohydrate food. This showed that the yam crop is a very important food and income earner for about 60 million Nigerians [8]. Nigeria has a global record as the largest producer and consumer of yam. On a global scale, Nigeria alone contributes 36 million metric tons of food yams being cultivated in about 3 million hectares [27]. The tuber yam is the most economic part of the yam plant and as such, it is the source of income for farmers, processors and marketers. The yam tuber is an important source of protein, iron, and zinc to consumers. The crop also plays significant role in the socio cultural life of the people of Nigerian especially in South-eastern part of the country where it is regarded as the King of roots and tuber crops.

Despite the importance of the crop in the economy and socio-cultural life of many Nigerians, the crop faces a lot of challenges that reduce its potential to meet farmers, industrialists and consumer's needs. Some of the challenges include; unavailability of seed yam at affordable price, pests and diseases infestation and lack of interest in its research as a result of its long lifespan of 7 to 9 months.

Nigeria is by far the world's largest producer of yam. Accounting for about 79% of the world production, where Nigeria produced 18.3 million tonnes of yam from 1.5 million hectares, representing 73.8 percent of total yam in Africa [11]. Yam production in Nigeria has nearly doubled the volume produced in 1985 with a production of 35.017 million metric tonnes with a value equivalent to USD 5.654 million [12]. In perspective, the world's second and third largest producers are- Corte D' Ivoire and Ghana who produced 6.9 and 4.5 metric tonnes of yam in 2008 respectively.

[2] reported that in many yam producing areas in Nigeria, one can store yam tubers for periods of up to 6 months at ambient temperature thus contributing to sustainable food supply, especially at the difficult periods at the beginning of the wet season. [13] emphasized that root and tuber crops especially yam, have some inherent characteristics which makes it attractive, especially to smallholder farmers in Nigeria. Firstly, they are rich in carbohydrate, especially starch and consequently have a multiplicity of end users. Secondly, they are available all year round making them preferable to other more seasonal crops such as grains (peas, beans) for food security.

Women play an important role in the agricultural production in many countries including Nigeria. Their roles are in multiples and diverse which spans from soil tilling, cultivation, harvesting, processing, marketing of produce among others. In fact, it is increasingly known in recent times that a major share of the income of rural households are obtained through women activity, and sometimes even share of women income in the household economy is more than the share of men [6].

Rural women are active participants in retail trade and marketing, particularly where trade is traditional and not highly commercialized [3]. In many parts of Asia, women participate in many agricultural activities and marketing of foods such as vegetables, tubers, cereals among others. In West Africa, they help in distributing most major commodities; and in the Caribbean, women account for nearly all local marketing and through their marketing efforts, women provide valuable links among farmers, intermediaries and consumers. Petty trading often thought of in the past as non-productive, serves to stimulate the production and consumption linkages in the local economy [3].

Participation has been defined by [22] as the ability of the people to choose voluntarily to be an integral part of a development process. There has been ample research evidence to buttress the argument of women's high level of participation and contribution to agricultural production and other related agri-business and marketing of food crops in Nigeria.

However, the degree of women participation varies from one location to the other. Their specific task, vary from place to place, depending on cultures. It is generally believe that, women participation on self-employment including agricultural production and other related activities may varies from community to community, state to state, country to country and may as well differ across different regions of the world.

[1], women provide the backbone of the rural economy in most of sub-Saharan African, about 80 percent of the economic active female labor force. Food production is the major task of rural women and their responsibilities and labor inputs often exceed those of men in most area in Nigeria. Women also provide much of the labor for men's cultivation of export crops from which women derive little direct benefits [14]. Although women's activities vary according to differences in rural setting and cultural background, they generally participate actively in agricultural work and income generating activities which include food production and tending of livestock, making of pottery, handicraft, weaving of clothes and material as well as in trading are also responsible for hoeing from the farms to their home, preservation and marketing of crops. In a nut shell, women take primary responsibility for the production of sustaining food essential for family survival [26].

Nigeria like some other African countries has made efforts to promote gender equity, according to several policy commitments at global, continental, sub-regional and national levels. For instance the Federal Government of Nigeria formed a national policy on women in the year 2000 and this was revised in 2006 to resolve the problems of imbalance of the role of men and women in sustainable development [5].

Women generally face more serious constraints than men regarding the establishment of their economic activities, the obstacles include: lack of access to financial services, lack of entrepreneurship and market knowledge, low management and technical skills, lack of time due to household responsibilities and their generally low levels of livelihood which affect their ability to accumulate capital for investment [4; 20] and participation in yam production.

Although there have been accepted evidences of the contribution of rural women in food production, the contributions of women in yam production distribution and marketing of yam produce is yet to be fully appreciated. All channels of information, inputs and access to market have often been aimed at men on implicit assumption that men are heads of households and produce the food crops [26; 28] noted that there are bulks of women in developing economies, yet they are usually the poorest in the society less educated, disease ridden and occupy low social, economic and political status.

More, so a search through the literature reviewed shows that there have not been any empirical studies on the participation of women in yam production in the study area, this study is aimed at bridging this gap. The pertinent research questions in this study are:

(i)What are the socioeconomic characteristics of women farmers in the study area?

(ii)What activities are women involved in terms of yam production?

(iii)Do women socio-economic variables affect their participation in yam production?

Objective of the Study

The objectives of the study are to:

-describe the socio-economic characteristics of women farmers;

-examine the activities of women in yam production;

-determine the relationship between selected socio-economic variables of women and their participation in Yam production in the study area.

Hypothesis

There is no relationship between selected socio-economic variables and women

participation in yam production.

MATERIALS AND METHODS

The Study Area

The study area is Gwagwalada Area Council of the Federal Capital Territory (FCT), Abuja. It is geographically located at Latitude 8 56' 59" North of the equator and Longitudes 7 5' 59 East of the prime meridian. It shares boundaries with Kwali (which is 16.9km from it), and the FCT, Abuja which is (19.4 km away).

The high humidity in the area gives a heat trap effect which makes Gwagwalada uncomfortably hot, it has an area of 1,043km and population of 157,177 people [25]. The area is characterized by two main seasons; rainy (April to November) and dry (December to march). The mean daily temperature ranges between 30^0 and 37^0 C, with an annual rainfall of 1,100 to 1,600 mm, which encourages agricultural activities such as the cultivation of crops (yam, cassava, groundnut, cowpea, maize, sorghum, rice, and melon), grazing of animals and fishing. Gwagwalada Area Council is predominantly inhabited by Gbagi, Bassa, Gede and a handful of other tribes such as Fulanis, Pangus, Nupe, Hausa, Igbo and Yoruba.

Sampling Techniques

A multistage sampling procedure was used. In the first stage, five (5) out of the ten (10) communities Gwagwalada area council were purposively selected based on the concentration of women farmers in these areas. Hence, Paiko-kore, Dobi, Tunga-maje, Gwako and Zuba were selected. In the second stage, using a list of farmers obtained from ADP, farmers were stratified into male and female. Simple random sampling was then used to select thirty female respondents from each of these communities giving a total sample size of 150 respondents

Data Collection/ Analysis

The instrument used for this study was interview schedule. Both descriptive statistics and Logit regression analysis were employed to analyze the data. The descriptive statistics used included; frequency distribution, percentage, mean and standard deviation to achieve objectives one and two. While, Logit regression analysis was used to analyze objective three, the logit analysis is suited to models where the dependent variable is a dummy. The logit model is mathematically represented as follows:

$$Yi = a + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + U_1$$

where Yi = participation of women in yam production (1 = if a farmer participate, and 0 = if a farmer did not participate given a critical value of above 75%).

a= constant

β_1- β_7 = Regression coefficients

$$P = a + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7$$

X_1 = Age (years)

X_2 = marital status (married = 1, single = 0)

X_3 = years of experience in farming

X_4 = income (estimate annual income)

X_5 = household size (number of persons)

X_6 = hectares (farm size)

X_7 = years of formal education (primary school = 6, secondary school = 12, tertiary = 16 and no formal education = 0.)

Ui = Error terms

Definition of Measurement of variables

(i) Participation of women in yam production – is measured by the use of a dummy 1 (participated) dummy 0 (did not participate)

(ii) Age –the last birthday of respondent at the time of the study (years).

(iii)Farming experience –Numbers of years spent in farming.

(iv)Income –Amount of money realized from the sales of agric produce per annum

(v)Household size –Number of person resident under a single roof.

(vi)Farm size –The area of land cultivated (hectare).

RESULTS AND DISCUSSIONS

Socio-economic characteristics of women farmers

Socio-economic characteristics of farmers have a significant influence on the

respondent's decision making process, availability and the level of conventional inputs and other related technology. According to [16] some .of the socio-economic characteristics of the farmers which may contribute to or affect the farmers productivity level include; age, marital status, experience in farming, level of education, household size, farm size, income distribution, access to credit, among others.

The result on Table 1 shows the distribution of respondents based on their age groups. Majority of the respondent (43.3%) were between the ages of 21-30 years, this was followed by farmers with ages of 50 and above and this constituted 36%, and 20.7% of the respondents were of ages ranging between 10 – 20 years. This implies that majority of the farmers belong to the active age group and energetic enough to take up responsibilities in their farms. It is at active age when farmers can carry out the physical requirements of farm activities. The marital status of the respondents refers to the disposition of the farmers as to either married or unmarried (single). Widowed and divorced respondents were also grouped under the single category. The distribution of the respondents as also reflected in Table 1 revealed that most of the women farmers (77.3%) were married while un-married represented 22.7%. It is generally observed that married persons have more responsibility than the un-married and hence more efforts are given in terms of participation in farm activities so as to enable them generate more food and income to meet their domestic requirements.

Farming experience of the farmers refers to the number of years put into farming by individual or household. From same Table 1, the study reveals that majority (70.7%) of the female farmers had years of experience in farming of less than 10 years while about 20% of farmers had 21 and above years of experience, followed by the least experienced farmers which constituted 9.3% of the farmers with experience of between 11 – 20 years. This implies that majority of the women farmers had low experience in farming. This is not in agreement with [15] which noted that in West Africa, 60 – 70% of domestic farms and marine product are handled by women and had long period of farming experience.

Table 1 further shows that most (70%) of the female farmers had an annual income of between ₦10,000-₦100,000 naira, while about 15.3% of the women farmers had annual income of ₦160,000 and above and the least percentage (14.7%) with an annual income ranging between ₦110,000 - ₦150,000. This result shows that majority of the female farmers had lower income level and this could affect participation in yam production because the more the income of the farmers the more the production and purchase of lands and other essential inputs such as fertilizer, improve varieties of seed and other technology for improve productivity.

The analysis regarding the household size is also captured in Table 1. This indicated that majority (44.7%) of women farmers had Household size of less than10 members 41.3% of the female farmers had 11-20 members while the remaining 14% having household size of 20 and above people. In consideration of this result, it was observed that majority of the women farmers had lower household size and this could affect agricultural production activities which are labor intensive. This is in agreement with [23] who observed those female headed households are smaller in size and this could lead to shortage of labor especially in peak seasons to facilitate farm operations requirements.

As regards to the farmers land holdings, the analysis also indicated that mostly (58%) had farm size of less than 2 hectares while 32% had farm size of between 2-5 hectares with a lower percentage of 10% of the farmers who had farm size of over 5 hectares. This result demonstrated that women that participate in yam production are more in the hands of small scale women farmers. It was pointed out by researchers such as [7] that women are perceived to be less capable of farming their allocations despite the smallness.

Education in whatever form is often considered as a backbone and a strong weapon to technology adoption and development that will lead to improve

productivity. It enable farmers to acquire more rapidly new innovations available in all aspect of the agricultural related activities as well as technology testing between existing and new ones being tried to develop and promote.

Table 1. Distribution of the respondents according to socio-economic characteristics

Variables	Frequency	Percentage
Age (years)		
Less than 20	31	20.7
21-30	62	43.3
31 and above	54	36.0
Marital Status		
Married	116	77.3
Single	34	22.7
Experience in farming (years)		
Less than 10	106	70.7
11-20	14	9.3
21 and above	30	20.0
Household size		
1-10	67	44.7
11-20	62	41.3
21 and above	21	14.0
Farm size (ha)		
Less than 2	87	58.0
2-5	48	32.0
Above 5	15	10.0
Educational level (Years)		
No formal education	52	34.7
Primary School	31	20.7
Secondary	39	26.0
Tertiary	28	18.6
Income distribution (₦)		
10,000-100,000	105	70.0
101,000 - 200,000	22	14.7
201,000 and above	23	15.3
Women Participation in Yam Production		
Participated	132	88.0
Not participate	18	12.0

Source: Field survey, 2015

In consideration of the results of this study, it reveals that majority (34.7%) of the women with had no formal education, followed by 26% with 12 years indicating the achievement of secondary education, followed by 20.7% with 6 years of formal schooling and this indicates the attainment of primary education. Only (minority) 18.6% had a formal education of 16 years of formal education which indicates tertiary education. This result shows that women farmers have low level of education, and hence low adoption of new technology with less accessibility of new innovation and low tendency of innovativeness, access to improve inputs, farm credit support, and effective record keeping among other related incentives. In the case of women participation in yam production activities in the study area, the findings of the study indicated that majority representing 88% of the respondents participates in yam production, while the remaining 12% did not participate in yam production. This has shown that despite the general acceptability and income generation being received from yam production in the entire yam producing area of Nigeria, yet some of the women are not participating, possibly due to the low level of education or preference for other crops or inadequate land and access to production inputs.

The activities of women in yam production.

The results on Table 2 show the activities of women in yam production. The result revealed that 62% of the women farmers were involved in land preparation, 81.3% in planting, 80% in fertilizer application. Also, 74.7% participated in weeding, 80.7% in staking while 84.7% involved in harvesting. Those involved in processing and marketing constituted 82% and 79.3% respectively. This results further shows that women farmers in Gwagwalada Area Council have a higher percentage of participation in of yam production activities.

Table 2. The activities of women in yam production

Women participation	Frequency	Percentage
Land preparation		
I participated	94	62
I did not participate	56	88
Planting		
I participated	122	81.3
I did not participate	28	18.7
Fertilizer application		
I participated	120	80.0
I did not participate	30	20.0
Weeding		
I participated	112	74.7
I did not participate	38	25.3
Staking		
I participated	121	80.7
I did not participate	29	19.3
Harvesting		
I participated	127	84.7
I did not participate	23	15.3
Processing		
I participated	123	82.0
I did not participate	27	18.0
Marketing		
I participated	119	79.3
I did not participate	31	20.7

Source: Field survey, 2015

Determinants of women participation in yam production in the study area

The estimates of the determinants of women participation in yam production in the study area is shown in Table 3.

The results of the regression analysis showing the participation of rural women in yam production indicated that farm size (W = 0.004) had a significant influence on women participation in yam production at 5% level of probability.

Table 3. Logit result showing the appraisal of women participation in yam production in relation with their social-economic variables

Variables	B	Exp(B)	Standard error	Wald
Constant	2.174	8.793	1.306	2.771
Age (years)	0.038	1.039	0.068	0.324
Farm size (ha)	-0.005	0.995	0.075	0.004*
Farming experience (years)	0.040	1.041	0.066	0.373
Marital status	0.318	1.375	0.664	0.230
Farmers income (Naira)	0.000	1.000	0.000	0.100
Household size	-0.098	0.907	0.050	3.822
R^2-value 0.081				

Source: Field Survey, 2015. *Wald is significant at 5% level of probability.

This agrees with Larson and [21] who pointed out that the land tenure systems in Africa vary across the continent. Both women's access to land and security of women's land affects overall productivity when there is maximum allocation of land. Also the result shows that age, household, farmers experience, farmer's income and marital status have no significant effect on the women participation in the production of yam in the study area.

Furthermore, the Negalkerke R square was found to be 0.081 (8.11%). This indicates that 8.11% of the variation in the women participation in yam production in the study area is accounted for by the explanatory variables included in the model. Also, the chi-square analysis gave a value of 6.464 which is significant at 10% of probability. The result further shows that livelihood value of 103.613.

Farm size had significant effect on participation of women in yam production. This implies that women with large farm size participated increasingly in yam production in the study area.

CONCLUSIONS

Women participation in agricultural production and the marketing of agricultural produce in particular is an age long activity. However, this study has revealed the factors which could influence women participation in yam production in Gwagwalada Area Council, Federal Capital Territory, Nigeria. The result further revealed that rural women are highly involved in yam production and majority of the women were married, had low educational level, farm size of less than 2 hactares, low income, and household size of 1-10 members, It has also shown that the participation of women in yam production in the study area was highly determined by farm size. The results further revealed that 63% of the women farmers were involved in land preparation, 81.3% in planting, 80% in fertilizer application. Also, 74.7% participated in weeding, 80.7% in staking while 84.7% involved in harvesting. Those involved in processing and marketing constituted 82% and 79.3% respectively. The logit regression result showed that farm size had a significant effect on women participation in yam production at 5% level of probability while age, household size, farming experience, farmer's income and marital status of women have no significant influence. The Negalkerke R square was found to be 0.081 (8.11%). This indicates that 8.11% of the variation in the women participation in yam production in the study area is accounted for by the explanatory variables included in the model. Also, the chi-square analysis gave a value of 6.464 which is significant at 10% of probability. The result further showed a livelihood value of 103.613. It is therefore recommended that; adequate extension agents should be made available to the women farmers to help in providing more improved technologies and other related capacity building services. Stakeholders should help in the provision of simple labour saving technologies that could reduce manual labour and energy sapping of the farmers. Government and relevant stakeholders should establish schemes that will enable women have easy access to land and other essential inputs. That sources of credit, whether formal or informal should also be made more accessible and affordable to the women. This will enable them source for the required funds needed to support their businesses. Processing equipment and storage facilities should also be developed and provided to the farmers to minimize the level of destructions of produce.

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THE EFFECTS OF SUBSIDIES ALLOCATION ON COMPETITIVENESS OF THE AGRICULTURAL ENTERPRISES FROM THE HORTICULTURAL SECTOR OF THE REPUBLIC OF MOLDOVA

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Abstract

Subsidies allocation represents an important source of financing the agricultural enterprises, being analyzed by the scientists from all over the World. The subsidy policy of the Republic of Moldova is different from the subsidy policy of the European Union, being determined by the following factors: the lack of the consistency of the subsidies policies from the Republic of Moldova and the insufficiency of the necessary financial resources in order to apply the policies like in the European Union. Strategically, at the state level, it doesn't exist a clear subsidy policy for a longer period of time, namely the subsidies measures are not very clear defined and are changing from year to year, which creates difficulties for agricultural producers to access subsidies. In this context this scientific research has the objective to analyze the subsidies effects on competitiveness of the agricultural enterprises, to analyze the subsidies allocated in Moldova compared to neighbor countries, to reveal the measures of subsidizing the agricultural enterprises and to find out if the enterprises can achieve higher competitiveness by subsidies allocation.

Key words**:** *agricultural enterprises, competitiveness, Total Factor Productivity, subsidies*

INTRODUCTION

Subsidies represent an important source of financing the agricultural producers. According to the scientific researches made by FAO [11], exists 3 types of economical justifications of subsidies allocation in agriculture:

(a)The case of the „infantile agriculture" – when the branch is dominated by the foreign production and the state would like to develop this branch. The government could allocate subsidies to the agricultural sector through grants, credits, reducing the taxes. When the branch will achieve the desired point of development, the subsidies will be eliminated [9].

(b)The case when a big agricultural enterprise of strategical importance, faces temporary difficulties and can be in danger of termination its activity. Thus, the government in this case has at least three options: no to take any attitude, feeling all the negative effects of the market; or can directly allocate subsidies to the company with difficulties, participating with capital inflows, credits, guarantees; or can let the company to go down and to intervene through the monetary system at the company's bankruptcy; which will affect the activity of other „healthy companies" from the branch.

(c)The current interests in the field of protection the environment can determine the policy of the state to encourage, through subsidies, the enterprises and the branches to act in an ecological way.

Studying the scientific literature regarding the importance of subsidies for agriculture, also there are many opinions among specialists which affirm that subsidies also have negative effects.

Thus, after the WTO Doha Round from 2001, many countries, like Brazil, China, India expressed their opposite opinion regarding the application of subsidies in the USA and Europe agriculture. They argued that a high volume of subsidy allocation determine artificially the decrease of the prices of the agricultural cultures, which negatively influence the development of the small farmers and contribute at poverty maintenance in many developing countries.

Subsidies should be used to solve some specific problems, not to stop some processes

a long time of period, because exists the risk that the producers not to be competitive and to depend by the government. The efficiency theory affirms that it is very important to produce more products with fewer investments. According to some scientific researches, the subsidies have the tendency to reduce the stimulus of the agricultural producers, which will concentrate not to increase the agricultural production volume, but how to obtain a higher volume of subsidies [6].

Analysing the situation of the Republic of Moldova in the field of subsidies allocation, we can affirm that subsidies are indispensable for the development of a competitive agricultural sector [5]. The subsidy policy from the Republic of Moldova is different from the subsidy policy of the European Union, being determined by the following factors: the lack of the consistency of the subsidies policies from the Republic of Moldova and the insufficiency of the necessary financial resources in order to apply the policies like in the European Union [10]. Also, if we will analyze strategically, we can affirm that doesn't exist a clear subsidy policy for a longer period of time, namely the subsidies measure are not very clear defined and are changing from year to year, which creates difficulties for agricultural producers to access subsidies. Those agricultural producers which access subsidies have more chances to be competitive on the market, compared to those who register lack of subsidies allocation.

In this context this scientific research has the objective to analyze how subsidies influence the competitiveness of agricultural enterprises and if the enterprises will achieve higher competitiveness by subsidies allocation.

MATERIALS AND METHODS

The research was elaborated on the basis of the official data collected from the National Bureau of Statistics, the National Bank of Moldova, the Minister of Agriculture and the Food Industry of Moldova, the Agency of Interventions and Payments for Agriculture (AIPA) and other economic sources.

As research methods there were used: analysis and synthesis, comparative method, logical analysis, graphical method.

Also, as a global indicator of competitiveness it was used Total Factor Productivity (TFP), being calculated on the basis of the Malmquist productivity index, which consists of two components: the index of technological change and the index of technical efficiency change [4,7,8]

$$M_0(x^{t+1}, y^{t+1}, x^t, y^t) = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \left[\left(\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \right) \left(\frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)} \right) \right]^{\frac{1}{2}} \quad (1)$$

where,

Technical efficiency change:

$$\frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \quad (2)$$

Technological change:

$$\left(\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \right) \left(\frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)} \right)^{\frac{1}{2}} \quad (3)$$

TFP may take the following values:

(i) TFP>1, then in the period t (between the moment t and t+1) was registered an increase of productivity;

(ii)TFP=1, in this case wasn't registered changes at the productivity level;

(iii)TFP<1, then was registered a decrease of productivity.

The data processing was performed using the program DEAP version 2.1., which was elaborated by Tim Coelli, at Centre for Efficiency and Productivity Analysis, Department of Econometrics, University of New England (Australia), in order to construct DEA frontiers for the calculation of technical and cost efficiencies and also for the calculation of Malmquist TFP Indices.

RESULTS AND DISCUSSIONS

The horticultural sector of the Republic of Moldova has a high importance in the economic growth of the country. The majority of the population is engaged in the horticultural sector, which represents quarter from the total agricultural production (Fig. 1).

Horticultural production is represented by fruits and vegetables, which play an essential role for the human health. Thus, according to the investigations performed by some scientists, was stated that a person should

consume annually about 563 kg of various vegetables, particularly tomatoes - 416 kg, cabbage- 30 kg, onion - 20 kg, peppers - 15 kg, eggplants - 5 kg; roots of different vegetables - 15 kg, peas and beans - 5 kg; herbs - 5 kg, other vegetables - 15 kg; potatoes - 50 kg.

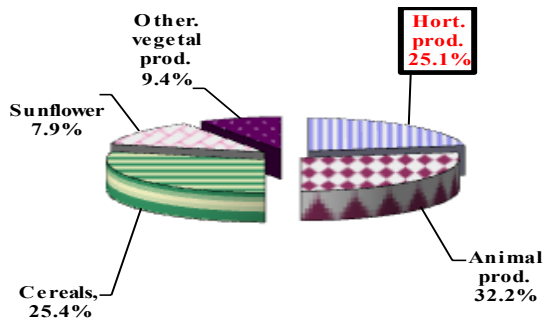

Fig. 1. The structure of agricultural production (2014)
Source: elaborated by the author based on the data from [2]

Taking into consideration, the information mentioned above, there was stated that for a family composed of 4 persons it will be necessary 2,144 kg of vegetables and 200 kg of potatoes. But, this statistics is estimative, because the consumption of fruits and vegetables must be correlated with the level of the physical activity, age, gender, food habits, daily energy consumption etc., so as not to offer the body more food than it needs to operate normally.

The horticultural sector of the Republic of Moldova is divided in two subsectors:

(a)**The sector of fresh horticultural products** – characterized by the lack of financial resources, investments in high-tech, innovative production technique, developing irrigation infrastructure and the marketing strategy (lack of post-harvest infrastructure – refrigerated rooms, packing houses, etc.)

(b)**The sector of processing horticultural products** – characterized by continuous process of developing, which can be ensured by 3 basic pillars - the raw material, the labor force and the development of new high requested products.

The analyze of the horticultural sector using five forces competition model of Michael Porter, reveals that the competition on the local market is moderate without big inclination towards the consumer or the producer.

Risk of new entrants on the market is not very high because initiation of a fruit production business requires long term investments in multiannual plantations which is a little different from vegetables production in cold period of the year, but which also need investments for greenhouses. New entrants on the market also must ensure high quality, well packed products to be competitive towards the existing firms from the market.

Buyers are the final point of all the producers preoccupation, because the acquisition of the horticultural products by the consumers represent the acceptance of the producers supply by which is realized the change commodity – money. Regretfully, in RM doesn't exist a brand strategy for agricultural products which will differentiate the products, thus influencing the prices. Also it is very important to remark that in RM, the majority of the horticultural products are bought by consumers from the open markets because of the price which lower than in supermarkets.

Threat of substitute products. Fruits and vegetables have no substitute products. Even more that once the income of the population are decreasing, the consumers will change their preferences to lower prices products, from exotic products to local products.

Suppliers. In Republic of Moldova the number of suppliers of horticultural products is very high. Those who have a well organized distribution network of horticultural products from the producer to the consumer (it is a rather small number) are more advantaged towards those who have no a well organized distribution network. Local suppliers of horticultural products have no strong brands which would determine the consumers to give up to some of their preferences in favor of local horticultural products. A very serious problem is the lack of cold storage rooms, which determines the agricultural producers to realize directly from the field the horticultural production during the harvest season at low prices, compared to the period out of the season, when they could obtain incomes two

times higher, if they had cold storage rooms for keeping horticultural production in the cold period of the year.

Rivalry between players. Examining the existing rivalry from the market of horticultural enterprises, it is revealed that exist situations when local market faces overproduction because of the lack of foreign markets. Republic of Moldova faces with many export barriers. As a result of the embargo imposed by Russian Federation, in 2014 the fruits and vegetables producers from Republic of Moldova, according to the Minister of Agriculture and Food Industry registered losses over 20 Million USD, connected to the export of apples, but regarding the total exports of food products, RM registered losses over 200 Million USD.

In this context high level of competitiveness can be achieved by increasing the productivity, according to the M. Porter theory of competitiveness, which can be realized by the allocation of the financial resources in the modernization of the horticultural production process.

Thus, according to the Government Decision nr. 352 of 10.06.2015, regarding the way of repartition the subsidy fund to agricultural producers for 2015, the amount of the subsidy fund constituted 610 Million MDL, which is more than in 2014 by 110 Million MDL, and then in 2013, by 210 Million MDL.

Analyzing the sum of subsidies fund of some EU member states and the subsidies fund from the Republic of Moldova we can state that agricultural producers receive the least subsidies in the region. For example, in 2013, in Hungary, there were allocated 1,904 Million EUR (approximately 450 EUR/ha), in Romania, there were allocated 2,620 Million EUR (approximately 191 EUR/ha), which is considerably much more than in Republic of Moldova, where the subsidizing fund was 454.03 Million MDL (approximately 24.67 Million Euro or 20 EUR per ha). Under these conditions, the agricultural producers are not competitive on the region's markets. Production costs are too high and the lack of financial resources creates difficulties at increasing the competitiveness [3].

In the same context, analyzing the structure of subsidies allocation in 2013 (Fig. 2), we can mention that for stimulating crediting for agricultural producers and by banks non-financial institutions were allocated only 8.66% of financial resources. The investments subsidies for the establishment of multiannual plantations constituted 19.51%. Also for the development of the horticultural sector very important are technologies used in the process of production, thus 31.26% of subsidies were allocated as investments for purchasing agricultural machinery and equipment including irrigation equipment; 15.38% of subsidies were investments in the development of the processing and post harvesting infrastructure [1].

A specific measure of subsidizing agricultural producers which contribute to the increasing of competitiveness of the agricultural enterprises is „Stimulation of investments in the post harvest infrastructure", for which in 2013 were allocated 69,817 Million lei. From this sum of subsidies allocated to the agricultural enterprises, for the development of the post harvest and processing infrastructure of the horticultural products were authorized subsidies equal to 8,901 Million lei only to 20 enterprises from 18 rayons, which represents 12.75% from the total sum of the allocated subsidies for the development of the post harvest and processing infrastructure, which represent a very low value for increasing the competitiveness of the local horticultural production, which represents a third from the total agricultural production. The majority of the allocated subsidies were for: purchase of equipment for primary processing of fruits and vegetables, the largest subsidy being allocated to Comrat Rayon amounting to 1.5 million lei; procurement of equipment for drying fruits, the largest subsidy being allocated to Criuleni Rayon in the amount of 1,240 Million lei.

Thus in order to increase the competitiveness of the horticultural production it is necessary to increase the allocated subsidies for the development of the post harvest and processing infrastructure.

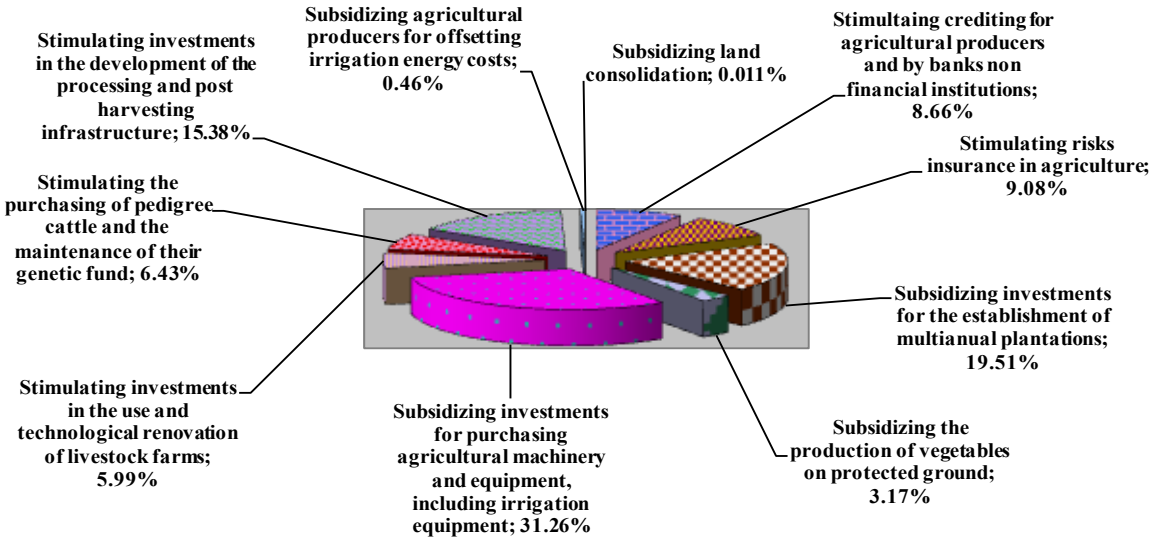

Fig. 2. The structure of subsidies allocation in 2013, %
Source: Elaborated by the author based on data from the Agency of Interventions and Payments in Agriculture

Fig. 3 . Intensive growing of tomatoes and strawberries in greenhouses, tunnels and greenhouses
Source: http://pepinierelehida.ro/php/cultura-protejata-a-capsunului/

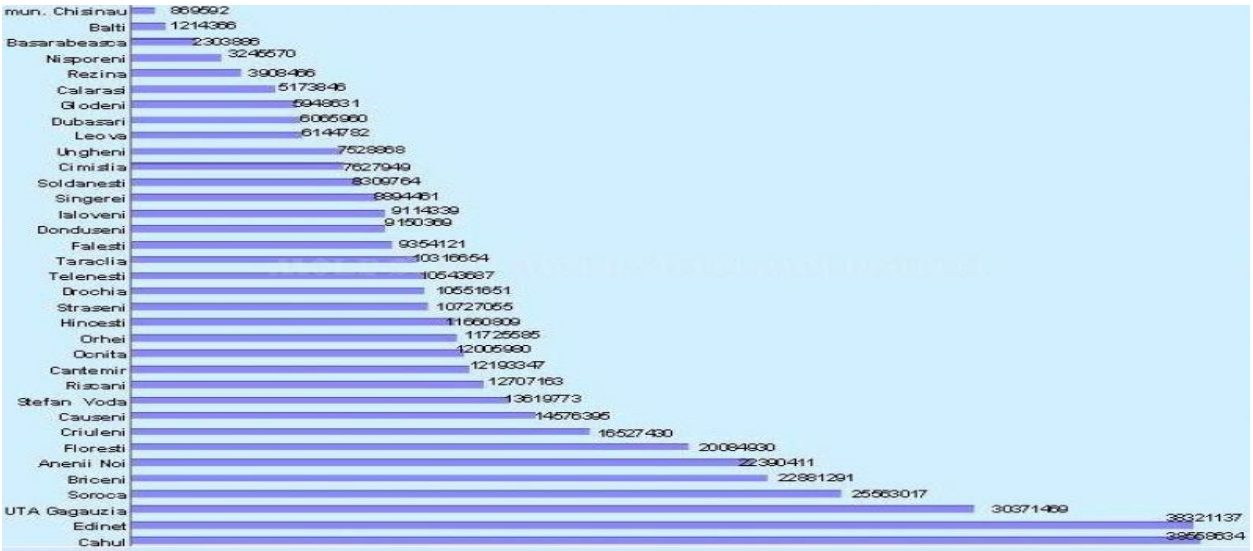

Fig. 4. The repartition of the subsidy fund by rayon (2013)
Source: [1]

According to the Fig. 4, it is revealed that the subsidy fund is not uniform. The leader Rayons in receiving subsidies are: Cahul – 38.56 Million MDL, Edineţ – 38.3 Million MDL, UTAG – 30.4 Million MDL, Soroca – 25.6 Million MDL, Briceni – 22.9 Million MDL.

The territorial repartition of subsidies reveal that the discrepancy between the received subsidies by rayons is very high. This will not be a problem if there will be defined the disadvantaged rayons and the financial resources will be allocated to them.

The competitiveness analysis of the agricultural enterprises from the horticultural sector was performed using the Malmquist productivity index. Thus, using the linear programming duality there was determined the equivalent envelope of competitiveness of the agricultural enterprises, namely:

$$\begin{cases} \min\limits_{\theta,\lambda} \theta \\ -y_i + Y\lambda \geq 0 \\ \theta x_i - X\lambda \geq 0 \\ N1' \cdot \lambda \leq 1 \\ \lambda \geq 0, \end{cases}$$

where:

θ- efficiency parameter;

n – number of farmers

Y – output vector, represented by the income from selling the agricultural products

X – input vector, $n^x 5$ dimensional, given by:

a) Surface of the agricultural lands effectively seeded

b) Costs for labour remuneration, thousands lei

c) Costs for seeds and planting material, thousands lei

d) Costs for chemical and natural fertilizers, thousands lei

e) Costs for auxiliary activities and indirect consumptions, thousands lei

N1 – is vector n- dimensional with components 1;

λ – variable of linear programming problem which would be solved

The competitiveness analysis of the agricultural enterprises was performed on the base of 303 agricultural enterprises with horticultural frontier of production, which performed activity during 2008-2012. The statistical data processing was performed using the DEA program version 2.1.

The obtained results (TFP) for the analyzed period (2009-2012) were grouped into two categories:

(i)Average TFP of enterprises which received subsidies;

(ii)Average TFP of enterprises which didn't receive subsidies.

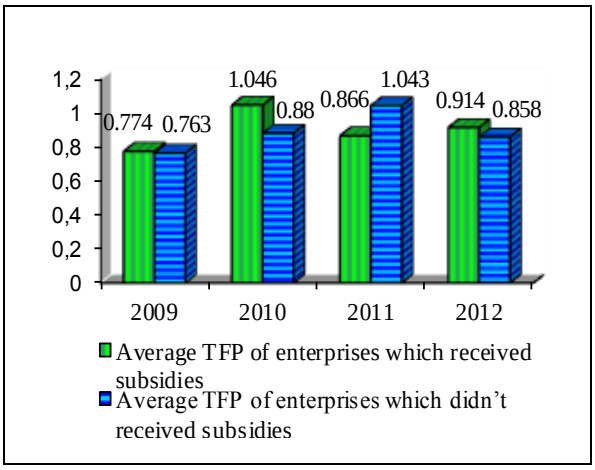

Fig. 5. The competitiveness dynamics of the agricultural enterprises from the horticultural sector depending on subsidies allocation

Source: Elaborated by the author.

Analyzing the competitiveness dynamics of the agricultural enterprises from the horticultural sector of the Republic of Moldova depending on subsidies allocation during 2009-2012, it is revealed that the agricultural enterprises from the horticultural sector which received subsidies are more competitive compared to the enterprises from the horticultural sector which didn't received any subsidies, fact demonstrated by higher values of TFP, namely: in 2012 the average TFP of the agricultural enterprises from the horticultural sector which received subsidies constituted 0.914, which is more by 0.056 compared to the average TFP of the agricultural enterprises from the horticultural sector which didn't received subsidies, where the average TFP constituted 0.858. From the figure 5 we can state that only in 2011 the average TFP of the agricultural enterprises from the horticultural sector which didn't

received subsidies exceeded the average TFP of the agricultural enterprises from the horticultural sector which received subsidies by 0.177. This fact can be explained by the lack of a vigilant control from the state regarding the use by destination of the subsidy fund, which maybe was used in other purposes than those for which they were granted, which influence negatively the competitiveness of the agricultural enterprises from the horticultural sector of the Republic of Moldova.

In the same time, according to Fig. 5, it is revealed that the difference between the average TFP of the enterprises which benefited of subsidies towards the average TFP of the enterprises which didn't received subsidies it is not very big. This fact reflects the inefficiency of the country's subsidy system, where must be performed improvements in terms of the subsidy measures, the selection criteria of the subsidy beneficials, as well as the control of the use of subsidies by the destination they were allocated.

CONCLUSIONS

The scientific researches regarding the role and influence of the subsidies on competitiveness of the agricultural enterprises from the horticultural sector of the Republic of Moldova give us the possibility to formulate the following conclusions:

-Despite the fact that subsidies represent an important source of financing the agricultural enterprises from the Republic of Moldova, from the analyze of the allocated subsidies fund in some of the EU countries - Romania, Hungary, compared to the subsidies fund from the Republic of Moldova, there was stated that the agricultural enterprises from the Republic of Moldova benefit approximately of 24.67 Million Euro or 20 EUR per ha, which is considerably less than in Hungary, were the allocated subsidy fund constitutes 1,904 Million EUR (approximately 450 EUR/ha), or in Romania were the allocated subsidy fund constituted 2,620 Million EUR (approximately 191 EUR/ha). Production costs are too high and the lack of financial resources creates difficulties at increasing the competitiveness of the horticultural products.

-The territorial repartition of subsidies reveals a high discrepancy between the rayons which received subsidies. In order to solve this problem, there must be defined the disadvantaged rayons and elaborated a legal framework of subsidies allocation to this rayons.

-The analyze of the competitiveness dynamics of the agricultural enterprises from the horticultural sector of the Republic of Moldova depending on subsidies allocation during 2009-2012, revealed that the agricultural enterprises from the horticultural sector which received subsidies are more competitive compared to the enterprises from the horticultural sector which didn't received any subsidies, fact demonstrated by higher values of TFP.

-In 2011 the average TFP of the agricultural enterprises from the horticultural sector which didn't received subsidies exceeded the average TFP of the agricultural enterprises from the horticultural sector which received subsidies by 0.177. This fact can be explained by the lack of a vigilant control from the state regarding the use by destination of the subsidy fund, which maybe was used in other purposes than those for which they were granted, which influence negatively the competitiveness of the agricultural enterprises.

-The difference between the average TFP of the enterprises which benefited of subsidies towards the average TFP of the enterprises which didn't received subsidies it is not very big. This fact reflects the inefficiency of the country's subsidy system, where must be performed improvements in terms of the subsidy measures, the selection criteria of the subsidy beneficiaries, as well as the control of the use of subsidies by the destination they were allocated.

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FOREIGN DIRECT INVESTMENTS – A WAY OF REDUCTION SOCIAL EXCLUSION FROM THE RURAL AREAS OF THE REPUBLIC OF MOLDOVA

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Abstract

The rural areas represent a very complex concept which determined lots of opinions regarding its definition and its components. The analyze of the rural areas presume the estimation of the changes which take place within it, both in terms of quantity and in terms of quality. Nowadays rural areas face many problems, namely: low developed infrastructure, lack of acceptable living conditions in rural areas (lack of aqueducts, sewerage, road infrastructure, low quality of medical services, etc.) in this context intensifying the phenomenon of social exclusion. Thus, this scientific research has the main objective to analyze the reduction of the social exclusion from the rural areas of the Republic of Moldova using the Foreign Direct Investments and to show how FDI influence the modernization of the country, in this context reducing the social exclusion.

Key words**:** *Foreign Direct Investments, rural area, social exclusion*

INTRODUCTION

The agri-food sector of the Republic of Moldova plays an important role for the economic development of the country, but which faces with many risks which slow down the development of this sector.

In this context, the poverty and the social exclusion, represent major problems the rural areas are facing, being necessary specific measures to be taken at the state level.

Therefore, appears the necessity to manage more efficiently the social exclusion risk, in order to intensify the process of social inclusion, by development policies and strategies, in order to ensure the economical and social cohesion.

The first definitions regarding the social exclusion, have their origins in France, where Rene Lenoir in 1974 published the research „Les exclus", which considered that „the excluded" represent persons which are not included in the social insurance system of France, namely: disabled persons, veterans, abused children, families with divorced parents and other persons who were marginalized and not found their place in society [6].

At the international level, the term – "exclusion", appeared in Europe at the end of the 80's, beginning of the 90's, when the terms of exclusion and inclusion were introduced in many international treaties at the level of the EU policy, namely: The Maastricht Treaty and its annexed Protocols, in many documents of the EU Parliament and Commission Social Action Programs [5]. Thus, the term of social exclusion, with its introduction in several European policies, has acquired a particular importance and use by several specialists. Some specialists affirm that exclusion is a result of poverty, others affirm that exclusion represent the insufficient participation of the population from the rural areas at the economic and social life of the country.

In this context, at the EU level, was elaborated by Eurostat, the definition of the social exclusion, which represents:"a dynamic process, which is reflected on decreasing levels: some of the disadvantages lead to exclusion, which in its turn, leads to a more unfavorable situation [...] and ends with several multiple and persistent disadvantages. The individuals, the households or other spatial units can be excluded from the access

to resources such as: jobs, health care, education and social or political life. ”

Thus, social exclusion is a consequence of poverty, which is constituted from material and relative parameters. In a society, the individuals live in poverty when their incomes are insufficient and do not give them possibility to ensure a standard of living considered acceptable in the society where they live. The lack of financial resources from the rural areas, determine the persons which live and activate in this medium to face with numerous problems, namely: poorly developed infrastructure, barriers to achieve knowledge, to practice sports, barriers in culture, poor quality of medical care [7].

Nowadays, to reduce the social exclusion are necessary financial resources in order to modernize the rural areas.

The main purpose of this scientific research consists in highlighting the advantages of Foreign Direct Investments (FDI) application in order to reduce poverty and social exclusion from the rural areas.

Foreign direct investments influence positively at the macroeconomic and at microeconomic level, contributing at the economic growth, the creation of new jobs, of new production facilities [4].

In this conditions, the application of FDI represents a solution of modernization the rural area, rural infrastructure development and improving quality of life in rural areas

MATERIALS AND METHODS

In this scientific research, the investigation methods used were the following: quantitative and qualitative analysis; induction and deduction, the tables and charts method; the time series method, the comparison method.

The informational base of this investigation is represented by the scientific literature dedicated to the agrarian economy, social exclusion, FDI; reports offered by the National Bureau of Statistics of Moldova.

RESULTS AND DISCUSSIONS

The agricultural sector of the Republic of Moldova plays an important role for the economy of the country, contributing in the last years to the GDP by 14-15 %.

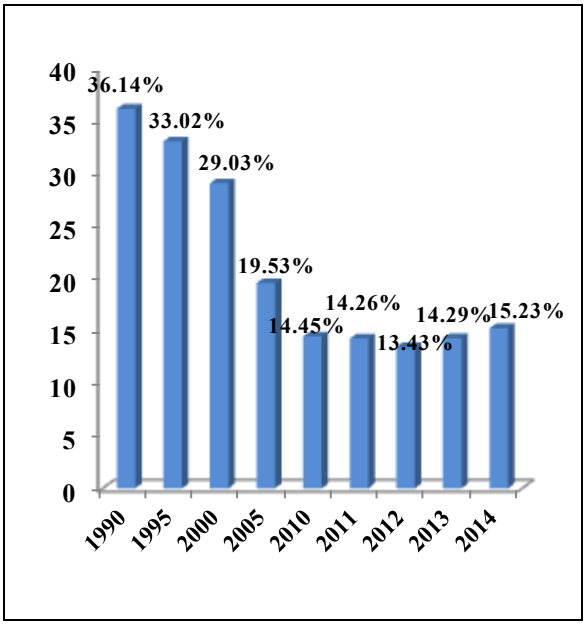

Fig. 1. Contribution of agriculture to GDP during the period 1990-2014 (%)

Source: Elaborated by the author based on the data from NBS.

The analyze of the Fig. 1 reveals that during 1990-2014, the share of agriculture in GDP decreased by 20.91%, from 36.14% in 1990 to 15.23% in 2014. This significant decrease of the share of agriculture in GDP was determined by the decrease of the number of the occupied population from agriculture, caused by the migration outside the country of a high number of citizens, other citizens changed their domain of activity, thus causing the decreasing of the share of agriculture in GDP. According to the data from the Fig. 2, it is revealed that the share of the occupied population from agriculture during 2007-2012 decreased by 6.4%, from 32.8% to 26.4%. In 2013 and 2014 was registered an increase of the share of the occupied population from agriculture from 26.4% in 2012 to 28.8% in 2013, and respectively to 30.5% in 2014.

However, analizing a longer period of time (2001-2014) the dynamics of the employed population in agriculture, based on the data from the National Bureau of Statistics, it is revealed that in 2014 the share of the employed population in agriculture constituted 30.5%, which represent a

decrease by 20.4% compared to 2001, when this indicator constituted 50.9% [2].

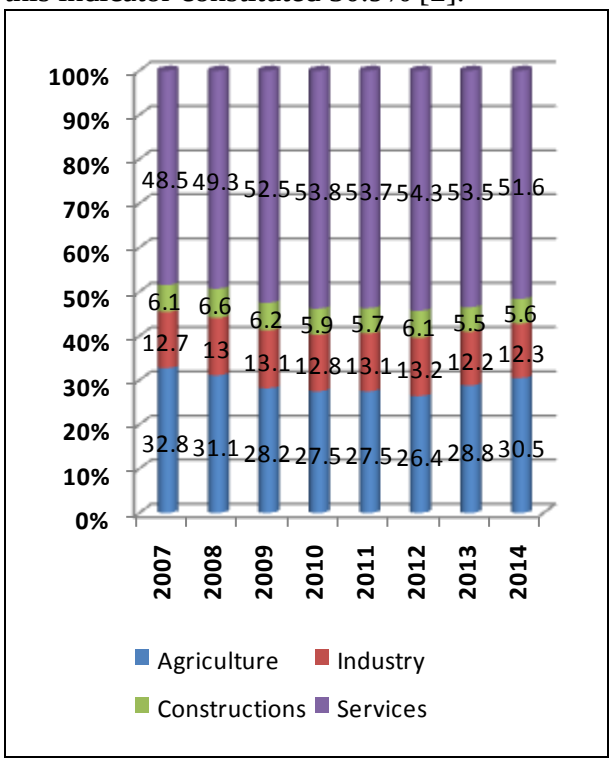

Fig. 2. Distribution of employed population by sectors of economy (%)
Source: Elaborated by the author based on the data from NBS.

Thus, because of the low developed infrastructure (sewage, water supply, roads, medical insurance, education, sports, etc.) as well as because of the low incomes from the agricultural sector, a lot of active population left the village, either migrating outside the country or orienting towards other areas of activity, such as services, which registered an increase of the employed population: from 48.5% in 2007 to 51.6% in 2014.

The massive emigration of the active population from rural areas has determined the aging of the population, its marginalization and respectively, the intensification of the phenomenon of social exclusion, which influences in a negative way the development of the rural areas, the population from rural areas (the vast majority represented by elderly population) being pushed to the margins of society, having no opportunities to fully participate to the social life because of poverty, lack of basic skills and lack of opportunities to long-term learn, or as a result of discrimination.

The social exclusion represents a multidimensional process, which implies and combines multiple factors. The scientific research from this domain tried to synthesize multiple factors of exclusion through the following important dimensions:

-Exclusion from economic life, resulting *in* and *from* the inequality on possession of assets and incomes, as well as reducing the employment opportunities.

-Exclusion from social services, resulting *in* and *from* the inequality of access to a large number of services – education, health, social protection, etc. – generating pronounced effects on the results with human nature (education, health, nutrition)

-Exclusion from politics participation, resulting *in* and *from* the inequality of distribution within the group of the political opportunities and power and the inequal access to justice, liberties and institutions;

-Cultural exclusion, resulting *in* and *from* the differences of recognition (de facto) of the status hierarchy of cultural norms, customs and traditions of different groups.

In this context, from the analyze of the population structure by participation in economic activity by age groups in 2014 (Fig. 3), it is revealed that in the rural areas predominates the population aged between 35-49 years – 57.7%; being followed by the population aged between 50-64 years – 49.8% and respectively the population aged between 25-34 years – 41.0%. Analyzing these data, regarding the population from the rural area, compared to the population from the urban area, it is revealed that on the second position by importance in the urban area predominates the population aged between 25-34 years (56%), while in the rural areas prevails the population aged between 50-64 years (49.8%), thus being noticed that in the rural area is registered an increase of the population aged over 50 years old, this fact being influenced by the low developed infrastructure from the rural areas, lack of acceptable living conditions in rural areas (lack of aqueducts, sewerage, road infrastructure, low quality of medical services, etc.), in this context intensifying the phenomenon of social exclusion in rural areas.

Also, from the analyze of the Fig. 3 it is revealed tha in 2014, in the rural areas the number of population aged over 65 years old, constituted 5.7%, or about 2.01 times higher compared to the urban area, where this indicator constituted 11.5%. At the same time, in the rural areas, in 2014, the number of the population aged between 15-24 years constituted 17.3%, which represents a decrease by 5.4%, compared to the urban area.

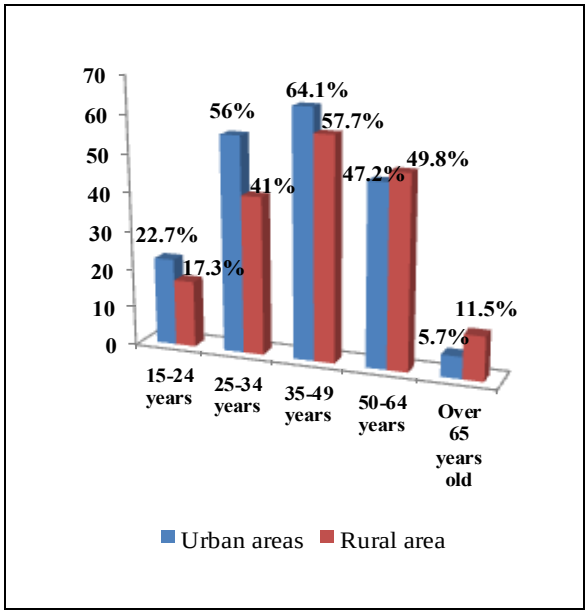

Fig. 3. The population structure by participation in economic activity by age groups in 2014 (%)
Source: Elaborated by the author based on the data from NBS.

In this sense, from the above analyzed data, it is revealed that in rural areas there is a diminution of the number of young population and an increase of the aging population, intensifying the phenomenon of social exclusion. The young population migrates from rural areas either outside the country or in urban areas, changing area of activity from agriculture, to services, trade, industry.

An important factor that determines the migration of population from rural to urban areas is the highest salary, which may be obtained in other fields than agriculture.

Thus from analyze of the Fig. 4, it is revealed that the average monthly salary of an employee from agriculture, forestry, fishing in 2014 constituted about 193 USD, which represents the lowest average monthly salary per national economy compared to other fields of activity such as: industry, where the average monthly salary of an employee in 2014 constituted about 312.6 USD; production and supply of electricity - 516.4 USD; water supply, sewerage, waste management - 309.8 USD; construction - 296.7 USD; trade - 239.9 USD; financial and insurance activities - 534.6 USD [2].

In these conditions, when the salary in agriculture, forestry, fishing is the lowest from economy, it is observed a stagnation of processes from rural area, increasing of the aging population and the lack of desire of young people to work in rural areas.

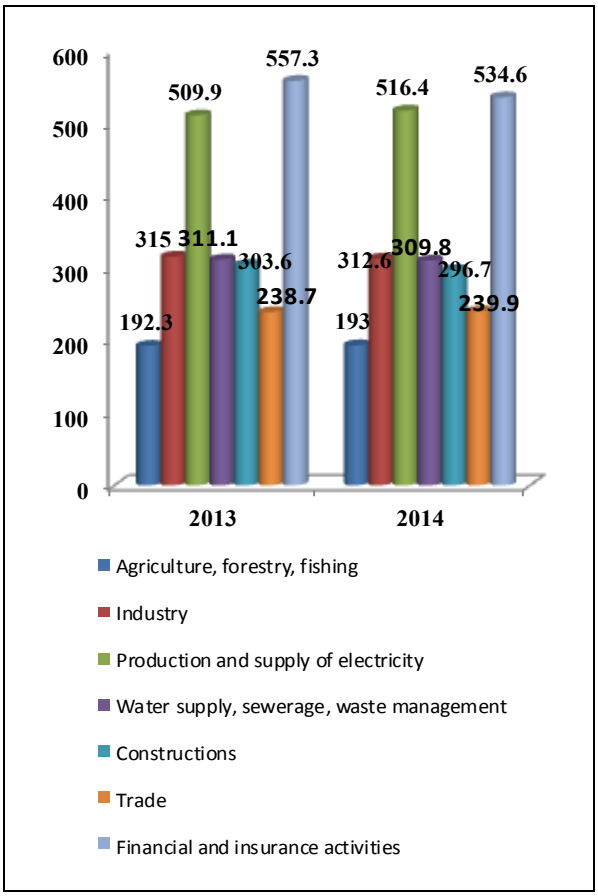

Fig. 4. The average monthly nominal wage earning of an employee in economy by types of activities during 2013-2014, USD
Source: Elaborated by the author based on the data from NBS.

In the context of the above mentioned, in order to increase the attractiveness of the rural areas in front of young people and to reduce the social exclusion an important factor could serve the application of the Foreign Direct Investments.

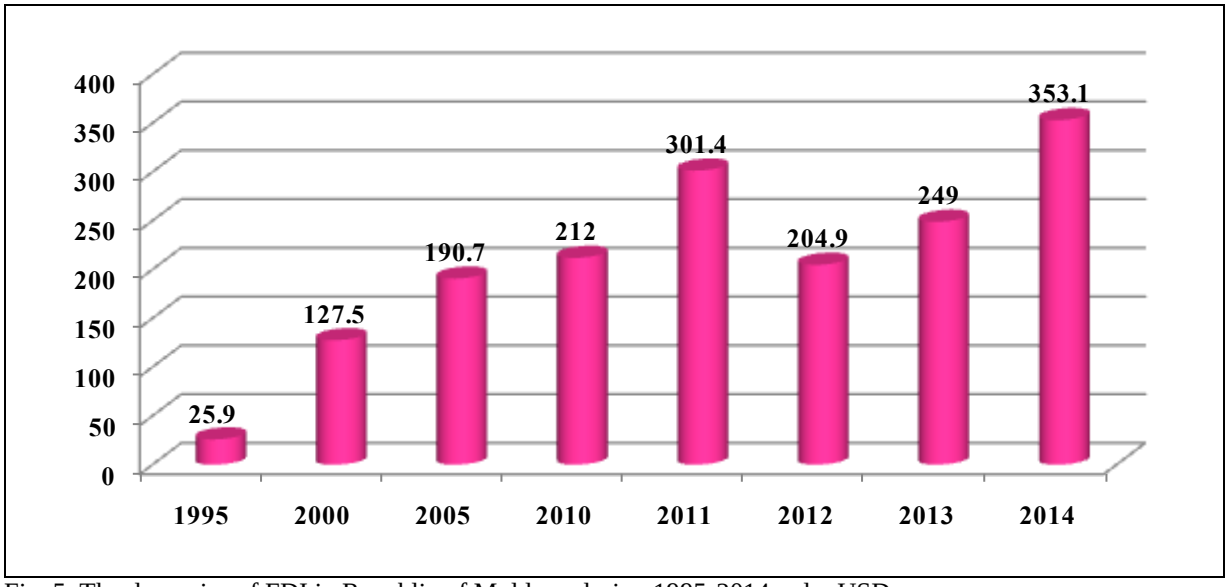

Fig. 5. The dynamics of FDI in Republic of Moldova during 1995-2014, mln. USD
Source: Elaborated by the author based on the data from NBM.

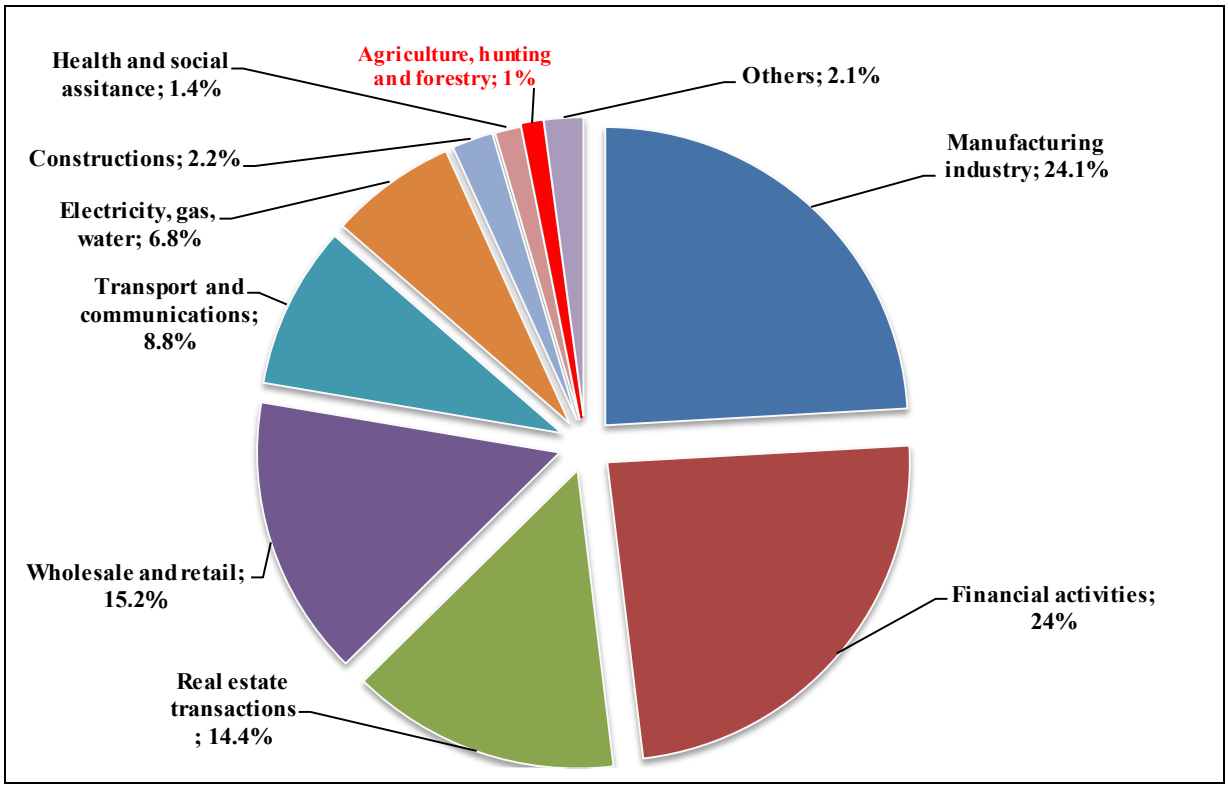

Fig. 6. Foreign Direct Investments distribution by economic activities as of 30.06.2016
Source: Elaborated by the author based on the data from NBM.

From the analyze of the Fig. 5, it is revealed that during 1995-2014 the dynamics of FDI in Republic of Moldova was not uniform, increasing from 25.9 Million USD in 1995 up to 353.1 Million USD in 2014 [1,3]. Although the volume of FDI increased during 1995-2014, however, compared to Romania, which in 2013 attracted 4.108 million. USD or about 16.5 times much more than in Republic of Moldova, the volume of attracted FDI in Republic of Moldova remains very small.

From the analyze of Fig. 6 it is revealed that the biggest volume of FDI as of 30.06.2016 were attracted by the following sectors: manufacturing industry - 24.1%; financial activities - 24%; wholesale and retail - 15.2%;

real estate transactions - 14.4%; transport and communications - 8.8%. In agriculture, hunting and forestry was registered the lowest volume of attracted FDI – 1%.

Thus the sectors which attracted a biggest volume of FDI, registered an increase of the employed population in this sectors (Fig. 2) during 2007-2014, also higher salaries, while because of the low volume of attracted FDI in the agricultural sector – about 1%, the number of the employed population in this sector decreased significantly (from 50% in 2010 to 30.5% in 2014), because of the lack of adequate working conditions in agriculture, the equipments being outdated, requiring urgent investments of capital. In the same time, from the analyze of salaries, it is revealed that the sectors of economy which attracted a higher volume of FDI, registered higher average monthly salaries of the employed persons, while in the agricultural sector were registered the lowest average monthly salaries of the employed persons, which determined the increase of rural poverty, social exclusion, aging population due to migration of young people outside the country or in other areas of activity where they can obtain much higher incomes.

In this sense, in order to reduce the poverty and the social exclusion from the rural areas it is necessary to attract FDI, which will modernize the agricultural sector and will create attractive conditions of work for young people, will develop the infrastructure and will ensure a higher level of life in the rural areas.

CONCLUSIONS

Social exclusion represents a barrier in the development of the agricultural sector.

The lack of acceptable living conditions in the rural areas, namely: low developed infrastructure, lack of adequate medical care, lack of a road infrastructure, low salary from agriculture determine the intensification of the process of social exclusion.

In this context, appears the necessity to modernize the agricultural sector in order to increase the attractiveness of the villages in front of the young people, which massively migrates from the rural areas to the urban area and other domains of activity, different from agriculture.

The reduction of social exclusion from the rural areas can be realized by the FDI allocation, in order to create the necessary conditions (good infrastructure of roads, aqueducts, sewerage, qualitative medical assistance, etc.) of living in the rural areas.

From the performed analysis was determined that those sectors of economy which received the biggest amount of FDI, registered an increase of the occupied population and highest average monthly nominal wage. For example, financial activities attracted one of the highest volume of FDI – 24% (after the manufacturing industry), this determining highest average monthly nominal wage in financial and insurance activities and increasing of the number of population occupied in the services sector.

Diametrically opposed is in the agricultural sector, which attracted the lowest volume of FDI - 1%, and the occupied population in this sector during 2001-2016 decreased practically twice and the average monthly nominal wage earning of an employee in this sector is the lowest from economy, thus increasing the phenomenon of social exclusion determined by low participation of the population from the rural areas at the social and economic life of the country, in the rural areas being registered a process of the aging population.

In the context of the mentioned above, it is necessary to modernize the rural areas, and FDI represent a way of overcoming the existent problems (low developed infrastructure, outdated working equipment, lack of adequate living conditions, etc.)

Thus there must be taken at the state level measures in order to increase the attractiveness of the agricultural sector in front of the foreign investors by organizing of the workshops, conferences, media spots by which will be promoted a positive image of the Republic of Moldova, and especially of the agricultural sector. In the same time, there must be intensified the role of the economic diplomacy, the ambassadors of the country which must promote the agricultural sector in front of foreign investors far beyond the

country borders. Also, it is not necessary to concentrate the attention, at creation of big agricultural enterprises, which will obtain from the first years of activity, high profits, but it will be better to create sometimes small competitive enterprises in the rural areas, which will produce high quality production in order to achieve good sales results, high net profits and progressively to evolve from small enterprises to large enterprises which will be attractive in front of the young people, determining the increasing of the occupied population in the agricultural sector, thus reducing the social exclusion phenomenon.

Therefore, from the performed analysis, the role of FDI in reduction the phenomenon of the social exclusion is very high, being necessary the realization of a high number of actions from the state level, in order to increase the attractiveness of the agricultural sector in front of foreign investors and to ensure the modernization of the rural areas.

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TRENDS IN ROMANIA'S ANIMAL PRODUCTION

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Abstract

The paper aimed to analyze the trends in animal production in Romania and identify its position among the EU countries and make a few recommendations to improve the statement of the sector. Animal production declined both at the EU level and in Romania. The livestock decline in cattle and pigs resulted in meat and milk production as well as consumption declined. Poultry meat and mutton and goat meat as well as honey production increased. Food consumption and self sufficiency rate are still lower compared to the EU average and their level in the most important producing countries of products of animal origin. The achievements in animal production in Romania are below its potential to produce meat and milk and food security could not be assured to the population. A clear strategy and important measures are needed to increase milk and meat production: a higher forage production, a balanced feeding to animals, the use of high breeding value animals, the implementation of modern technologies, a high training level to farmers and units managers, a higher productivity and product quality, as well as farm competitiveness, creation of associative forms. A sustainable agriculture and mainly animal production could be developed only in intensive farm systems, but also in the mountain and hilly areas by small farms which could use the pastures and meadows. As a final conclusion, the future strategy must pay more attention to animal production and create a balance with crop production. Otherwise, Romania's agro-food market will always depend on imports, affecting local producers.

Key words**:** *animal production, livestock, holding size, trends, Romania, EU selected countries*

INTRODUCTION

The market economy is an economy of competition, price liberalization, profit and bankruptcy, risk and uncertainty, of recession and growth, prosperity and poverty, aspects that always are linked of money and efficiency (Mayer *et al.*, 1993)[20].

Romania has passed to the market economy after 1990, and this determined continuous changes of the juridical, economical, financial and social factors in the whole economy in order to the new challenges.

Agriculture is an important branch of Romania's economy. It assures food for population, raw materials for processing industry and agro-food products for export (Grigoras, 2016) [15].

Agriculture contribution to GDP accounts for 5.6 % (Cristea et al., 2015) [7]. It is also an important source of jobs for the population living in the rural areas. About 45 % of Romania's population lives in the rural space, of which 30 % is employed in agriculture. However, the key problems related to work force in agriculture are populating aging, the low training level, the reduced number of young farmers, as the young people leave the villages and the communes going to cities looking for better paid jobs. (Balan, 2015) [4].

Agriculture is characterized by the land fragmentation, and the huge number of holdings, most of them being subsistence and semi-subsistence farms with a low technical endowment and productivity. Between Romania and other EU countries there is a technological gap, a weak access to the EU funds, the shortage of human resources and the market disfunction. Since 1990, Romanian agriculture has passed from a few thousands of agricultural large state units and cooperatives to millions of small private holdings lacked of endowment, capital, labor and efficiency (Sterghiu *et al*., 2014, Manescu *et al*., 2016) [54, 19].

Important changes appeared in the contribution of crop and animal production to

the value of agricultural production. From 62 % animal production in the agricultural production value before 1990, at present animal production contributes by only 32.6 % to agricultural production output.

Animal production is an important branch of agriculture as it transform the raw materials from crop production into high value added products like meat and meat products, milk and dairy products, which are required to assure the needs of protein and essential amino-acids, fats, vitamins and minerals in human diet.

Animal production have been has been developed in Europe during the last five centuries contributing to the modern civilization. From here, it was extended in the world and at present it is facing a huge competition among the main " actors" playing in animal production and international trade with animals and products of animal origin. For this reason, animal production could be considered "the backbone" of agriculture in the developed countries (Draganescu, 2013a, 2013b, 2014) [9,10, 11].

Animal growing is a traditional activity in Romania' rural areas assuring the population consumption needs, sustainable farming and stability. Animals are a source of essential food for human diet like milk and meat, but also of skins, natural fertilizer and biogas (Luca, 2015) [17].

Animal Sector of Romania's agriculture has been facing deep changes regarding the number of farms, farm size in terms of number of animals per holding, livestock evolution, milk yield, milk production, average weight of animals at slaughter, carcass weight, meat production, egg per hen, egg production, bee families, honey yield and production, animal products quality, producer's price and contribution of animal sector to Romania's trade with products of animal origin, farm management, economic efficiency in terms of gross margin, farmer's income and profit, marketing of agricultural products,

The major problems animal sector is facing in Romania are: the land fragmentation into small plots, the small farm size, the old technical endowment, low productivity, the lack of competitiveness and high self-consumption (Sandu, 2015, Sandu et al., 2015, Simtion, 2015) [48, 49, 50].

Important changes appeared in the ratio between production and consumption, due to the demographic evolution of Romania's population, crop and animal production dynamics, participation to international trade. Also, consumer behavior has changed being more oriented to a healthier food.

Despite that important EU fund were allotted to Romania they haven't been entirely used loosing the opportunity to help the farmers (Stanciu, 2014) [47].

In this context, the objective of the paper was to identify the main trends in animal production in Romania in the period 2007-2015 and establish Romania's position among the EU countries which are important producers of products of animal origin.

MATERIALS AND METHODS

The paper is based on a large information collected from various source mainly the important publication regarding livestock and animal production in the EU and Romania. the author structured the information and create a logical scheme of the paper approaching the following aspects: agriculture contribution to GDP, agricultural production value and its structure by crop and animal production, the evolution of livestock (cattle, dairy cows, pigs, sheep and goats, poultry, bee families), number of farms, animal production (milk, beef and veal, pork, mutton and goat meat, poultry meat, eggs, honey), consumption of products of animal origin and self-sufficiency.

The comparison regarding the situation in Romania was done with the EU average almost for each indicator and also with the most important EU producing countries: France, Germany, Italy, Spain, Netherlands, Poland, United Kingdom.

The data are presented in comparison especially for the year 2007 and 2014 or 2015, and for the EU with the data displayed by EU Commission for Agriculture in its Report 2015 for the year 2012.

RESULTS AND DISCUSSIONS

Romania is an important EU country coming on the 6th position with a population of 20.096 million inhabitants (4%) after Germany (81 Mil., 16 %), France (65 Mil., 13 %), Italy (60 Mil., 12 %), Spain (46 Mil., 9 %), and Poland (38 Mil., 7.5 %).

Regarding GDP per inhabitant, Romania comes on the 25th position with 12,600 Euro/capita, much less than the EU average (25,200 Euro/capita) [1].

The contribution of agriculture to GDP. The development of agriculture, forestry and fishing in the last decades is obviously important for Romania, a country with a favorable geographical position, good soil and climate conditions for achieving agricultural products.

In the analyzed period, the GDP produced in agriculture, forestry and fishing increased by 64.85 % from 23.9 Lei Billion, current prices in 2007 to 39.40 Lei Billion, current prices in 2015. Taking into account that Romania's GDP increased by 69.47 % from 416 Lei Billion in 2007 to 705 Lei Billion in 2015, the contribution of agriculture, forestry and fishing to Romania's GDP remained relatively constant from 5.8 % in 2007 to 5.6 % in 2015, reflecting just a slight decrease (Table 1).

Table 1.Agriculture, forestry and fishing contribution to Romania's GDP in 2007 and 2015 (Lei Billion current prices)

	2007	2015	2015/2007 %
GDP produced in agriculture, forestry and fishing	23.9	39.4	164.85
Romania's GDP	416	705	169.47
Share of agriculture, forestry and fishing in Romania's GDP (%)	5.8	5.6	-

Source: Own calculation based on NIS Database, 2016 [22].

GDP produced in agriculture is influenced by a series of factors such as: local geographical conditions, technical endowment, fixed assets and investment, labor force and productivity, employment and unemployment (Popescu, 2015c, Popescu *et al*, 2015) [40, 45].

In the EU, the contribution of agriculture to the EU GDP is just 1.2 % in average. Romania comes on the 1st position with 4.7 % being followed, in the decreasing order by Bulgaria with 4.2 %. In the EU countries, where services and industry are well developed, there is a lower share of agriculture in GDP. For instance: Germany 0.6 %, France 1.6 %, Netherlands 1.4 %, Italy 1.6 %, Spain 2.1 %, Poland 2.4 % [1].

The contribution of agriculture to GDP is deeply determined by fixed assets in agriculture and also it is closely linked to employment in agriculture.(Popescu, 2015c, Popescu *et al*., 2015) [40, 45].

The value of agricultural production increased by 56.2 % from 47,699.9 Lei Million current prices in 2014 (Table 2).

From this point of view with 14.4 Euro Billion in 2012, Romania came on the 7th position in the EU after France (77 Euro Bil.), Germany (54 Euro Bil.), Italy (48 Euro Bil.), Spain (42 Euro Bil.), Netherlands (26 Euro Bil.) and Poland (23 Euro Bil.) [1].

Table 2. Agricultural production value in Romania in 2007 and 2014 (Lei Million current prices)

	2007		2014		2014/ 2007 %
	Lei Million	%	Lei Million	%	
Agric. prod. value	47,699.9	100.0	74,524	100.0	156.2
Crop prod. value	28,723.4	60.2	49,058	65.8	170.7
Animal prod. value	18,291.6	38.3	24,481	32.8	133.8
Service value	684.8	1.5	984	1.4	143.6

Source: Own calculation based on NIS Database, 2016 [22].

The value of crop and animal production. While crop production increased by 70.7 % from 18.2 Lei Billion in 2007 to 49 Lei Billion in 2014, animal production value increased by 33.8 % from 18.2 Lei Billion in

2007 to 24.4 Lei Billion current prices in 2014 (Table 2).

The key "actors" growing animals and with the highest share in animal production in the EU are France, Spain, Germany, Unites Kingdom, Italy, Netherlands, Poland and Denmark (Bazbanela, 2015, Luca, 2015a) [5, 17].

Romania comes on the 8th position for the output of crop production after France, Germany, Italy, Spain, Netherlands and Poland, and also on the 8th position for the output of animal production after Germany, France, Italy, Spain, Netherlands and Poland (Table 3).

Table 3. Agricultural production value in the EU and selected EU countries in 2012 (Mio. Eur.)

	EU-27	Romania	Germany	Italy	France	Spain	Netherlands	Poland	United Kingdom
Agricultural production	390,500	13,348	55,579	46,678	73,025	41,423	25,967	22,518	28,220
Crop production	208,015	9,100	27,682	24,987	43,900	24,907	12,723	11,700	10,900
Livestock production	163,610	4,112	26,060	16,666	25,475	16,090	10,381	10,341	16,006

Source: [1]

However, the EU Report on agriculture 2013 mentioned that compared to 2005=100, in 2012, Romania registered an output of agriculture industry of 85.9 %, meaning 14.1 % less than in 2005. And this is among the highest declines, Romania being followed only by Cyprus with 73.1 % and Malta with 70 %. In the EU selected countries, the declines were smaller, except the growth recorded in Spain (+12.3 %), Netherlands (+8.3%0, Poland (+9.7%) and United Kingdom (+1.9%) (Fig.1.)

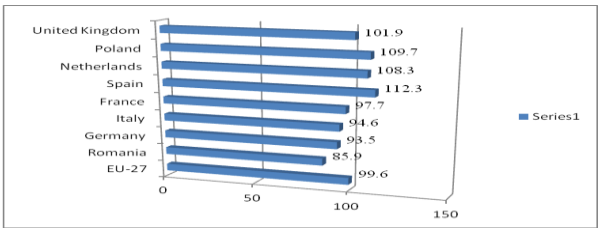

Fig.1.Output of agricultural industry in the selected EU countries in 2012 (2005=100)

Source: Own design based on [1]

The share of animal production in the value of agricultural production. The highest contribution to agricultural production is given by crop production. The weight of crop production in agricultural production in Romania increased from 60.2 % in 2007 to 65.8 % in 2014. The share of animal production declined from 38.3 % in 2007 to 32.8 % in 2014 (Table 2).

The share of products of animal origin in the EU agricultural production and in the selected EU countries is presented in Table 4. At the EU level, in 2012, the products of animal origin contributed by 40.3 % to animal production value. In Romania, this contribution was 28.2 % compared to 46.5 % in Germany, 39.9 % in Poland, 37.4 % in Spain, 34.2 % in France and 33.3 % in Italy (Table 4).

Table 4. The share of products in agricultural production in the EU-27 and the EU selected countries (%)

	EU-27	Romania	Germany	Italy	France	Spain	Netherlands
Milk	13.1	8.9	18.2	10.4	11.1	6,1	16.1
Cattle	8.5	2.2	7.7	7.6	11.0	6.0	6.2
Pigs	9.6	6.6	14.1	6.3	4.5	14.2	11.5
Sheep and goats	1.4	1.5	0.4	0.4	1.1	2.2	0.6
Eggs	2.5	6.1	1.5	3.0	1.7	2.9	2.4
Poultry	5.2	2.9	4.6	5.6	4.8	6.0	3.1
Total	40.3	28.2	46.5	33.3	34.2	37.4	39.9

Source: [1]

Milk, cattle and pigs represent about 75 % of the EU animal production value in the EU. The main producers of animal products are France, Germany, Italy and Spain [2].

The comparative advantage or disadvantage in the production and trade of a country for a particular good is reflected in the economic and social profitability (Gorton et al., 2015) [14].

The output of animal industry in Romania and some selected EU countries is presented in Table 5. The figures reflect that the output of animal industry in Romania is smaller than in the selected EU countries with a high development of animal sector.

About 75 % of the EU animal production value is represented by milk, cattle and pigs (Luca, 2015a) [17].

In 2012, Romania came on the 15th position for cattle output accounting for 263 Mio Euro, on the 10th position for milk output for 1,208 Mio Euro, on the 10th position for pig output for 904 Mio Euro, and on the 9th position for eggs and poultry output for 1,249 Mio Euro (Table 5).

Table 5.The output of animal industry in the EU-27 and the selected EU countries in 2012 (Mio Euro)

	EU-27	Romania	Germany	Italy	France	Spain	Netherlands	Poland	United Kingdom
Cattle	31,800	263	4.093	3,543	7,393	2,244	1,561	1,237	4,480
Milk	51,465	1,208	9,721	4,950	8,589	2,572	4,174	3,319	4,520
Pigs	37,768	904	8,010	2,983	3,339	6,063	2,934	2,633	1,395
Eggs and poultry	30,731	1,249	3,555	4,038	4,801	3,823	1,315	3,041	3,385

Source: [1]

On the first positions, in the decreasing order, are situated ***for cattle***: France, United Kingdom, Germany, Italy, Spain, Netherlands, Poland, ***for milk:*** Germany, France, Italy, United Kingdom, Netherlands, Poland and Spain, Denmark and Ireland, ***for pigs***: Germany, Spain, France, Italy, Netherlands, Poland, United Kingdom, Denmark and Belgium, and ***for eggs and poultry:*** France, Italy, Spain, Germany, United Kingdom, Poland, Netherlands and Austria.

Agricultural holdings raising animals in Romania. Romania has the highest number of holdings growing animals in the EU. However, their number decreases year by year, having a general descending trend which is a positive aspect in relation to the average farm size in terms of number of animals/holding.

In 2010, in Romania, there were 728,020 cattle holdings, by 31.82 % less than in 2007, 1,655,578 pig holdings by 2.48 % less than in 2007 and 272,775 sheep holdings by 30.16 5 less than in 2007 (Table 6).

Table 6.Number of agricultural holdings in Romania in 2007 and 2010

	2007	2010	2010/2007 %
Cattle	1,067,726	728,020	68.18
Pigs	1,697,575	1,655,578	97.52
Sheep	390,562	272,775	69.84

Source: NIS Data base, 2016

The average size of stocks/holding and the number of holdings in Romania compared to the selected EU countries is presented in Table 7.

The figures from this table reflect that Romania has the smallest farm size in terms of 2.7 cattle/holding, 1.8 dairy cow/holding and 1.9 pigs/holding and also the highest number of holdings in the EU: 728 thousands cattle holdings, 625 thousands dairy farms and 1,656 thousands pig holdings.

The dynamics of livestock in Romania. The general trend of livestock is a decreasing one for cattle, dairy cows, buffaloes and heifers, for pigs and poultry. Exception is made by sheep, goats and bee families whose number has a continuous increasing trend in the period 2007-2015.

In 2015, cattle livestock accounted for 2,092

thousand heads by 25.79 % less than in 2007, the dairy cows, buffaloes and heifers numbered 1,311 thousand heads by 24.31 % less than in 2007, the pigs accounted for 4,926 thousand heads by 24.97 % less than in 2007 (Draghici *et al*., 2014) [12].

But, in 2015, the sheep and goats number reached 11,250 thousand heads by 32.83 % more than in 2007 and the number of bee families accounted for 2,800 thousands, by 195 % more than in 2007 (Table 8).

Table 7. Average size of stocks/holdings and the number of holdings by species in Romania, the EU and the selected EU countries in 2010

	Cattle		Dairy cows		Pigs	
	Average size of stocks per farm	No. of holdings x 1,000	Average size of stocks per farm	No. of holdings x 1,000	Average size of stocks per farm	No. of holdings x 1,000
EU-27	34.2	2,574	13.7	1,701	22.6	2,755
Romania	2.7	728	1.8	625	1.9	1,656
Germany	86.5	145	46.4	90	127.6	60
Italy	47.3	126	35.2	52	42.9	26
France	97.7	200	45.0	83	45	24
Spain	38.8	112	30.9	29	100.8	70
Netherlands	121.1	33	74.6	20	243	7
Poland	28.6	514	5.9	426	16.6	388
United Kingdom	117.3	86	78.3	24	32	10
Denmark					506.1	5
Belgium					202.1	6

Source: [1]

Table 8. Livestock in Romania in 2007 and 2015 (Thousand heads)

	2007	2015	2015/ 2007 %
Cattle	2,819	2,092	74.21
Dairy cows, buffaloes and heifers	1,732	1,311	75.69
Pigs	6,565	4,926	75.03
Sheep and goats	9,334	11,250	120.52
Poultry	82,036	78,648	95.87
Bee families	982	2,800	285.13

Source: Own calculation based on NIS Data base, 2016

The dynamics of animal production in Romania. As a result of the decline in the livestock, animal production carried out a general decreasing trend in meat production in equivalent live weight (-4.8 %) and milk production (-19.5 %) and a general increasing trend in poultry meat production (+34.1 %) and honey production (+66.3 %), while in mutton and goat meat production and eggs production the situation remained stabled in 2015 compared to 2007 (Table 9).

Table 9. Animal production in Romania in 2007 and 2015

	MU	2007	2015	2015/ 2007 %
Total meat	Thousand tons live weight	1,503	1,431	95.2
Beef	Thousand tons live weight	333	200	60.0
Pork	Thousand tons live weight	642	562	87.5
Mutton and goat	Thousand tons live weight	110	110	100.0
Poultry	Thousand tons live weight	416	558	134.1
Milk	Thousand hl	61,048	49,156	80.5
Eggs	Million pieces	6,522	6,555	100.5
Honey	Tons	16,767	27,892	166.3

Source: Own calculation based on NIS Data base, 2016

Meat production declined because of the reduction in cattle but also in pig number. But, it was positively sustained by the increased number of sheep and goats and poultry (Dincu, 2014, Stanciu, 2015, Sterghiu

et al.,2014, Niculae *et al.,* 2015) [8, 53, 55, 21].

The main problems the meat production is facing are the following ones: the uncorresponding breed structure and the lack of specialized breeds for meat especially in cattle, the unbalanced feeding during the fattening period, the low live weight at slaughter and low carcass weight and high production and processing costs, the lack of farmers' associative forms and financial resources (Soare, 2015) [51].

Milk production went down due to the decline in cattle and mainly in dairy cows, buffaloes and heifers, the low yield and the invasion of imported dairy products on the domestic market which has deeply affected the local producers (Popescu, 2011, Stanciu, 2014, Popescu, 2015a, Grigoras, 2016) [32, 52, 38, 15].

Also, in milk quality is still a problems in some farms, and milk collection as well (Popescu *et al.*, 2009) [44].

Also, the dairy farms have a small size of about 1.8 cow/farm in average, but also there are a few farms with over 50 heads/farm. The technical endowment and labor resources determine the efficiency in terms of variable costs and gross margin. The higher the number of dairy cows, and the higher the yield/cow, the higher gross margin (Popescu, 2006, 2010a) [28, 30].

An increased milk yield and milk production in a dairy farm result in a lower production cost/ kg milk and higher marketed milk (Popescu, 2014) [37].

Pork production is facing the decline in pigs, because of the lack of piglets for fattening in the market and the small price per live weight at slaughter. However, pork dominate the meat market in Romania as pork is a traditional food for centuries (Popescu, 2009) [29].

Pork is also important in many EU countries like Denmark, Spain, Poland etc (Popescu, 2015d) [41].

Poultry production in terms of meat and eggs had a positive evolution grace to the flexibility of producers to adapt to the EU market requirements and long tradition in this high efficient sector of agriculture (Pirvutoiu *et al*., 2012a, 2012b) [24, 25].

Sheep and goat is another traditional occupation of the rural population living mainly in the mountains and hilly areas, reflecting its existence for thousands of years, its stability and cohesion in the Carpathian, Danube and Pontic region (Dreve *et al*., 2016) [13].

Sheep and goats contribute to milk production with high quality milk and also are an important source of tasty and high digestible meat compared to beef and pork.

Sheep and goats growing is favored by the existence of pastures and meadows where meat hybrids could be used to produce more meat for the domestic market and also for the Arabian countries where the supply is unsufficient (Pirvutoiu *et al*., 2013a, Dreve *et al*, 2016 [26, 13].

Poultry farming is well developed in industrialized units but also in small farms and is bale to cover the domestic market and assure exports. Poultry farming mainly broilers fattening is convenient for farmers for its short period, high production gain, low production cost and good price (Sabau *et al.*, 2009) [46].

Many of the companies are integrated holdings from the first day chickens till the final products: chicken carcass and carcass parts. Consumer's preference is more and more oriented to chicken and also to meat which have a high content of protein, low cholesterol, and a convenient price on the retail shelves (Pirvutoiu *et al*., 2013b) [27].

Honey production has recorded an ascendant trend due to the growth in the number of bee families and bee hives, the average honey yield/bee family and apiary. More and more apiarist keep more bee families being aware that profitability of an apiary is assured by over 50 and mainly over 100 bee families (Popescu, 2011, 2012b, 2012a) [32, 33, 34].

The high quality of the Romanian honey makes it required for export mainly in the Western European countries. Romania's honey trade is an efficient part of its external trade, assuring a positive honey balance, because Romania is a net exporter of honey (Popescu, 2010b, 2013a, Pirvutoiu *et al*., 2011) [31, 35, 23].

Honey consumption is low in Romania, just about 0.5 kg/inhabitant per year, smaller compared to the Western countries.

Honey is consumed by Romanians for its medical benefits, dietary quality, ethical character and suitability with food consumption pattern (Arvanitoyanis *et al*., 2006) [3].

In Romania it is also another branch of animal production "silk worm rearing", which has remained in small family farms as an activity for additional income and for producing handicrafts.

Romania was among the main producers of silk cocoons and silk in Europe besides Italy, Spain, and Bulgaria. (Popescu, 2013b, Popescu *et al*., 2008a, 2008b) [36, 42,.43].

Research experiments pointed out that integrated sericicultural family farms are viable and profitable in Romania for producing silk worm eggs, silk and handicrafts.

Beef, veal, pork poultry meat and sheep and goat meat contribute by about 25 % to the EU agricultural production value, because about 50 % of the EU holdings raise animals. However, meat production as well as meat consumption in the EU registered a slight decline because of the lower beef and pork offer (Tluczak, 2015) [56].

Animal production per inhabitant in Romania. As a result of the evolution of animal production and population in the period 2007-2015, the animal production per inhabitant declined from 72 kg meat in 2007 to 67 kg in 2015 (-7%), from 292.3 l milk/inhabitant in 2007 to 248 l in 2015 (-15.16%), only in case of eggs the production increased from 312 pieces/capita in 2007 to 320 pieces in 2015 (+2.56 %) (Table 10).

Table 10. Animal production per inhabitant in Romania in 2007 and 2015

	MU	2007	2015	2015/2007 %
Meat	Kg/capita	72	67	93.05
Milk	Liters/capita	292.3	248	84.84
Eggs	Pieces/capita	312	320	102.56

Source: Own calculation based on NIS Data base, 2016 [22].

Consumption of meat, milk and eggs in Romania compared to the selected EU countries. Meat, milk, and egg consumption per inhabitant declined from 2007 to 2014, explained by a new orientation of consumers to vegetables and fruits, and mainly due to the high market price and low purchasing power.(Table 11).

The consumption growth depends on consumers' preferences, consumption pattern, product quality and price, offer availability and the purchasing power of the population (Grodea, 2002) [16], (Constandache *et al*., 2014) [6].

Beef consumption declined by 22.6 % from 8.3 kg/capita in 2007 to 5.6 kg/capita in 2014.

While beef declined in the Romanians' consumption due to the high price, pork is still on the highest position, despite its share recorded a slight decline as people became aware of its content in cholesterol (Constandache *et al*., 2014) [6].

Pork consumption is on the top, followed by chicken meat, beef, mutton, lamb and goat meat.

Pork consumption registered a decline from 32.4 kg in 2007 to 29 kg in 2014 and self - sufficiency in pork accounts for about 71 % (Luca, 2015b) [18].

Poultry meat consumption increased and reached about 20.7 kg/capita in 2007, and remained relatively at a constant level of about 20 kg (Pirvutoiu *et al*., 2013b) [27].

Milk and dairy products consumption in milk equivalent 1.5 % declined by 6.4 % from 268.6 kg/capita in 2007 to 251.5 kg/capita in 2014. But it is still important for various categories like children, young and old people, but also for adults (Popescu, 2015b) [39].

Eggs consumption decreased by 10.9 % from 276 pieces in 2007 to 246 pieces in 2014 (Table 11).

The consumption of meat, milk and eggs per inhabitant in Romania is lower compared to other EU average: 39.7 kg/capita pork, 14.8 kg/capita beef and veal, 24 kg poultry meat, but a little higher for mutton and goat meat 2.1 (Table 12).

Table 11. Consumption of products of animal origin per inhabitant in Romania in 1990, 2007 and 2014 (kg)

	1990	2007	2014	2014/ 2007 %
Meat and meat preparation in fresh meat equivalent	56.9	64.7	57.8	89.3
Beef	10.9	8.3	5.6	67.4
Pork	25.1	32.4	29	89.5
Sheep and goat meat	3.1	2.6	2.3	88.4
Poultry meat	17.3	20.7	20.1	97.1
Other sorts of meat	0.5	0.7	0.8	114.2
Milk and dairy products in milk equivalent 1.5%	180.5	268.6	251.5	93.6
Eggs	246	276	246	89.1
Fish and fish preparations	5.1	3.9	4.9	125.6

Source: Own calculations based on NIS Data base, 2016 [22].

Table 12.Gross internal meat production, meat consumption and self-sufficiency in the EU in 2012

	Gross internal meat production		Meat consumption		Self-sufficiency (%)
	%	1,000 tons	%	kg/ capita	
Pig meat	49.4	22,400	47.0	39.7	111.1
Beef and veal	16.3	7,387	17.5	14.8	101.4
Poultry meat	27.8	12,614	28.4	24	104.1
Sheep and goat meat	2.0	918	2.5	2.1	87.3
Total	95.6	43,319	95.4	80.6	-
Edible offals	4.4	2,008	4.6	3.9	-
Total	100.0	45,326	100.0	84.5	-

Source: [1]

Meat self-sufficiency is lower in Romania compared to the EU average and with the self-sufficiency in the selected EU countries (Table 13).

Table 13. Meat Self-sufficiency in Romania compared to other EU selected countries, 2010 (%)

	Total meat	Beef and veal	Pork	Poultry meat	Sheep and goat meat
EU	-	101.4	111.1	104.1	87.3
Romania	77	111	60	89	143
Germany	113	119	110	101	55
Italy	76	59	67	109	45
France	105	105	106	114	46

Source: [1]

CONCLUSIONS

Animal production is an important sub branch of the agricultural production in the EU and Romania. However, animal production registered a decline both at the EU level and in Romania.

The cattle and pig number decreased, while poultry, sheep and goat livestock and bee families increased in Romania. As a result both meat and milk production declined, while poultry meat and mutton and goat meat as well as honey production increased.

The purchasing power and retail price of meat and milk determined consumers to reduce consumption. Food consumption is still lower compared to meat and milk consumption in the EU.

The self-sufficiency rate is also lower than the EU average and in the most important EU countries producing products of animal origin. Therefore, the achievements in animal production in Romania are below its potential to produce meat and milk. The demand/offer ratio is not balanced, so that imports of milk and dairy products as well as of meat and meat products are justified.

With a contribution of 32.8 % of animal production to agricultural product value, Romania' s agriculture characterizes a country with a high risk for assuring food security of the population.

Food security of a population is assured by the availability and stability of food supply. In order to diminish or eliminate the vulnerability of Romania in terms of food security, animal production must grow and

become the key sector in agriculture. To increase milk and meat production it is needed to develop forage production, to assure a balanced feeding to animals, to create a balance breed structure and hybrids for meat production using high breeding value animals. Modern technologies and trained labor are required to increase productivity and product quality, as well as farm competitiveness.

Beef could be a niche for Romania to cover the EU market needs. For this purpose, farmers must join their forces into associations for fattening using crossbreds with high meat production potential. The EU funds are an opportunity which must not be ignored. The Programme Horizon 2014-2010 is of a high importance for the Romanian agriculture and especially for animal production to assure the financial support for creating nee farms or modernizing the existent ones, and for the acquisition of high genetic value biological material.

The associative forms could allow lower input prices for equipment, the use of modern technologies, a better marketing of the products of animal origin, a more flexibloe management to the meet the market fluctuations.

A sustainable agriculture and mainly animal production could be developed only in intensive farm systems, but also in the mountain and hilly areas by small farms which could use the pastures and meadows.

As a final conclusion, the future strategy must pay more attention to animal production and create a balance with crop production. Otherwise, Romania's agro-food market will always depend on imports, affecting local producers.

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DETERMINING THE NUMBER OF OCCUPIED PERSONS, NEEDED BY DAIRY CATTLE FARMS IN BULGARIA

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Abstract

The aim of the study is to determine the number of occupied persons, needed by dairy cattle farms in Bulgaria. The information was collected through interview and the number of cows in the main herd, decares of arable land (own and rented) and the number of occupied persons, directly involved in the production process, were analyzed. A regression model was constructed with a confidence level of 95% using the Ordinary Least Squares Method. The regression model is as follows: $L = C_1.A + C_2.D + C + a$, where: L is natural logarithm of the the number of occupied persons, needed by dairy cattle farms; A is natural logarithm of the decares of arable land; D is natural logarithm of the number of dairy cows; C_1 and C_2 are the coefficients of the independent variables; C is a constant; a is an error of the regression. By replacing the constant and the coefficients with their theoretical values, it is obtained the following model: L = 0.067.A + 0.596.D - 1.386. The number of occupied persons could vary depending on the type of crops, the technology and the intensification of the production process. With the increase in the number of cows in the main herd and the amount of arable land, the number of occupied persons needed also increase. The constant in the regression model is a negative number (-1.386), which could be explained by better utilization of the working time: a major part of the occupied persons can perform activities related to dairy farming, and can also be included in forage production. It could be concluded that for a farm with 20 cows and 20 decares of arable land, the theoretical number of occupied persons is 1.8. A farm with 100 cows and 100 decares of arable land needs an average of 5.3 workers, but the number can vary between 3.8 and 6.8 workers. In a farm with 150 dairy cows and 3,000 decares of arable land needs an average of 8.5 workers. The combination of forage production and dairy cattle production leads to optimization of the number of occupied persons needed.

Key words**:** *dairy cattle breeding, forage production, occupied persons, regression analysis*

INTRODUCTION

In 2015 Bulgaria produced 1,028,036 tons of cow milk, which accounted for 89.2% of total milk production. The concentration of dairy herds in the country is still low. There were 276.2 thousand dairy cows on 01.11.2015, which was 6.5% less than in 2014. In the last decade there was a steady trend for reduction of the number of dairy cattle farms in which were bred up to 9 animals. At the same time, the number of farms with 20 or more dairy cows steadily rises [5]. The average milk yield of dairy cattle herds in Bulgaria is still unsatisfactory: 3,668 kg in 2013, while the EU-28 average yield of cow's milk was 6,553 kg in 2013 [2].

In recent years major land tenants show interest in investing and establishing animal farms, including dairy cattle farms. The human factor is crucial to the effective functioning of each business unit. This creates the need to analyze the current state of cattle farms in the area of human resources. Taking into account the number of people who are actually engaged in dairy farming and/or in plant production, it could be possible to plan the necessary number of occupied persons when a dairy farm is established or when the number of animals or arable land have been changed. This could be achieved by the methods of the regression analysis. Regression analysis could be applied in dairy farming in order to explore the relations between milk production and number of dairy animals [6], as well as to explore various economic indicators, such as profit and costs [3].

MATERIALS AND METHODS

The aim of the study is to determine the number of occupied persons, needed by dairy cattle farms in Bulgaria. To

achieve the aim, a linear regression model was developed, based on 10 dairy cattle farms in Bulgaria. The information was collected through interview and the number of cows in the main herd, decares of arable land (own and rented) and the number of occupied persons, directly involved in the production process (employees, involved in the cattle farm; employees, involved in crop production, and owners, involved in the working process) were analyzed. The number of occupied persons (expressed as a full-time equivalent), directly involved in the production process represents the number of occupied persons, needed by dairy cattle farms.

In the analyzed farms were bred between 25 and 146 cows in the main herd and the arable land was used for the production of feed: lucerne for the production of lucerne hay; forage corn - one part of which is given to animals in the form of concentrated feed, another part is used for the production of silage and the rest is sold; wheat - part of the production is used to feed the animals (grain and straw) and another part is sold.

Some of the farms grow grain crops such as oats. The ratio between the cultivated crops in the farms varies: some of the farms do not grow alfalfa, others do not grow grain crops. In some farms the own production of forages occupies minimum rate, while in other farms the animals are fed entirely with forages, produced in the farm. Also some farms sell part of its plant production, while others realize revenue only from the sale of animal production. The number of occupied persons employed on farms varies depending on the size of the farm (number of cows and amount of arable land) and production technologies.

A regression model was constructed with a confidence level of 95% using the Ordinary Least Squares Method. The regression model is as follows:

$$L = C_1.A + C_2.D + C + a$$

where:

L – natural logarithm of the the number of occupied persons, needed by dairy cattle farms;

A – natural logarithm of the decares of arable land;

D – natural logarithm of the number of dairy cows;

C_1 and C_2 – coefficients of the independent variables;

C – constant;

a - error of the regression;

The null hypothesis was tested during the estimation of the parameters. According to the null hypothesis, the regression coefficients corresponding to the variables are equal to zero. The standard error of the regression, the coefficient of determination (R-squared), and Jarque – Bera Test of Normality were calculated.

RESULTS AND DISCUSSIONS

The probability of acceptance of the null hypothesis (Prob.) in Table 1, is less than 0.05 and each of the estimated coefficients is statistically significantly different from zero [4]. This means that the null hypothesis is rejected. The coefficient of determination (R-squared) is high in value (0.92).

Table 1. Estimation of the parameters of the regression model /Dependent variable – natural logarithm of the the number of occupied persons, needed by dairy cattle farms /L/; N= 10

Variable	Coefficient	Standard error	t-Statistic (Probability)
A	0.067	0.02	3.17 (0.016)
D	0.596	0.07	8.82 (0.000)
C	-1.386	0.31	-4.47 (0.003)
R-squared of regression	0.92		
Standard error of regression	0.13		
Jarque – Bera Test of Normality (Probability)	0.49 (0.78)		
F-statistic of regression (Probability)	40.98 (0.0001)		

Source: Own calculation.

The probability of Jarque – Bera Test of Normality was higher than 0.05, so we accept the hypothesis that the regression residuals were normally distributed.

Fig. 1 represents the actual and fitted values of number of occupied persons, needed by

dairy cattle farms.

By replacing the constant and the coefficients with their theoretical values, it is obtained the following model (Table 1):

$$L = 0.067.A + 0.596.D - 1.386$$

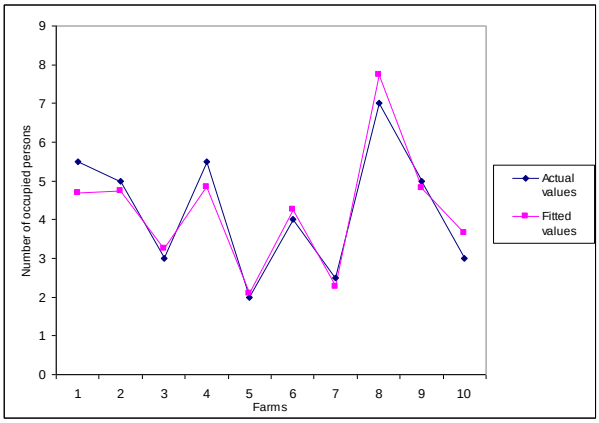

Fig. 1. Actual and fitted values of number of occupied persons, needed by dairy cattle farms

For better presentation of the results of the regression model, in Fig. 2 are shown the theoretical values of the number of occupied persons needed in case of different combinations between the number of cows and decares of arable land (Table 2).

Table 2. Number of cows and decares of arable land

Case	Number of cows	Arable land /decares/
1	13	80
2	20	20
3	25	70
4	30	50
5	40	100
6	45	150
7	50	200
8	60	500
9	70	400
10	70	800
11	80	100
12	90	120
13	100	100
14	130	150
15	130	300
16	150	500
17	150	1,000
18	150	3,000

The number of occupied persons could vary depending on the type of crops, the technology and the intensification of the production process.

From Figure 2 could be concluded that for a farm with 20 cows and 20 decares of arable land, the theoretical number of occupied persons is 1.8 with a lower bound of variation of 1.2 and an upper bound of 2.4 occupied persons number; for the farm with 50 cows and 200 decares of arable land, the theoretical number of occupied persons is 3.7 workers with a lower bound of variation of 2.7 workers and an upper bound of 4.7 workers.

Farm with 100 cows and 100 decares of land needs an average of 5.3 workers, but the number can vary between 3.8 and 6.8 workers.

With the increase of farm size, the standard error also increases, leading to a wider range between the minimum and maximum number of occupied persons needed. In a farm with 150 dairy cows and 3,000 decares of arable land needs an average of 8.5 workers, the minimum number of occupied persons is 5.7 and the maximum - 11.3, which is almost 2 times more than the minimum number. The wide range of variation can be explained by the specific technological solutions, type of crops, specific characteristics of the production process and the level of management in the particular farm.

With the increase of farm size, the possible technological solutions, related to milking, cleaning, feeding and reproduction of animals, forage production and storage also increase.

Dairy cattle farms in Bulgaria in 2011, on average had 13 dairy cows and 80 decares forage areas and the average number of occupied persons was 2.18 [1].

When replace that number of cows and decares in the regression, the results are: the average number of occupied persons is 1.5; the minimum number of occupied persons is 1.0 and the maximum - 2.1 (Table 2 and Fig. 2).

The maximum value from the regression is quite similar to the reported data [1] (2.1 vs 2.18).

For comparison according to the same report [1], in 2011 dairy cattle farms in EU-27 on average had 29 dairy cows and 290 decares forage areas and the average number of occupied persons was 1.82.

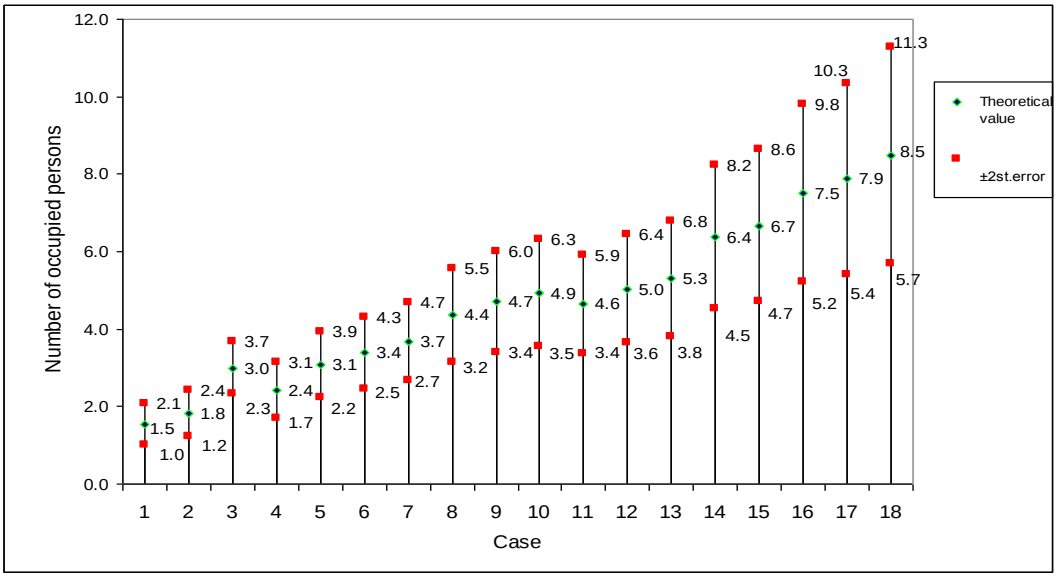

Fig. 2. Theoretical values of the number of occupied persons needed

For Denmark these indicators were: 142 dairy cows, 1,020 decares and 2.38 persons; for Poland: 16 dairy cows, 130 decares and 1.91 persons; for Slovakia: 217 dairy cows, 7,880 decares and 29.57 persons; for Romania: 4 dairy cows, 20 decares and 1.34 persons.

Profitability depends on labour costs and optimization of occupied persons' number in dairy cattle farms. According to some authors [7], labour costs comprises 14,97% from the total costs in a dairy cattle farm in Bulgaria.

With the increase in the number of cows in the main herd and the amount of arable land, the number of occupied persons needed also increase. The constant in the regression model is a negative number (-1.386), which could be explained by better utilization of the working time: a major part of the occupied persons can perform activities related to dairy farming, and can also be included in forage production.

The combination of forage production and dairy cattle production leads to optimization of the number of occupied persons needed.

CONCLUSIONS

It could be concluded that for a farm with 20 cows and 20 decares of arable land, the theoretical number of occupied persons is 1.8. A farm with 100 cows and 100 decares of arable land needs an average of 5.3 workers, but the number can vary between 3.8 and 6.8 workers. In a farm with 150 dairy cows and 3,000 decares of arable land needs an average of 8.5 workers.

The combination of forage production and dairy cattle production leads to better utilization of the working time and optimization of the number of occupied persons needed.

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VECTOR ERROR CORRECTION MODEL FOR FORECASTING SHEEP NUMBERS IN BULGARIA

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Abstract

The aim of this study was to forecast sheep numbers in Bulgaria on 01.11.2016 and on 01.11.2017, using a vector error correction model (VECM). A vector error correction model was constructed to forecast sheep numbers in Bulgaria for 2016 and 2017. The model was developed on the basis of 3 time series for the period 2000 – 2015 year. The time series were: Sheep numbers in Bulgaria on 01 November, Number of sheep farms on 01 November and Consumption of lamb and goat meat for 1 year per member of household (kg). Sources of information were annual data from the Ministry of agriculture and food, Republic of Bulgaria and the data from the National Statistical Institute. The stationarity of the variables was tested with Augmented Dickey-Fuller Unit Root Test. The cointegration of the three variables was estimated with Johansen Cointegration Test. VECM was constructed with lag length 1 and 1 cointegrated vector. An intercept was included in the model. Granger causality test was performed with the help of Wald Test in order to check the short-run causal relationship, running from the independent variables to the dependent variable. In order to forecast the number of sheep on 01 November 2016 and on 01 November 2017, one of the equations of the VECM was estimated with the method of least squares. The standard error of the regression, the coefficient of determination, the Adjusted R-squared of regression, F-statistic of regression, Jarque – Bera Test of Normality, Breusch-Godfrey Serial Correlation LM Test and Autoregressive Conditional Heteroscedasticity Test of Residuals were calculated. To check the stability of the model, the cumulative sum and cumulative sum of square had been represented. The forecasted sheep numbers in Bulgaria on 01.11.2016 are 1,313,796; and on 01.11.2017 are 1,306,403.

Key words**:** *Vector error correction model, sheep numbers, forecast*

INTRODUCTION

In 2015 Bulgaria produced 74,324 tons of sheep milk, which accounted for 6.4% of total milk production. There were 1,117 thousand sheep mothers on 01.11.2015, which was 19.6% less than in 2014. The number of sheep was 1,331.9 thousand heads. Sheep farms were 37.7 thousand, which was with 19.4% less than in 2014 [4].

Sheep breeding in Bulgaria is characterized by extensive farming, low average milk yield, low average number of animals on a farms level. However, there is a process of consolidation of flocks: the average number of sheep in a farm on 01 November 2015 was 35.3 head numbers, which was with 23.8% more, compared to 01 November 2014; the average number of sheep - mothers on 01 November 2015 was 29.9 head numbers, which was with 25.3% more, compared to 01 November 2014 [4].

For the proper and effective development of sheep farming, labour is of a great importance: according to some authors [6], the relative share of labour costs from the total, varied from 28% to 37% for a sheep flock of Bulgarian Synthetic population. Other factors, influencing the economic efficiency of sheep breeding, are milk productivity and protection of the new-born lambs [5].

MATERIALS AND METHODS

The aim of this study was to forecast sheep numbers in Bulgaria on 01.11.2016 and on 01.11.2017, using a vector error correction model.

A vector error correction model (VECM) [1] was constructed to forecast sheep numbers in Bulgaria for 2016 and 2017. The model was

developed on the basis of 3 time series for the period 2000 – 2015 years.

The time series were: Sheep numbers in Bulgaria on 01 November (ShN), Number of sheep farms on 01 November (FN) and Consumption of lamb and goat meat for 1 year per member of household (kg) (Cons). Sources of information on which the model was constructed were annual data from the Ministry of agriculture and food, Republic of Bulgaria for the period 01.11.2000 – 01.11.2015 year [7] and the data from the National Statistical Institute [8].

The stationarity of the variables was tested with Augmented Dickey-Fuller Unit Root Test. Stationary time series have mean and variance, which are constant over time [3].

A nonstationary time series will have a time-varying mean or a time-varying variance or both [3].

The next step was to check for cointegration of the three variables with Johansen Cointegration Test [2].

VECM was constructed with lag length 1 and 1 cointegrated vector. An intercept was included in the model.

In order to forecast the number of sheep on 01 November 2016 and on 01 November 2017, one of the equations of the VECM was estimated with the method of least squares. The standard error of the regression, the coefficient of determination (R-squared), the Adjusted R-squared of regression, F-statistic of regression, Jarque – Bera Test of Normality, Breusch-Godfrey Serial Correlation LM Test and Autoregressive Conditional Heteroscedasticity Test of Residuals (ARCH Test) were calculated.

Granger causality test was performed with the help of Wald Test in order to check the short-run causal relationship, running from the independent variables to the dependent variable.

To check the stability of the model, the cumulative sum (CUSUM) and cumulative sum of square (CUSUMSQ) had been represented.

RESULTS AND DISCUSSIONS

The three time series appeared not to be stationary according to the graphical analysis and the Augmented Dickey-Fuller Unit Root Test (Fig.1, Fig. 2 and Fig. 3).

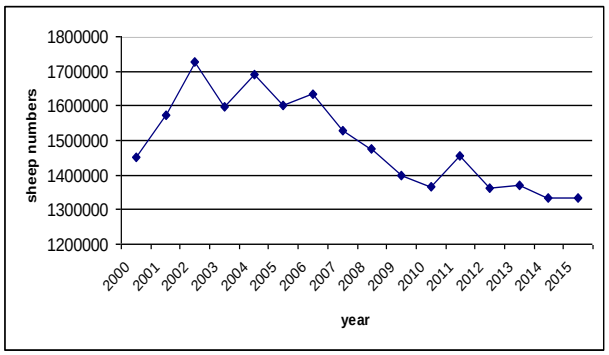

Fig. 1. Sheep numbers in Bulgaria on 01 November
*Note: Augmented Dickey-Fuller Test Statistic: -0.432409; 5% Critical Value: -3.1003

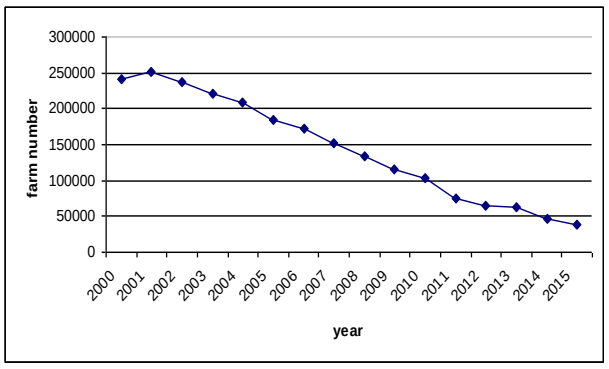

Fig. 2. Number of sheep farms on 01 November
*Note: Augmented Dickey-Fuller Test Statistic: -0.8555; 5% Critical Value: -3.1003

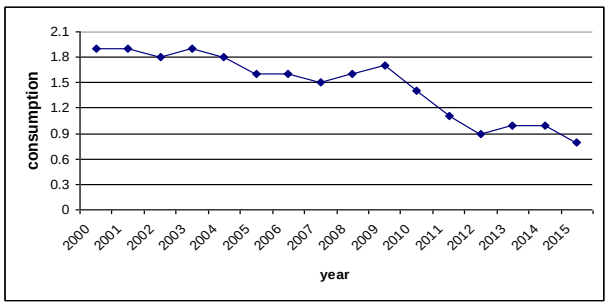

Fig. 3. Consumption of lamb and goat meat for 1 year per member of household (kg)
*Note: Augmented Dickey-Fuller Test Statistic: -0.2968; 5% Critical Value: -3.1003

During the studied period (2000 – 2015) the three variables showed a decreasing trend.

The Augmented Dickey-Fuller Unit Root Test showed that ShN was stationary at second difference (lag 1); FN and Cons were stationary at first difference (lag 1) (Fig. 4, Fig. 5 and Fig. 6).

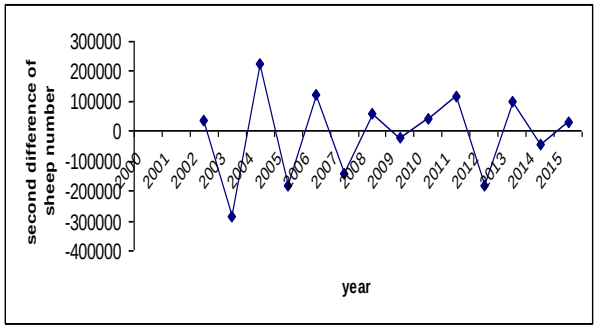

Fig. 4. Second difference of Sheep numbers in Bulgaria on 01 November
*Note: Augmented Dickey-Fuller Test Statistic: -5.01834; 5% Critical Value: -3.1483

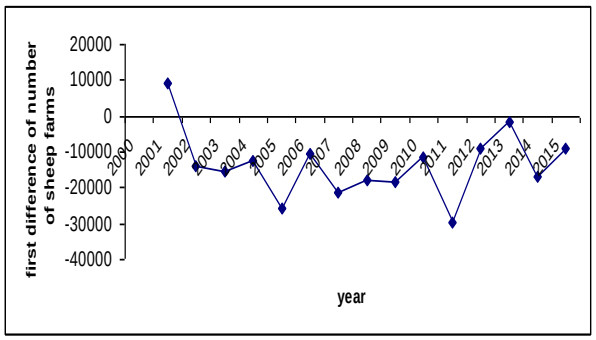

Fig. 5. First difference of Number of sheep farms on 01 November
*Note: Augmented Dickey-Fuller Test Statistic: -3.15363; 5% Critical Value: -3.1222

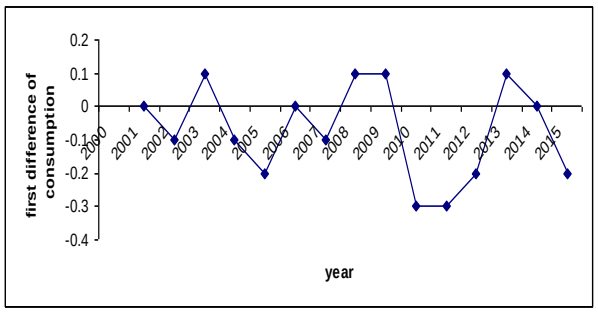

Fig. 6. First difference of Consumption of lamb and goat meat for 1 year per member of household (kg)
*Note: Augmented Dickey-Fuller Test Statistic: -3.3872; 5% Critical Value: -3.1222

According to the results of the Johansen Cointegration Test, the variables were cointegrated at 5% significance level and there were long-run relation (equilibrium) between them. The Likelihood Ratio indicates 3 cointegrating equation at 5% significance level (Table 1).

Table 1. Cointegration test results including intercept and no trend

Series: ShN, FN and Cons Lags interval: 1 to 1				
Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.937024	54.68531	29.68	35.65	None **
0.556846	15.97540	15.41	20.04	At most 1 *
0.279105	4.581666	3.76	6.65	At most 2 *
*(**) denotes rejection of the hypothesis at 5%(1%) significance level				
L.R. test indicates 3 cointegrating equation(s) at 5% significance level				

The three system equations of the VECM were:

(1.) D(ShN,2) = C(1)*(D(ShN(-1)) + 2634.864* Cons(-1) + 0.147* FN(-1) - 5736.906) + C(2)*D(ShN(-1),2) + C(3)*D(Cons(-1)) + C(4)*D(FN(-1)) + C(5)

(2.)D(Cons) = C(6)*(D(ShN(-1)) + 2634.864* Cons (-1) + 0.147* FN(-1) - 5736.906) C(7)*D(ShN(-1),2) + C(8)*D(Cons(-1)) + C(9)*D(FN(-1)) + C(10)

(3.)D(FN) = C(11)*(D(ShN(-1)) + 2634.864*Cons(-1) + 0.147*FN(-1) - 5736.906) + C(12)*D(ShN(-1),2) + C(13)*D(Cons(-1)) + C(14)*D(FN(-1)) + C(15)

Where:
D(ShN,2) - Second difference of Sheep numbers in Bulgaria on 01 November;
D(ShN(-1)) – First difference of Sheep numbers in Bulgaria on 01 November for the previous time period;
Cons(-1) - Consumption of lamb and goat meat for 1 year per member of household for the previous time period;
FN(-1) - Number of sheep farms on 01 November for the previous time period;
D(ShN(-1),2) - Second difference of Sheep numbers in Bulgaria on 01 November for the previous time period;
D(Cons(-1)) – First difference of Consumption of lamb and goat meat for 1 year per member of household for the previous time period;
D(FN(-1)) - First difference of Number of sheep farms on 01 November for the previous

time period;
D(Cons) - First difference of Consumption of lamb and goat meat for 1 year per member of household;
D(FN) - First difference of Number of sheep farms on 01 November;
C(1), C(2), C(3), C(4), C(6), C(7), C(8), C(9), C(11), C(12), C(13), C(14) - coefficients of the independent variables
C(5), C(10), C(15) – Intercepts.

Table 2 represented the estimation of the parameters of the first equation of the VECM. The method of least squares was used. The standard error of the regression, the coefficient of determination (R-squared), the Adjusted R-squared of regression, F-statistic of regression, Jarque – Bera Test of Normality, Breusch-Godfrey Serial Correlation LM Test and Autoregressive Conditional Heteroscedasticity Test of Residuals (ARCH Test) were represented.

Table 2. Estimation of the parameters of the equation. Dependent Variable D(ShN,2), N= 13

Variable	Coefficient	Standard error	t-Statistic (Probability)
C(1)	-1.344	0.27	-5.01 (0.001)
C(2)	-0.198	0.16	-1.21 (0.261)
C(3)	-128635.31	113926.70	-1.13 (0.292)
C(4)	2.561	2.32	1.11 (0.301)
C(5)	16683.00	37169.89	0.45 (0.666)
R-squared of regression			0.91
Adjusted R-squared of regression			0.87
Standard error of the regression			53416.81
F-statistic of regression (Probability)			21.20 (0.0003)
Jarque – Bera Test of Normality (Probability)			0.17 (0.92)
F-statistic of Breusch-Godfrey Serial Correlation LM Test - lag 1 (Probability)			0.59 (0.47)
F-statistic of ARCH Test - lag 1 (Probability)			3.65 (0.09)

The equation could be written with the substituted coefficients as follows:

D(ShN,2) = -1.344*(D(ShN(-1)) + 2634.864* Cons(-1) + 0.147* FN(-1) - 5736.906) -0.198*D(ShN(-1),2)) - 128635.31*D(Cons(-1)) + 2.561*D(FN(-1)) + 16683

Since the C(1) coefficient is a negative number with a probability less than 0.05, there is long-run causality, running from the independent variables to the dependent variable.

Table 3. Wald Test

Null Hypothesis: C(2)=0	
Chi-square (Probability)	1.462 (0.227)
Null Hypothesis: C(3)=0	
Chi-square (Probability)	1.275 (0.259)
Null Hypothesis: C(4)=0	
Chi-square (Probability)	1.222 (0.269)

The results from the Table 3 (p-values>0.05) showed that there is no short-run causality. The same conclusion can be made from the p-values of the coefficients C(2), C(3) and C(4) from the Table 2.
The plots of CUSUM and CUSUMSQ fall within the critical bounds of 5% which shows that the model was stable (Fig. 7 and Fig. 8).

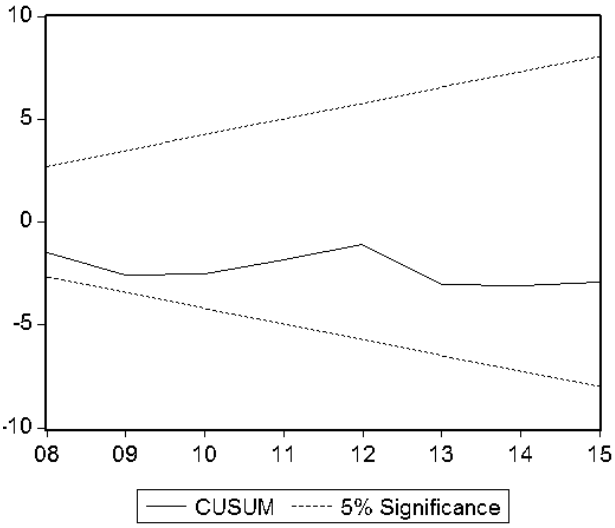

Fig.7. Plot of CUSUM

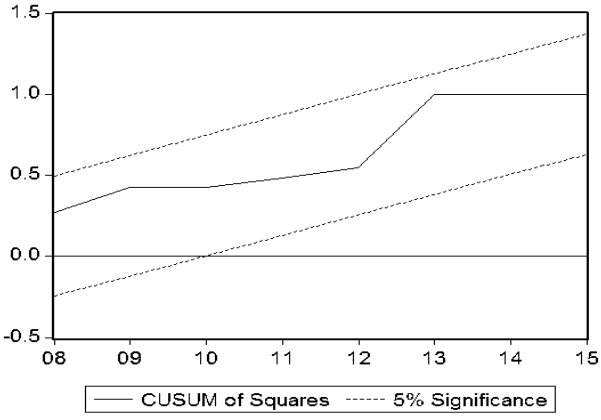

Fig. 8. Plot of CUSUMQ

With the help of the system equations, the forecasted sheep numbers in Bulgaria on

01.11.2016 and on 01.11.2017 were found. Dynamic solution was applied. The forecasted sheep numbers in Bulgaria on 01.11.2016 are 1,313,796; and on 01.11.2017 are 1,306,403.

CONCLUSIONS

The forecasted sheep numbers in Bulgaria on 01.11.2016 are 1,313,796; and on 01.11.2017 are 1,306,403.

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THE ANALYSIS OF THE TOURIST TRAFFIC - AN INTEGRAL PART OF THE TERRITORY PLANNING OF THE TOURISM

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Abstract

"Doftana Valley" has a rich and valuable potential anthropogenic result of the existence and history of five centuries of the Romanian people in this geographic area. Components of the anthropic tourism potential are pointed out by their attractiveness and value. In terms of natural resources and tourism anthropogenic resources, "Doftana Valley" is well represented, the main attractions are the ethnography, folklore, folk art, nature reserves. In terms of reception facilities, "Doftana Valley" has a pretty good picture for the future, but it still has room for more, regarding the construction of new structures and upgrade existing ones. Concerning the proposed target for tourism organization is the analysis of tourist traffic on tourism demand and supply at a guesthouse in "Doftana Valley", calculating, processing and interpretating the most representative tourism indicators: average daily number of tourists, number of overnight stays, average length of stay, tourist traffic density and the coefficient of utilization of the accommodation capacity and other indicators features. Statistical data were taken from the NIS and the guesthouse in the study case.

Key words: tourist density, tourist attractiveness, tourist traffic, quarterly tourist traffic coefficient, average tourist stay

INTRODUCTION

"Doftana Valley" (previously called, Teşila) is a village in the Prahova County, Muntenia Region, Romania, composed of villages Teşila (residence) and Trăisteni.

Its common name comes from the eponymous river. It springs from the Baiului mountains at an altitude of 1,260 m in Step Predeluş, and crosses the village along it, on a North-South direction, for a distance of 30 kilometers, while in the South, it forms the Paltinu Lake of accumulation.

The beauty and variety of the natural and cultural values existing in the Prahova County characterize a remarkable tourism potential, which plays an important part in the national and international tourism offer of Romania.

The main tourist areas are: "Prahova Valley," "Doftana Valley," "Teleajen Valley", "Slănic Valley" and the Drajna - Ceraşu - Starchiojd belonging to the mountainous and sub-mountainous area; Salty Cricov Valley and hilly area belonging to the Ploiesti area - situated on the "Balta Doamnei" plains, Prahova [2].

Prahova county area is recognized as a tourist destination since the 19th century, and it has developed a special infrastructure both quantitatively and qualitatively, especially in recent years.

"Rural areas can be defined by considering the following criteria: morphological criterion (number of inhabitants, density, type of environment), structural and functional criterion (type of activities and relationships)" as mentioned by Condei et al, (2016).

This definition highlighted the main characteristics of the rural areas as mentined by Popescu (2015): [8]

-the low population density in the rural areas;

-villages are the human establishment forms characterized by individuality and discontinuity of the built space;

-the productive activity includes predominantly agriculture and forestry but this does not exclude rural tourism and the processing industry and trade areas;

-the relations between people rely primarily on mutual recognition from all points of

views;
-the environment is much less polluted than in urban areas".
The commune "Doftana Valley" is located in a picturesque landscape with many facets of travel and deprived of sources of pollution and environmental degradation.
The city Campina of Grigorescu and Hasdeu, lies at the crossroads. It goes to the North of a road that winds Valley Doftana water.
After you leave behind the gentle hills, the Doftana Museum in Telega and the Brebu Keys, the valley narrows, mountain gaining exquisite beauties. Before the entrance of "Doftana Valley" the river waters were dammed by the dam construction at Paltinu, forming a reservoir that can be likened to "a great little mountain" - another tourist attraction [11].
The commune "Doftana Valley" is located in the North of the Prahova county, in the Carpathian Curvature, and it is crossed in the middle by the river with the same name. It is situated in the Northern part of the Prahova county, between the Prahova and Teleajen valleys.
In the town "Doftana Valley" can be visited the "Glodeasa" Natural Reservation with an area of 534.9 ha. It is a secular virgin forest of beech and fir, aged 200-300 years and heights of 40-45 m [14]. It is considered a rarity at the European level because it is an evidence of forest evolution. The area proposed for protection consists of an outstanding variety of landscapes: forests, cliffs, rocks, meadows, gorges, fresh water.
The "Doftana Valley" has a rich and valuable anthropogenic potential given by the existence and history of five centuries of the Romanian people in this geographic area. The components of the anthropic tourism potential are pointed out by their attractiveness and value.
The Teşila - Trăisteni depression is another attraction in the "Doftana Valley," which welcomes tourists with quiet landscapes and a refreshing atmosphere. The traditional peasant households in the villages situated in this region and their inhabitants attracts more and more tourists, coming mainly from urban areas [10]. They found in these places kind people, who preserve their customs and traditions inherited from their ancestors from generation to generation. Of the total peasant hoses in the commune, about 53 could be considered boarding houses, having 400 beds.
The "Paltinu" Lake is a reservoir for edible water, spread over a length of 3 km, offering a breathtaking view. Both sides offer favourable conditions for the settlement of picturesque camps and holiday homes. It is located in a picturesque mountain setting in the Doftana basin and nearby the Doftana river, located at the confluence with the creek "Paltinoasa" and "Rye". Located at an altitude of 650 m the "Paltinoasa" Lake occupies an area of 215 ha as mentioned by Hontus (2009)[4]. The "Paltinu" Dam serves mainly for water supply for the municipalities and industries in Câmpina and Ploiesti. Also, the dam assures water for irrigation for 9,000 hectares in the valley of Baicoi Prahova-Ploiești and the "Dâmbul" River of Ploiestias affirmed by Hontus (2015) [3].
In terms of natural resources, it includes:
- forests of beech and fir;
- careers basalt, limestone, gravel, sand;
- a micro-hydro-electric power- 7 (built on the Doftana river)
- the alpine area approved by law mountain and rural tourism development has become an important resource for the community.
The settlement "Doftana Valley" is a specific hilly-mountain village, where important economic activities are developed as follows: wood processing; forestry; trade - services; livestock growing; agritourism.
The "Doftana Valley" commune cosists of two villages: Teşila and Trăisteni with an area of about 28,637 ha.
Acoording to Vlad et al., (2014) [9], who quoted Pipike J. (2012), “The concept of tourism emerged as people travelled to new locations to partake activities and experiences”. Hussein et al., (2012) mentioned that “innovation adoption has been conceptualized in different ways and studied from several perspectives”.
In this context, the purpose of this paper was to analyze the tourist traffic, the tourism demand and supply at a guesthouse in

”Doftana Valley”, calculating, processing and interpreting the most representative tourism indicators: average daily number of tourists, number of overnight stays, average length of stay, tourist traffic density and the coefficient of utilization of the accommodation capacity and other aspects

MATERIALS AND METHODS

This paper is based on an analysis of tourism demand and supply in Prahova county, in the "Doftana Valley"commune.
The research aimed to study and analyse the statistical data on tourist flows at a boarding house in the village of "Doftana Valley."
Thus, it can be identified if the promotion and services offered to tourists can be improved. The analysis is also focused on tourist traffic, tourism planning being an integrated part of the area. For this study, we used the empirical data provided by the National Institute of Statistics on tourist traffic in the area, as well as statistics made available by the guesthouse.
For the analysis of tourism demand and supply at the "Crăița" guesthouse, there were calculated, analysed and interpreted the following tourism indicators: Index of global tourist demand change, Index of domestic and foreign demand variation in time, Indicator of total accommodation capacity evolution, Index of global tourist demand distribution, Index of customer evolution, Index of overnight stay evolution, the evolution of the average length of stay, the customer occupancy indicator, the monthly concentration coefficient, the quarterly coefficient of tourist traffic, the weight capacity of the guesthouse accommodation in the total accommodation capacity of the village, employment indicator of pensions (employment), tourist density in relation to local population.
The analysis and interpretation of these indicators of tourist traffic helps us to appreciate how tourism in the area "Doftana Valley " has been developing and what tourism strategy and planning must be adopted in this area.

RESULTS AND DISCUSSIONS

"Crăița"Guesthouse - The "Doftana Valley", Prahova County

The "Crăița" Pension is a two-daisies guesthouse.
It is distinguished by a rustic elegance, an undeniable authenticity and through a wide range of possibilities for recreation and leisure [15].
From this guesthouse you can go on trips and hiking occasion when as a visitor you can admire the landscapes of the ”Doftana Valley” village " and breathe fresh air and ozone.
The hosts of the pension are always available and welcome those tourists who cross their threshold. They are friendly and kind and full of hospitality, and ready to fulfil any wish of their guests.
The pension has 13 rooms, of which 9 rooms have bathroom, 4 rooms with bathrooms down the hall. For full board (breakfast, lunch and dinner), tourists will pay 70 Euro / day and a double room for 2 persons is 110 Euro / day with breakfast [15].
The *"Crăița"* Pension enables guests to feel relaxed grace to the tranquillity of the village, which allows to recharge your batteries living for a few days outsides of the city life [15].
The restaurant has 100 seats with fireplace and terrace on site, preparing various menus consisting predominantly of traditional food, whose composition comprises purely biological ingredients produced by the owner of the household [15].

Fig. 1. The "Crăița" Guesthouse [15]

Fig. 2. The "Crăiţa" Guesthouse [15]

Location

Located in a natural setting of great beauty, without sources of pollution and environmental degradation, the "Doftana Valley" commune, with its two villages Teşila and Trăisteni, is crossed by the upper Doftana River, the Baiului (V) and Grohotiş (E) foothills.

From the peaks of medium altitude (1,600 m), the majestic forests of centuries are reflected in the mirror by the Doftana river, a vital water for the existence of the inhabitants and give life to gardens and orchards in the wonderful chain of the land [15].

Sports and leisure opportunities

Tourists come to relax by doing exercise. The "Crăiţa" pension has an important leisure potential. Besides badminton and table tennis, tourists may practice cycling the mountain route "Doftana Valley" - "Cornu" - "Câmpina", riding on the trail before ending with "Posada". They also may play football or practice skiing. [15]

The lovers of hiking the mountains around the village have the occasion to pass the "Predeluş" crossing and climb:

- The peaks of the "Baiului" Mountains in the "Floricului Valley" and the peak "Gagu Mare"- 1,660 m, the duration is about 4-5 hours;
- The peaks of "Orjogoaia", "Cazacu"- 1,723 m altitude, 6-8 hours [15].

Statistics of tourism indicators characterizing the "Crăiţa"Pension

Table 1. Total number of tourists arriving in the "Crăiţa" Pension in last 5 years

The structure of tourist	**Types of tourists**	**Years**				
		2011	2012	2013	2014	2015
Pension Crăiţa	Romanian	1,350	1,477	1,255	1,405	1,302
	Foreign	21	35	12	29	15
	R+F	1,371	1,512	1,267	1,434	1,317

Source: ”Crăiţa” Pension

Table 2. Number of overnight stays at "Crăiţa"Pension

Types of tourists	The structure of tourist	Years				
		2011	2012	2013	2014	2015
Romanian	Crăiţa	735	879	667	767	695
Foreign	Crăiţa	8	13	4	14	6
R+F	Crăiţa	743	892	671	781	701

Source: "Crăiţa” Pension

Table 3. Number of beds in "Crăiţa" Pension

The structure of tourist	Years				
	2011	2012	2013	2014	2015
Pension Crăiţa	30	30	30	30	30

Source: ”Crăiţa” Pension

Table 4. The population of the village "Doftana Vallley"

Gender	County	Village	Years				
			2011	2012	2013	2014	2015
			UM: Persons Number				
			Persons Number	Persons Number	Persons Number	Persons Number	Persons Number
Total	Prahova	Doftana Valley	6,897	6,880	6,837	6,814	6,766
Male	Prahova	Doftana Valley	3,480	3,455	3,435	3,424	3,389
Female	Prahova	Doftana Valley	3,417	3,425	3,402	3,390	3,377

Source: www.insse.ro

Table 5. Total accommodation places "Doftana Valley"

The structure of tourist	County	Village	Years				
			2011	2012	2013	2014	2015
			UM: Places				
			Places	Places	Places	Places	Places
Total	Prahova	Doftana Valley	59	40	84	84	100
Tourist villas	Prahova	Doftana Valley	:	:	:	:	16
Cabane turistice	Prahova	Doftana Valley	20	20	20	20	20
Agrotourist pensions	Prahova	Doftana Valley	39	20	64	64	64

Source: www.insse.ro

The area of "Doftana Valley"Commune = 286.1 km^2

Calculation of the indicators for the "Crăița" Guesthouse in "Doftana Vallley" Commune [5], [6], [7]

I. Index of global tourist demand change,

$$\Delta CG_{o-i} = \frac{CG_i}{CG_o} \cdot 100$$

where: CG_i- global tourist demand in year „i”;

CG_o- global tourist demand in year „0”.

Table 6. Number of Romanian and foreign tourists, and the ΔCG (%)

	2011	2012	2013	2014	2015
The total number of Romanian and foreign tourists	1,371	1,512	1,267	1,434	1,317
ΔCG (%)		110.28%	83.80%	113.18%	91.84%

Source: own calculations

Fig. 3. Index of global tourist demand change

Changing global tourism demand, at the "Crăița" Pension fluctuated from an increase of 10% in 2011-2012 to a decrease of 8% during 2014-2015.

II.Index of global tourist demand distribution, between domestic and foreign demand

$$\Delta CI = \frac{CI}{CG} \cdot 100\ ;\quad \Delta CE = \frac{CE}{CG} \cdot 100$$

where: CI - domestic tourist demand;
CE - foreign tourist demand.

a) Domestic tourist demand

Table 7.The number of tourists and the ΔCI (%)

	2011	2012	2013	2014	2015
The total number of Romanian and foreign tourists	1,371	1,512	1,267	1,434	1,317
The total number of Romanian	1,350	1,477	1,255	1,405	1,302
ΔCI (%)	98.47%	97.69%	99.05%	97.98%	98.86%

Source: own calculations

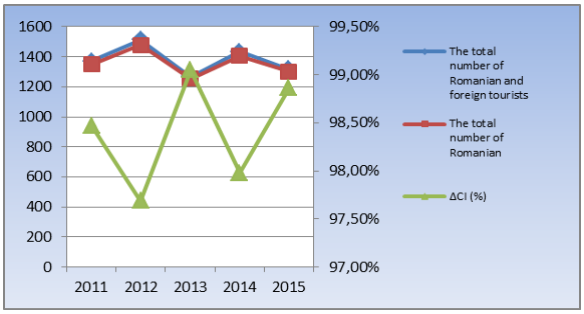

Fig. 4. Index of global tourist demand distribution (domestic tourist demand)

Distribution of domestic tourism demand, had a constant evolution throughout the period under review, about 98%.

b) Foreign tourist demand

Table 8.Number of tourists and the ΔCE (%)

	2011	2012	2013	2014	2015
The total number of Romanian and foreign tourists	1,371	1,512	1,267	1,434	1,317
The total number of foreign tourists	21	35	12	29	15
ΔCE (%)	1.53%	2.31%	0.95%	2.02%	1.14%

Source: own calculations

Fig. 5. Index of global tourist demand distribution (foreign tourist demand)

Distribution of domestic tourism demand, fared a slight oscillation in 2013, when he had a fall. But in the period under review amounted to about 2%.

***III. Index of (domestic and foreign) demand variation in time*:**

$$ICE_{0-i} = \frac{CE_i}{CE_0} \cdot 100 :$$

$$ICI_{0-i} = \frac{CI_i}{CI_0} \cdot 100$$

where: ICE_{o-i} *- index of foreign demand variation;*

ICI_{o-i} *– index of domestic demand variation.*

a) Domestic tourist demand

Table 9. The ICI (%)

	2011	2012	2013	2014	2015
The total number of Romanian	1350	1477	1255	1405	1302
ICI (%)		109.41%	84.97%	111.95%	92.67%

Source: own calculations

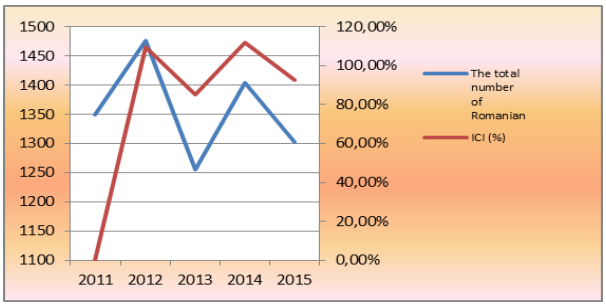

Fig. 6. Index of demand variation in time (domestic tourist demand)

Variation in time of domestic tourism demand, recorded the highest value in 2014, of 12% and in 2013 had a decrease of 15%.

b) *Foreign tourist demand*

Table 10.The ICE (%)

	2011	2012	2013	2014	2015
The total number of foreign tourists	21	35	12	29	15
ICE (%)		166.67%	34.29%	241.67%	51.72%

Source: own calculations

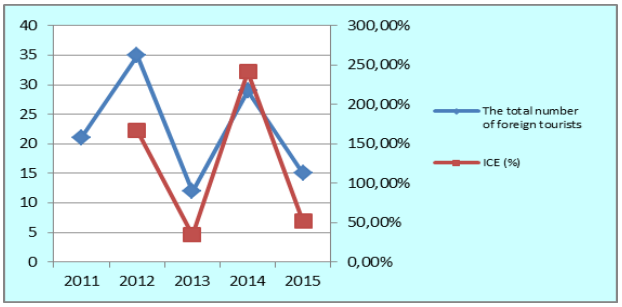

Fig. 7. Index of demand variation in time (foreign tourist demand)

Variation in time of domestic tourism demand, recorded the highest growth in 2014 of approximately 142%, and in 2013 had a decrease of 66%.

IV. Calculating "average stay" *is used in place of the number of days of travel, the number of overnight stays recorded in accommodation establishments*:

$$Sp = \frac{NP}{T} (\text{days})$$

where: NH - number of recorded overnight stay;

T - number of tourists arriving;

S_H *- average stay in the pension.*

Total average stay = Nr. Total overnight

stays (foreign + Romanian) / No. Total Tourists (Romanian + foreign)

Table 11. Overnight stays and average stay in days-Total tourists

	2011	2012	2013	2014	2015
Total overnight stays (foreign + Romanian)	743	892	671	781	701
The total number of Romanian and foreign tourists	1,371	1,512	1,267	1,434	1,317
S (days)	0.54	0.59	0.53	0.54	0.53

Source: own calculations

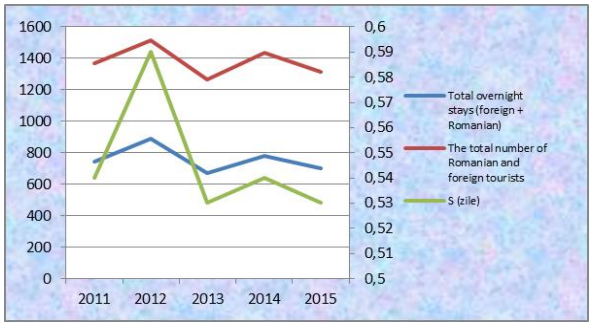

Fig. 8. Total average stay

Romanians

Table 12. Overnight stays and average stay in days-Ronanians

	2011	2012	2013	2014	2015
Total overnight stays of Romanian	735	879	667	767	695
The total number of Romanian	1,350	1,477	1,255	1,405	1,302
S (days)	0.54	0.60	0.53	0.55	0.53

Source: own calculations

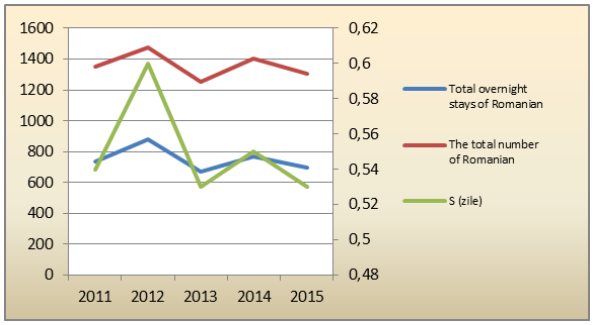

Fig. 9. Average stay (Romanians)

Foreigners

Table 13. Overnight stays and average stay in days-foreigners

	2011	2012	2013	2014	2015
Total overnight stays of foreign	8	13	4	14	6
The total number of foreign tourists	21	35	12	29	15
S (days)	0.38	0.37	0.33	0.48	0.40

Source: own calculations

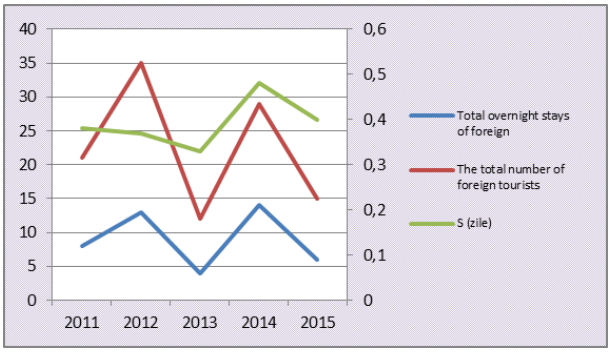

Fig. 10. Average stay (Foreign)

The average stay, recorded the highest value in 2014 and the lowest value in 2013.

V. The monthly traffic coefficient *is calculated as a ratio between the number of tourists during the highest-traffic month (LM) and the number of tourists during the lowest-traffic month (lm)*

$$C_{monthly} = \frac{LM}{lm}, \text{ where } C_{monthly} \geq 1$$

$C_{\text{total monthly}} = 85/30 = 2.83$
$C_{\text{Romanian monthly}} = 4/2 = 2.00$
$C_{\text{foreign monthly}} = 89/30 = 2,97$

Table 14. Tourist traffic

Pension tourist Crăița	Maximum tourist traffic	Minimum tourist traffic	C monthly
December / November - Romanian tourists	85	30	2.83
December / August - foreign tourists	4	2	2.00
December / November - total tourists Romanian + foreign	89	30	2.97

Source: own calculations

Fig. 11. The monthly traffic coefficient

Monthly tourist traffic coefficient for each month over the highest value recorded in November, since then it has recorded the maximum tourist traffic.

VI. The Quarterly traffic coefficient of tourist *- is calculated as a ratio between the number of tourists in the first quarter traffic and touristic maximum number of tourists in touristic quarter with minimal traffic.*

$$C_{quarter} = \frac{TM}{tm}, \text{ where } C_{quarter} \geq 1$$

Table 15.The quarterly tourist traffic

Pension "Crăița" Types of tourists	Quarter I	Quarter II	Quarter III	Quarter IV
Total	148	172	214	167
Romanian	148	172	212	163
Foreign	0	0	2	4

Source: own calculations

$C_{quarter}$ =214/148=1.45
$C_{quarter}$ =212/148=1.43
$C_{quarter}$ =4/2=2.00

Table 16.Tourist traffic by tourist origin

Pension "Crăița"	Types of tourists	Maximum tourist traffic	Minimum tourist traffic	C quarter
Quarter I /II	Total	214	148	1.45
Quarter I /II	Romanian	212	148	1.43
Quarter I /II	Foreign	4	2	2.00

Source: own calculations

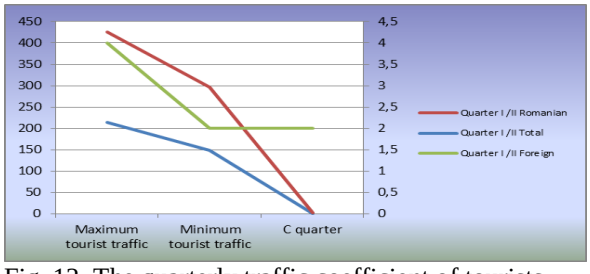

Fig. 12. The quarterly traffic coefficient of tourists

Quarterly coefficient of tourist traffic registered a peak in the first quarter (I).

VII. Share of pension (B&B) capacity of the total accommodation capacity in the commune

$$Icc = \frac{LC}{LP} \cdot 100$$

where: LP - total accommodation places in pensions in the area "Valley Doftana"

LC - total capacity of accommodation at the guesthouse "Crăița"

Table 17. Pension capacity and its Icc (%)

	2011	2012	2013	2014	2015
The total capacity of accommodation at the pension "Crăița"	30	30	30	30	30
The total capacity of accommodation in pensions in "Doftana Valley"	150	150	150	150	150
Icc (%)	20%	20%	20%	20%	20%

Source: own calculations

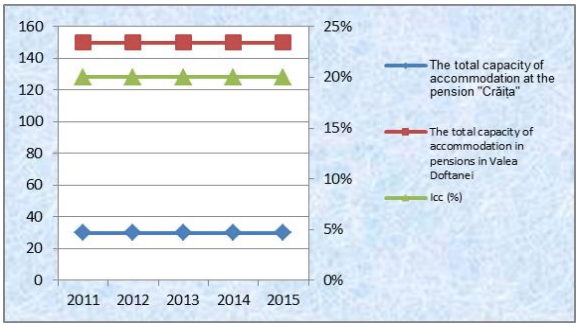

Fig. 13. Share of pension (B&B) capacity out of total accommodation capacity in town

Share accommodation capacity in the analysed period, recorded a 20% constant value because the accommodation capacity, both at the guest house and the village has not changed.

VIII. Index of customer evolution in pension:

$$\Delta T = \frac{TP_i}{TP_0} \cdot 100$$

where: TP_i - tourists in pension in year „i";

TP_o – tourists in pension in year „0".

Table 18. Customer evolution in Craita Pension

Pension "Crăița" Types of tourists	2011	2012	2013	2014	2015
Romanian	1350	1477	1255	1405	1302
Foreign	21	35	12	29	15
Total	1371	1512	1267	1434	1317
ΔT Romanian (%)		109.41%	84.97%	111.95%	92.67%
ΔT Foreign (%)		166.67%	34.29%	241.67%	51.72%
ΔT Total (%)		110.28%	83.80%	113.18%	91.84%

Source: own calculations

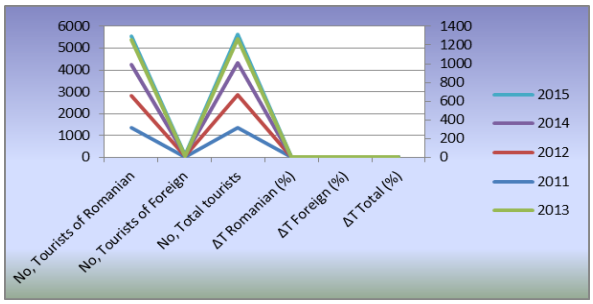

Fig. 14. Index of customer evolution in pension

Customer developments in pension "Crăița" had fluctuated, for both Romanian tourists and foreign tourists.

IX. Index of overnight stay evolution:

$$\Delta N = \frac{NP_i}{NP_0} \cdot 100$$

where: N - overnight stay.

Table 19. Overnight stays index

Pension "Crăița" Number of overnight stays	2011	2012	2013	2014	2015
Romanian	735	879	667	767	695
Foreign	8	13	4	14	6
Total	743	892	671	781	701
ΔN Romanian (%)		119.59%	75.88%	114.99%	90.61%
ΔN Foreign (%)		162.50%	30.77%	350.00%	42.86%
ΔN Total (%)		120.05%	75.22%	116.39%	89.76%

Source: own calculations

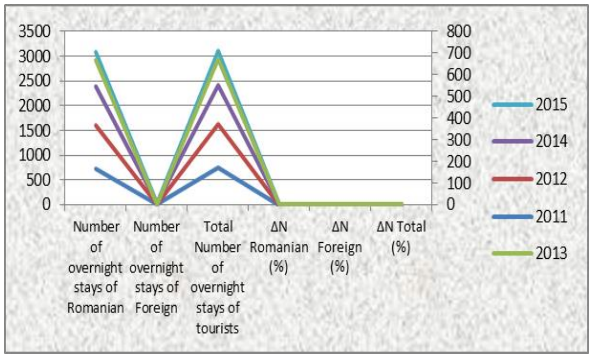

Fig. 15. Index of overnight stay evolution

The evolution of overnight stays in the "Crăița" Pension increased by approximately 19.6% in 2012 and in 2015 it decreased by 10% for Romanian tourists. For the total number of tourists, the evolution of overnight stays increased by 20% in 2012 and in 2015, it declined by 57%.

X. Pension occupancy indicator

This indicators reflects the use of supply for a given period of time, i.e. pension activity depending on its capacity:

$$G_0 = \frac{NP \cdot 100}{LP \cdot Z} = \frac{NT \cdot S}{LP \cdot Z} \cdot 100$$

where: G_o - occupancy, percentage; NH - number of overnight stays; LH - number of beds in pension; Z - number of supply days = 365 days; NT - number of tourists; S - average length of stay

Table 20. Pension occupancy indicator 9%)

Pension "Crăița"	2011	2012	2013	2014	2015
The accommodation capacity of the guesthouse	30	30	30	30	30
Nr. overnights	743	892	671	781	701
Go (%)	6.79%	8.15%	6.13%	7.13%	6.40%

Source: own calculations

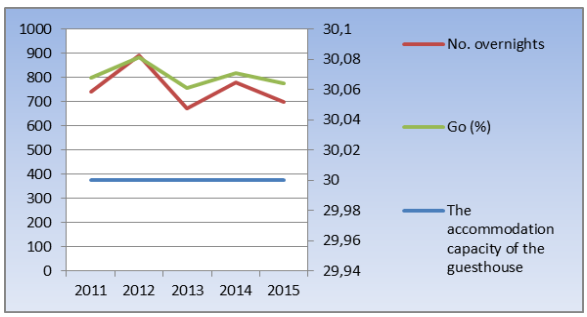

Fig. 16. Pension occupancy indicator

The occupancy of "Crăița" pension varies around 7%.

XI. Tourist density indicator in relation to population density

$$D_{t_{i-0}} = \frac{T_{t_{i-0}}}{Population} \quad \text{(tourists/no. population)}$$

where:

T_{i-0} - total Romanian+foreign tourists;

Pop - local population.

Table 21. Tourist density per inhabitant

Pension "Crăița"	**2011**	**2012**	**2013**	**2014**	**2015**
No. tourists	1371	1512	1267	1434	1317
Population	6897	6880	6837	6814	6766
Dt (tourists/no. population)	0.20	0.22	0.19	0.21	0.19

Source: own calculations

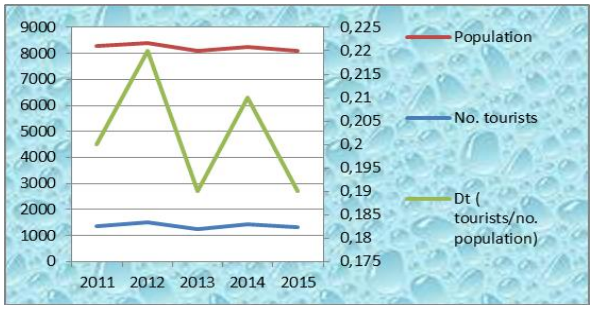

Fig. 17. Tourist density indicator in relation to population density

The Tourist density indicator in relation to population density remained constant at 0.20 tourists/No. inhabitants in the period under review.

XII. Tourist density indicator in relation to area

$$D_{t_{i-0}} = \frac{T_{t_{i-0}}}{Surface} \text{ (tourists/km}^2\text{)}$$

where:

T_{i-0} - total Romanian + foreign tourists;

S - town/village (county) area.

Table 22. Tourist density per surface unit

Pension "Crăița"	2011	2012	2013	2014	**2015**
No. tourists	1371	1512	1267	1434	1317
Surface	286.1	286.1	286.1	286.1	286.1
Dti (tourists/km^2)	4.79	5.28	4.43	5.01	4.60

Source: own calculations

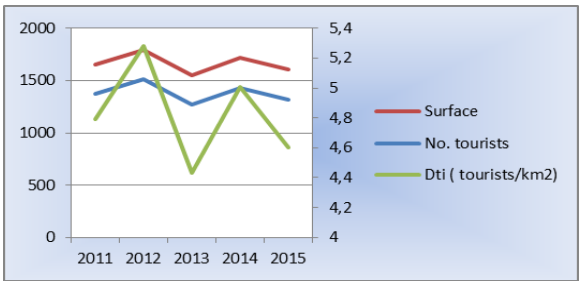

Fig. 18. Tourist density indicator in relation to area

The indicator tourist density in relation to surface is approximately constant, 5.00 tourists/km^2, the difference between the highest value in 2012 and the lowest one in 2013 is 0.85 tourists/km^2.

CONCLUSIONS

In terms of natural resources and tourism anthropogenic resources, the "Doftana Valley" is well represented, the main attractions being the elements of ethnography, folklore and folk traditions, folk art, nature reserves.

In terms of tourist reception, the "Doftana Valley" has a pretty good picture for the future, but it still has room for developing new infrastructures and modernizing the existing ones.

The tourist traffic and tourism supply and demand reflected that tourists come to enjoy spending a relaxing time in this area.

Regarding the indicators determined in the study, the following conclusions were drawn:

- The tourism demand at the Craita pension fluctuated;

-The distribution of the domestic tourism demand had a constant evolution along the period under review, and distribution of foreign tourist demand has fared a slight oscillation in 2013, when it fell.

-The maximum coefficient of the quarterly tourist traffic was recorded in the first quarter;

-The evolution of the overnight stays at the Craita guesthouse both for Romanian and foreign tourists;

-The share of accommodation capacity in the analyzed period registered a constant value because the accommodation capacity, both at the guest house and the village has not changed;

-Tourism density per surface has a constant value, 5.00 Tourists / km^2.

The evolution of the tourism demand in ”Doftana Valley” was determined by a number of demographic, psychological, organizational, who play a decisive role in the various segments of tourism.

Tourism is very closely related to civilization and culture, among these aspects being an interdependent relationship.

Natural, human and financial resources put at the disposal of tourism generate important economic and social effects which increase economic efficiency, progress and civilization.

The complex development of tourism requires as the potential customers to be better informed by mass - media.

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EXCESS MOISTURE - A MAJOR REASON WHY PRODUCING LANDSLIPS

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Abstract

The soil is a porous medium with variable physical time and space that determine certain features of the mass of water flow. Sometimes these features prevent the formulation of mathematical laws describing these processes, requiring approximations of the physical process. For this reason, the approach to water movement through saturated soil to drain requires simplification actual physical processes and how they can be expressed by means of contemporary knowledge. This paper refers to a study on the factors and measures to combat a natural hazard. Natural hazards are several ways, and occur in different circumstances, but this paper will present the production conditions of landslides and methods / measures to combat them. It is known that excess moisture is one of the triggers of landslides. Also, to halt and prevent these natural disasters, various measures are necessary. Besides the determinants of a landslide, the study presents some of the measures against landslides, focusing on the drainage method. Water flow through saturated soil for drainage is a case of plane- parallel motion of fluid particles moving in transverse planes against the perpendicular axis of drainage.

Key words: *landslide, natural hazard, drainage horizontal, hydraulically conductivity, porous environment, excessive humidity*

INTRODUCTION

Landslides are movements of the rocks that form the sides of mountains, hills, embankments or other hydrological works built by people.

Rock movements may occur along the side slope and, as a result of natural phenomena or due to human activity [9].

Landslides leaks and damage not as big as other disasters, but they are dangerous and may lead to the destruction of buildings by moving the rock layer or coating.

Also, landslides can bar the course of rivers, creating lakes temporary or permanent, can produce even destruction of dams by forming a strong wave on entering the lake, suddenly a large rock. [6]

Landslides are a class of natural risk phenomena that define the movement, the movement itself to rocks or deposits on the slopes and the resulting landform. [11]

Typology of landslides Romania

Genetic peculiarities, geological conditions and triggers, for triggering dynamic specifics, activation, reactivation, dynamic stabilization, massiveness and depth of the masses of slippery material, morphogenetic aspects, terrestrial elevation, relief gear that focuses outburst etc., could lead to the possibility of the individualization and typing the specific forms of relief in Romania.

Such features are criteria for defining some types of landslides which dislocated mass of material [12]:

- Superficial landslides, which often involves materials with slope surfaces exceeding approximately 5 degrees (for easy labile materials) and 10-15 degrees when deposits on the slopes and connecting surfaces become wet harder and their dislocation is slower.
- Slips deep (depth) define outbursts of land which causes deposits and rock in place on a section of frequently exceeding 2-5 m depth, reaching even tens of meters. The deeper slips in certain regions are consistent with the so called "massive" slides, which can affect relatively large peak and hilly areas. The reasons why specific slides have such a potential are their size, in terms of length, their resistance to long and repeated reactivation which lead to the creation of

other types of slides. They meet and support role for other categories of genetic manifestation of geomorphological processes (and possibly a different geomorphological) the emergence of other forms of relief, etc.
In this context, the paper aimed to present the determinants of landslides and also some of the main methods/measures to combat them focusing on the drainage method.

MATERIALS AND METHODS

This paper is based on an analysis of factors that determine a natural disaster, a landslide default and measures to combat it.
Methods or measures against landslides are different depending on the triggers that caused natural hazards.
A selection of the control and prevention measures against landslides is presented in this study, namely: to remove the excess water from the slopes, the drainage of surface water and groundwater, the horizontal interception drainage, horizontal drainage, horizontal drainage and systemic stabilization using vegetation improving the physical and mechanical properties of rocks, etc.
And in particular, the main measure to fight against landslides and eliminate the excess is water drainage.

RESULTS AND DISCUSSIONS

Excess moisture, paradoxically manifests itself on slopes, especially on the slopes of the wetter areas with weak soil and low permeability of the lithological substrate, with a weak internal or external drainage.
Excess moisture is located on the slopes, having as source stagnant waters in lowland areas, coastal springs that occur on the slopes and concentrated waters from the slopes. [4]
Excess moisture on slopes is usually more damaging than on flat land, because most times it is a potential factor for triggering landslides.
On the other hand, although they occupy smaller areas, spreading their prints scattered on a uniform dampening effect of excess moisture manifesting larger areas on which agricultural operations are hindered or delayed.
The areas with excess moisture on the slopes are met in the Transylvanian Basin, the North of Moldova and the Carpathian hills, in the springs of the coastal land area and this means approximately 230,000 hectares [4].
Removing the excess moisture and combat landslides are more commonly used than soil erosion.
To establish measures to prevent and combat excess moisture on the slopes is necessary to study the natural environment of the area, to clarify the causes of waterlogging, the determinants of its manifestations and the damage it causes. Sloping land is characterized by a greater geomorphological, lithological and hydrogeological variation, and requires some further studies, especially topographical, pedo-lithological, hydrogeological and geotechnical studies. Hydrological studies must address and specify the characteristics of the aquifer, groundwater piezometrical elevation, groundwater drainage lines, on the slopes knowing that groundwater does not drain evenly.
For the geotechnical characterization in terms of the area it is needed to make a profile for the first waterproof layer, stating the nature, depth and slope waterproof layer overlays and hydraulic conductivity. [4]

Classification of landslides

Due to the large number of factors and combinations of these factors, a large variety of landslides could appear.
Among the many criteria that led to the classification of these phenomena over time, one can mention the following ones: [10]
-depth slip - is one of the main characteristics of landslides, it is found that the depth of the rupture zone could lead to the development of the sliding surface in relation to land area. The landslides classification depending on the maximum depth is presented in Table 1.

Table 1. Classification of landslides depending on the depth of their occurrence

Type of slip	***Depth H_{max} = [m]***
Sliding surface	$H_{max} \leq 1m$
Shallow landslides	$1m < H_{max} \leq 5m$
Deep landslides	$5m < H_{max} \leq 20m$
Very deep landslides	$H_{max} \geq 20m$

Source: [10]

-***sliding speed*** is the speed of the mass of earth sliding down (Table 2).

Table 2. Classification of landslides depending on the speed of sliding

Type of slip	***Speed v = [m/s]***
Sliding extremely fast	v > 3m/s
Sliding very fast	3m/s ≥ v > 0,3m/min
Moderate slip	0,3m/min ≥ v > 1,6m/ month
Slow slip	1,6m/ month ≥ v > 1,6m/year
Very slow slip	1,6m/year ≥ v > 0,006m/year
Extremely slow slip	v ≤ 0,006m/year

Source: [10]

-***direction of evolution process of sliding*** - depending on the direction in which the sliding phenomenon evolves towards the accumulation slip away, there are: *sliding detrusor* (progressive) and *move slides* (regressive);
-***position related to the sliding surface slope or slope stratification*** - according to this criterion, landslides can be: *consistent, in-consistent* (about a landslide, that is oriented in the layers tilt) and *a-consistent*;
-***landslides age*** - this criterion takes into account the time elapsed from the occurrence of slipping and stage activity. Thus, landslides can be: *current or active landslides* and *mudslides old or discharged*;
-***moving-mass movement*** - is how the moving-table moves. As a result, depending on the character of movement, landslides can be: *sliding rotational* and *translational slides*;
-***nature of the material to be slipping*** - landslides may affect the structure's natural slope or may reactivate old body slumps. So, they are divided into: *sliding – first order* and *second-order slides*;
- ***a distance that slipped through the material*** - depending on the feature, landslides include: *proper sliding* and *sliding type flow field*.
The slide includes three phases [9]:
-preparatory phase, slip slow early (ante-threshold processes);
-slipping proper (crossing the threshold geomorphology);
-natural stabilization (balancing processes post-threshold)
In the case of conventional processes, typical landform is defined by [4]:
-ditch detachment,
-slip body,
-head slipping and
-sliding surface.

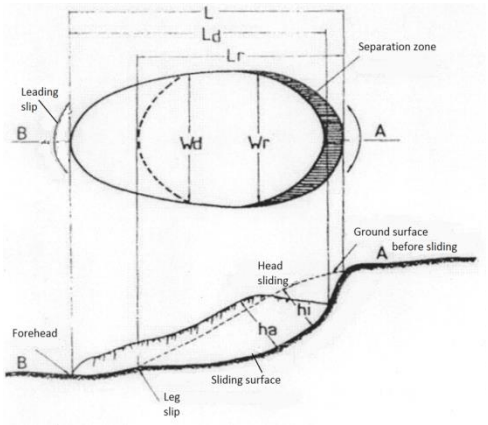

Fig. 1. Main morphometric characteristics of a landslide
Source: [4]

Causes, manifestations and determinants of excess moisture on the slopes
Like the flat land, on the slopes the excess moisture comes from precipitation and groundwater sources. Rainfalls influence excess moisture by volume, intensity and time they fall.
Groundwater is the main source of excess moisture on slopes because the manifestations are more varied, influenced by their succession, tilt and features of layers. Excess surface moisture coming from rainfalls is manifested by over-wetting or ponding of water in the depression areas on hillsides and slopes sloping uneven area sudden switch from a steep slope to a small or a stretch of level ground. Excess moisture groundwater or springs over-wetting manifests itself in the following situations: to change the slope that leads to the decreasing permeable coating thickness; the sudden change in a positive sense, the slope layer waterproof base and thus in the same direction and the groundwater; the slope contact with the ground plane, which can have the effect of decreasing the occurrence of the coating and groundwater; at the intersection with aquifers slope [4].
Waterlogging caused by sources must be analyzed separately as it has various characteristics. By spring, the groundwater reaches the surface. Depending on the

geological situation and the force that causes water, the sources differ downward or upward gravity and springs. Downward springs are the most common and come from aquifers. The water in these layers has a downward movement, the infiltration and to output, under the action of gravity. This includes springs from descending layer of the valley, terraced, scree, and alluvial cones. Descending layer springs come from aquifers between two impermeable layers. They appear to date only in situations when the aquifer is intersected by the action of erosion of rivers. Descending springs occur frequently in the slopes of the valley. Some valleys appear as lines sources [4].

Appear at the bottom springs terraces with permeable contact between deposits of waterproof. The springs are characterized by an upward movement of water through aquifers, first descending line, and then, until they reach the surface, have an upward trend. Water circulation area is under the influence of pressure standpipes. The main causes of excess moisture on the slopes can be of geo-morphological, pedological and anthropogenic nature [5]. Geomorphology of the terrain, the presence of some form of negative or flat micro-relief by changing the slope local land, water and favors accumulation of excess moisture appearance. The soil favors the appearance of excess moisture in the presence of horizons or waterproofing layers with differing permeability, which prevents infiltration and movement of water in the soil and subsoil, or the presence of a vertical horizon surface or substrate show that wetting and swelling clays type montmorillonite greatly reduces its permeability [5]. Man, through erosion control, works to retain water on slopes (waves and channel level) by updating the areas with excess moisture groundwater or springs by terracing slopes lands with internal drainage unsatisfactory, may favor the emergence of excess moisture.

Factors that lead to landslides

Landslides around the globe are responsible for producing significant damage, in terms of both human lives and material side. It is well known that these phenomena with devastating influences unfavorably, both human life, with adverse implications for economic and environment, affecting fauna and flora.

The complexity and myriad forms in which these phenomena can occur is due to the many factors that determine the onset.

The causes of landslides are a consequence of actions duration caused by external factors, acting on slopes or embankments. These factors can be *natural* or *anthropogenic*. Most often, failure occurs because cumulating effects on the mass of the earth. [10] [1].

Natural Factors

Natural factors may be divided into three subcategories: *climatic and meteorological factors, natural biotic and mechanical factors.*

Weather-climatic factors are most important in any form: precipitation, temperature, freeze-thaw phenomenon, the effect of wind, drought, etc. Of all these factors, climatic-weather, precipitation, either as water or as snow, they are responsible for causing the highest number of landslides. Water from this phenomenon comes to seep into the ground, influencing the flow and direction of groundwater flow, with negative consequences on the stability of the slope lands.

For example, homogeneous clays and forces that occur as a result of water infiltration, causing the formation of slip planes at great depths. This is actually normal due to the reduction effort, which is caused by water infiltration, or forces that up, facilitating increase in volume along the slip plane, even if the weight of the upper layer is greater.

Pore water pressure should not be seen merely as a factor that reduces the total unit effort. Many landslides are lamellar due to the presence of water in massive shows. The first rupture does not occur at the base of the slope but at a point where the water comes to the surface massif. Then produce movements of blocks of land being covered springs, and thus obstructed the free discharge of water, soak the ground.

Slips caused due to development of a strong-pressure groundwater at the contact zone of the lower strata more permeable layers with low permeability is manifested by a rapid propagation of surface breaking. The

emergence of new cracks is a matter of hours, fragmenting the land surface into large blocks stretching, even if the inclination massive ground is relatively small. [10], [2].

Biotic category includes the presence or absence of vegetation growth of microorganisms that can lead to chemical transformations, with the possibility of electric potential between the layers and increasing gas pressure in the pores and the nature of vegetation.

Natural mechanical factors are extremely varied and are consistent with the geographic area of the site which shows the potential of slipping. In the category of these factors include: erosion, abrasion, suffusion, of natural causes explosions, earthquakes, volcanic eruptions, etc. [2], [3], [12].

Anthropogenic factors

The second category of factors that may trigger landslides are human factors. They depend strictly on human interaction with the environment. These factors include: excavation activities, uncontrolled leakage of water from hydro networks that contribute to natural hydrostatic regime change, changes related to the initial purpose of using different locations, additional loads of massive ground vibrations, etc. Also in this category of factors may be included uncontrolled deforestation in Romania last year, a phenomenon that led to the conversion of large areas of safe areas and areas with potential slip.

Methods to combat landslides

These methods are different and must take into account the peculiarities and circumstances which led to the situation venue. The difficulty stabilizing the landslide is on determining exact causes and how the information can be taken necessary engineering works which is suitable for every situation.

It should be known in detail the geological structure of the mountain, meaning the hair layers front slope, the character stratifications, the inclination of the slope, tectonic area, hydrogeological conditions at the site, chemical composition and depth that is hosted hydrostatic level, details of any construction the load side and not least, the physical and mechanical properties of rocks.

Adoption of measures to stabilize the site or in certain cases, to limit the effects of the landslide must necessarily be preceded by the establishment plan slip and obviously the depth at which the phenomenon inside the slope.

Depending on all aspects of the above, that the civil engineer has to take into consideration, he chooses the optimal stabilization [10], [3], [12]:

-*Profiling slope* - can be achieved either by reducing the load acting on the upper part of the slope, either by increasing the base weight slip. Such reduction is achieved embankment slope. The advantage of such a solution is provided by the simplicity and lack of execution works very complicated, which normally use concrete.

-*Drainage of surface water and groundwater* - is highly effective, as required in most cases (if the table is made of soft rock slope) because water is the main factor that determines production slip phenomenon. Thus, by this measure to avoid damage physical and mechanical properties of the lands that make up the slope and decrease cohesion.

-*Making filters reverse to reduce the effects suffusion* (washing process and transport of fine particles of rocks loosened by the action of circulation of groundwater) - filters reverse, having a higher permeability than the land on which it protects, plays the role of collecting, draining water and hindering, also suspensions carried in stream water.

-*Stabilization using vegetation* - grassing, various plantations and reforestation measures are helpful with satisfactory effects due to preventing erosion, water absorption and avoiding the appearance of cracks in the soil shrinkage by drying the surface massif. It should not be neglected phenomenon of "reinforcement" that tree roots can have on the mountain.

-*The works of resistance* - are made in order to enhance slope stability or consolidation already produced landslides. The most commonly used are retaining walls. Another benefit of this type of work is that it provides slope erosion protection and abrasion major rivers (longitudinal walls, gabions, Fascia,

etc.).

-*Use of tensioned anchors and cables* - is another solution stabilization, especially where the rocks rocky.

-All category resistance works are part and solutions involving *pilots, caissons, straps and molded walls*. These solutions offer very good results but involve high costs and difficulties can arise in execution.

-*Improving the physical and mechanical properties of rocks* aims to increase the shear strength in the massive sliding. Improvement can be made using electrical processes (electro osmosis), chemical (injection rocks with different chemicals) or thermal (burning or freezing rocks).

Influence of maximum shear strength on triggering landslides

Landslides occur both in soft rock and rocks rocky, indicating that the phenomenon manifests itself differently in the two types of rocks. Thus, unlike the hard rock, the phenomenon of slip occurs suddenly, without being preceded by some obvious signs in soft rocks and in particular clays, slipping occurs relatively slowly, showing deformation clear ground surface [9].

Mobilizing resistance to shear rock, as well as in other materials is dependent on a certain amount of displacement. By shear tests are obtained diagrams effort - which offers travel information on the maximum or peak shear strength *(tf)*, and the last or residual *(tr)* [10], [8].

Effort normal value and nature of the terrain dictates the appearance trips are necessary mobilization of the two values (peak value and the residual). When sliding surface intercepts several rocks of different nature, the safety coefficient calculation must take into account the possibility of ceding progressive. This problem is associated with the fact that the peak value of the shear strength is obtained simultaneously for all the material subject to the breaking of [10], [8].

Failure to mobilize progressive and permanent resistance to shear be taken into account when we are dealing with nature rocks rocky. Where layers are weakened, showing cracks, bear in mind that they do not show a peak, their disposal is producing as a result of relatively large displacements. On the other hand, morphometric surfaces "*fracture - fissures*" and this bridge determine the concentration of tensions, local giveaways, as a result of small displacements and mass displacement that slip jerky.

In clay rocks shear strength mobilization takes place within slips regressive disposal propagate from the bottom [10], [12], [8]. Width sliding area is strictly dependent on geological pressure that arises at the base of the slope. This interdependence of geological pressure and sliding terrace width can be represented in the form of a parable, thus moving-mass width increases with geological pressure at the base of the slope.

As previously stated, the behavior of mass moving-where the rocks were soft, highly dependent on the mobilization of shear strength. In turn, it is influenced shear strength and moisture. For this reason, most landslides were the main cause rainfall.

The friction between particles is influenced by the presence of water and adsorption complex, which leads to a lower angle of internal friction than if non-cohesive lands [8]. If we have a significant percentage of clay fractions and a high humidity, internal friction angle has low levels close to 0. The greater the content of dust and sand fractions, internal friction angle reaches 20 ° -25 °.

Earth structures influence the angle of internal friction. A flocculation-like structure will have a greater friction angle because the links between components particles, while a dispersed structure will be much lower friction [4], [8].

Soil structure and water existing in its influence and cohesion.

$$c = cw + cs + cp$$ [4], [7]

where:

cw - electro-molecular cohesion (primary) generated by the action of complex adsorption and solid particle;

cs - structural cohesion (the cementation) while on cementing ties between the particles;

cp - cohesion capillary pore capillary meniscus on earth.

Primary cohesion is all the more pronounced

the more complex adsorbed water is low and decreases with increasing water adsorbed cohesion. The cementation cohesion is the component of cohesion which can be defeated only by disturbing the natural structure of the land and the destruction of links between particles. This destroys the loess land easier, because the cementation bonds between particles are easily damaged by water [4], [7].
Capillary cohesion disappears with the disappearance of capillary water and often can be neglected. Thus, we can list the main causes underlying the fracture and progressive mobilization of landslides [10]:
-emergence of new successor sliding surfaces;
-differential movement of rocks along the sliding surfaces that develops;
-creep depth;
-appearance of residual stresses in the rock mass;
-gradual destruction of the mountain, and the action of water infiltration caused by frost;
-gradual redeployment of forces normal due to changes in the normal exercise of sliding along the surface;
-variation of pore water pressure in rock mass, moving-mass displacements due.

Drainage of higher quantities of water from micro-depressions exhaust directed inflow leakage shallow water on slopes and diverting streams through ditches coastal area upstream of the ditch detachment to make the reduction of displacement and, where possible stagnation / outburst halting land. It is understood that such a draining should last until the effects are found, proving slipping out of its dynamic phase, after which they may be applied and technical operations building sectors slopes risk situations being removed [4].

Horizontal drainage interception. Removing excess moisture in the mesh and cloth located to date is carried out by means of interception drainage, which is designed to intercept the water-bearing layer upstream of the cloth. Intercept drains are placed transversely to the direction of flow of the water, the upper limit of the excess of water.
For aquifer with depths up to 2-2.5 meters, drains are posing even waterproof layer, because in this case ensures a more efficient water capture. To determine the most appropriate route interception of drains will be a recognition of their route through delimitation low of the stagnant water, the vegetation study, key elements that enable knowledge of water movement on slopes. Drains will be built of stone or corrugated PVC tubes with a maximum diameter of 40-60 cm tall filter layer. Collector drains that meet only a collector will run without filtering prism. Coastal springs that appear to date is captured using drainage capture that converge in a home visit, where water when growing vineyards and orchards, is discharged through a drain collector in ponds specially designated [4] .

Horizontal drainage lands with horizontal drain excess water table is the ideal solution permanent. Water circulation on the slopes is done on certain routes; evenly distributed drainage scheme is different from flat land. Therefore will not design a systematic network of drains dense, evenly spaced, and pictured at the same depth. These lands will follow drains groundwater circulation routes, resulting in different schemes of those on flat land, as distances, lengths and depth, but the situation requires execution of a large number of homes, falls and changes in direction. Drains may be of Fascia, stone, PVC tubes, and ceramic, located at a depth of 1.20-1.60 meters. Whatever type of drain, there is a danger of warping higher than on flat land, the pad is required [4], [5].

Horizontal systemic drainage is recommended to be used when at the foot of appearing areas with excess moisture in the soil profile, on hillsides with slopes up to 8-10%. In this case, use diagrams and technical elements of flat land suitable for drainage [4].

-Existing drainage water from aquifers under the slopes can be another way of preventing movement on the slopes, thus making the possibility of lowering the degree of soaking materials and rocks that are part of them. Wells and ditches for drainage conveniently located, allowing acceptable discharge of large quantities of water. Such a process is particularly necessary for the slopes situated in the vicinity of settlements at risk of outbursts geo-morphological field [4].

Original approaches to problems of leakage through the soil to drain to determine the technical elements of planning that is presented in this paper based on a conception of modern physics, based on experience in the theory and practice of drainage.

- The leak water through the ground case is fed to the drain of the plane- parallel motion of fluid particles moving in cross-sectional planes perpendicular to the axis of the drain;
- If homogenous and isotropic media drainage process described by *Darcy 's law* and continuity equation which shows the current function;
- Analytical solutions applied in solving this problem are applicable only under certain conditions imposed on the domain geometry that studies the movement of filtrate or the values they can take debit or hydraulic conductivity;
- Solutions have the advantage that the numerical approximation can be fine as desired, which leads to accurate results.

Regarding the calculation of the distance between drains by H_{max} we obtained the following graphs and the calculation of *Hontus-Carabineanu formula* (*):

$$\frac{L}{2} = -0.7185 \cdot D + D \cdot \sqrt{0.5163 - 3.1240 \cdot \frac{k}{q}\left(1 - \frac{H}{D}\right)}$$

(m) [4].

And the calculation for determining the final distance between drains obtained has the form - *Hontus-Carabineanu formula* (**):

$$\frac{L}{2} = -0.7185 D + D\left[0.5163 - 3.1240 k\left(\frac{1 - \frac{H}{D}}{q}\right)\right]^{1/2} \quad (m)$$

[4]

where:

D - distance between the drains and impermeable layer (m)

k - hydraulic conductivity (m/day)

H - groundwater hydraulic load (m)

q - discharged by drainage flow (l/s ha)

Strengthening resistance by damming the type of massive fences and deep as their sole fixed with the mass movement of materials and exposed rocks sliding along steep. Such technical corrections are effective for medium depth and shallow landslides, if there is a high percentage of their insurance status of stability returning to the slopes with starting field [9].

Strengthening the slopes with torrential correction works (if undermining it by a watercourse) and/or walls (in the case of valley roads) [9].

Remove excess water from the slopes

Remove excess water from the slopes can be achieved by capturing and removing water from surface and groundwater flowing to the area with excess moisture and even lowering of the groundwater depression areas - thalwegs. Depending on the source of excess moisture and intensity of the event, we recommend the following disposal methods: deep loosening, drainage-mole, modeling - leveling on slopes, if excess moisture manifests short time; collection and disposal channels and shoals drain, where ponding temporary or permanent; horizontal drains of interception (capture with free cavity filled with filter material or coarse) in the case of springs in strips or over-wetting and isolated spots; horizontal drains, systematic, if over-wetting in isolated spots or "mosaic" associated with secondary measures; horizontal drainage associated with amendment if excess moisture associated with processes "salinization" sewers or drains horizontal platform for over-wetting roads or terraces; Vertical drainage catchment ponding evacuation of small depressions located in the watershed, on the slopes with risk of landslides if the situation is favorable geomorphological - free shallow aquifer [4].

The presentation methods of removing excess moisture on the slopes are of a remarkable complexity of the issues that must be considered when choosing solutions, trouble insufficiently studied the theoretical and practical in Romania.

So far, it has paid greater attention to combating soil erosion compared to remove excess moisture and preventing landslides. As a result, the arrangement of slopes when plantations were reported alive fitting errors that favored the maintenance of excess moisture and even landslides. [11] The basic principle in removing excess moisture on the slopes is related to improving water flow to

surface slopes and preventing groundwater supply. Therefore, to combat erosion will not provide water retaining works, but works to foster leak interception and prevent the water supply from the slopes in a short time. The paper base is the leveling downhill slope, replacement channels coastal level and wave horizontal channel and waves inclined to be to intercept water runoff to lead them into outlets and discharge them from the slopes. The terraces will be designed to trim outlets to 1-3%. Channel coastal location will be the slope changes, limits land uses, roads, particularly in upstream areas of stagnant water.

CONCLUSIONS

The complexity and the numerous forms, where landslides may occur is due to the factors that determine the onset of the phenomenon.

The forces acting in a destabilizing effect on the massive earth must overcome this resistance, for the phenomenon to be triggered.

The foundation for premises in large slope and showing layers of fillings must be chosen so that the loads transmitted by construction can be covered properly without affecting the balance of morpho-dynamic site.

While tracking and managing controlled hydrostatic level of surface waters, the sites that are at risk of sliding is also a method that can give satisfactory results. Construction of infrastructure works may cause changes in steering and water circulation areas of surface and depth.

The original calculation formula presented in this study is able to solve some practical problems with the design or rehabilitation facilities for underground drainage and combating erosion under certain conditions.

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PROFESSIONAL MOTIVATION – DECISIVE FACTOR FOR INCREASING THE PERFORMANCE OF THE STAFF

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Abstract

Work motivation as a human phenomenon, in general and psychologically, particularly, arises from the interaction between the individual and the organization. The result of this harmonious interaction will necessarily lead to increased organizational performance. In the specialty literature on performance management circulates the idea that the relationship between motivation and performance is a cause and effect relationship. Usually, motivated employees contribute to the enterprise performance. In this article, it is described the relationship between motivation and work performance of employees, and there are presented the results of a study conducted on a sample of 589 respondents / employees in the SME sector (Small and Medium Enterprises). The purpose this study lies in research and complex analysis of motivational factors in relation to job the performance of employees.

Key words**:** *motivation, performance rewards, SWOT analysis*

INTRODUCTION

The success of organizations in activities largely depends on its human resources. In turn, the quality of work done and their involvement in proceedings depends largely on the motivation they have. [1]

One of the strengths of motivational policy adopted by managers is knowing the real reasons of the employees.

In addition, the same reason may influence employees through various behaviors. For example, if an employee wants a rise on the corporate ladder, he will opt for *performance,* avoiding discriminatory actions or will be assertive in front of the boss. [3]

Performance and prestige of an organization can depend to a significant degree on managerial motivation programs and employee training.

Adjusting the relationship between **motivation and performance** is also achieved through *aspiration level.*

When an employee is performing a task, he can have a sense of success or failure.

The level of aspiration is defined as ”expectations, goals or future claims of individuals on the implementation of a given task.” [4]

The level of aspiration has both a motivational and cognitive-evaluative component, since it is formed depending on the image that an individual has about himself and about the performance achieved prior to certain types of tasks.

Research has shown that both too intense motivation and motivation too low in an activity can lead to poor performance or even failure.

The *Yerkes-Dodson law* implies that performance growth is proportional with increased motivation only up to a point, beyond which is the stagnation and even regression. [5]

In these circumstances, appeared the question of the optimal level of motivation to lead the individual to achieve high performance in their activity.

The answer to this problem is found in **the Optimum motivation law.** (Fig. 1.)

Motivation is a complex process affected by a wide range of factors.

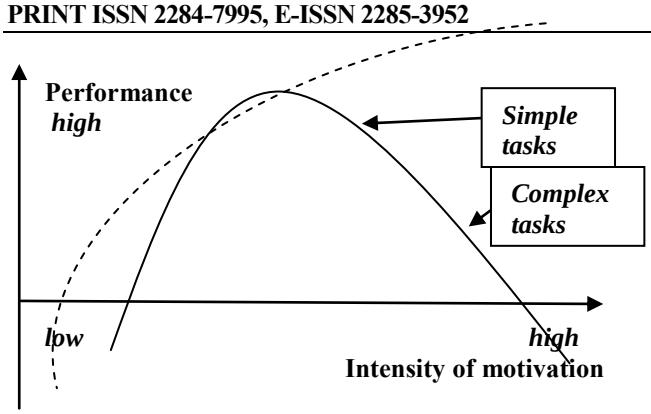

Fig. 1. The relationship between motivation and intensity depending on the difficulty of the task performance
Source: Elaborated by author based on the source [5].

If we look through the motivational frame or the motivational environment, then we can develop the well-known SWOT analysis of this environment, identifying factors both of internal and external order, shown in Table 1.

Table 1. Analysis of the motivation of the employee organization

Strengths	Weaknesses
Managers know the motivations of the staff	Lack of transparency for the motivational tools for employees
The organization has developed a motivational human resources policy	Lack of policies, strategies or programs to motivate employees
The transparency of the motivational tools for employees	Lack of sources for employee motivation
Adequate system of rewards	The material rewards system focused only on salary
Assertive communication between management and employees	Neglected motivational aspects by managers
Opportunities	**Threats**
Managers and employees participation in programs for developing motivational skills	The competitors offering a more attractive reward system for employees
Public policies to motivate and reward employees	Brain drain
Identification of financial sources to reward employees	High turnover of staff within the organization

Source: Elaborated by author.

Job performance are, in fact, the resultant of multiple factors based on employees, managers, of the material and organizational-material frame and motivational system of the organization. [2]

MATERIALS AND METHODS

The purpose of this study lies in the research and complex analysis of motivational factors in relation to the job performance of employees.
The methodology of the study focuses on methods such as: qualitative and quantitative data analysis, synthesis, comparison, scientific documentation.
One of the primary sources of information of this study was interviewing a sample of 589 respondents/employees in the SME sector (Small and Medium Enterprises) in Moldova.
The author also developed the SWOT analysis on the motivation of the employees in the organization.

RESULTS AND DISCUSSIONS

Proper motivation of the staff in a company is carried out primarily through the implementation of the reward system for employees.
Even if the management theory and practice uses a number of terms to describe the rewards, the salary remains the most common term for rewarding work.
The average monthly salary of an employee, based on activities, in the first half year of 2016 increased from 4,600 MDL to about 5,150 MDL.
If we convert these amounts in dollars or euro, then we have an average earning of an employee on the economy in the first half of 2016 ranged from 230-260 USD or 208-229 Euro.
The data contradict the Government Decision on approval of the average monthly salary amount in economy forecasted for 2016, which provided an amount worth 5,050 lei, for use in accordance with legislation.

Table 2. The average monthly salary of an employee by activities in 2016 (MDL)

Months	January	February	March	April	May	June
Total	4,665.8	4,650.6	4,749.7	4,909.6	4,863.9	5,169.7
Agriculture, forestry and fishing	2,677.1	2,861.0	3,003.2	3,096.1	3,040.6	3,122.1
Industry	4,837.7	4,843.2	4,982.5	5,290.6	5,159.1	5,275.1
Information and communication	9,534.2	9,928.7	12,310.5	11,153.8	10,869.0	10,933.8
Financial and insurance activities	9,040.2	8,723.3	10,503.5	11,206.1	9,136.3	9,828.6
Education	3,708.5	3,789.3	3,686.0	3,715.8	3,908.7	4,438.3
Health and social care	4,354.4	4,097.6	4,207.1	4,672.7	4,492.4	4,903.5

Source: Elaborated by author based on the National Bureau of Statistics of Republic of Moldova

This amount was determined in accordance with macroeconomic indicators forecasted for the years 2015-2018.

Although the amount is 12% higher than in 2015 (4,500 MDL) Moldovan salary for employees remains more a demotivating factor than a motivational one.

Meanwhile, a study on Time Use, developed by the National Bureau of Statistics with the support of UNDP, the value of unpaid work effectuate annually by Moldovans is about 95 billion MDL, including the contribution of women by 64% and men by 34%.

Table 3. Time Use Tab for free labor in Moldova (hours/day)

Total	***Women***	***Men***
3.9	**4.9**	**2.8**
Free labor depending on environment	*Rural areas*	*Urban areas*
	4.9	**3.8**
Free labor depending on a person's income	*Less than 5,000 MDL / month*	*More than 5,000 MDL / month*
	4.6	**3.5**

Source: Elaborated by the author based on the National Bureau of Statistics [6].

It is worth mentioning that the study results developed on a sample of 589 employees of SME sector (Small and Medium Enterprises) in Moldova has shown that over 72% of respondents consider salary as a determined motivational factor.

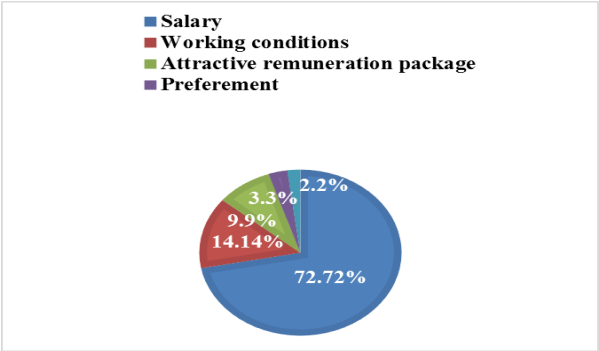

Fig. 2. Motivational factors in labor
Source: Elaborated by the author based on the analyzed sample.

Analysis by their sex shows some discrepancies between women and men. For women, the salary consists of 56% from the entire motivational system, and for men it exceeds 85%.

An equally important factor in achieving performances are the conditions of employment. These conditions job satisfaction, especially for women.

The reward wage of the employees must have a fair and transparent character in the opinion of those interviewed.

In the opinion of respondents, pay equity is perceived differently.

Results reflected in figure 3 demonstrate that only 13% of respondents appreciate the rewards as largely fair in relation to colleagues, 43% appreciate rewards in average equity and 23% in small measure. In the same context, 21% of respondents deemed that the rewards are not fair at all, compared to their peers.

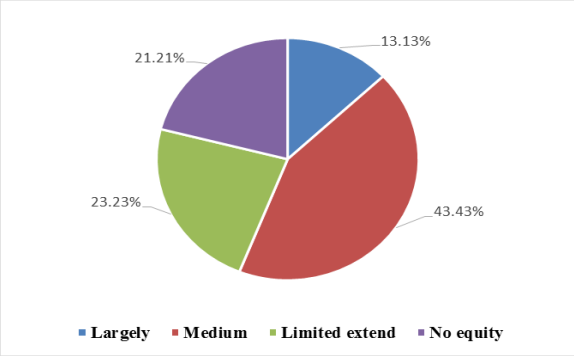

Fig. 3. Assessment of equity by respondents
Source: Elaborated by author based on the analyzed sample.

Since the purpose of the study was the complex research and analyzing of motivational factors compared to the performance of employees, one of the questions is related to ways to reward employees.

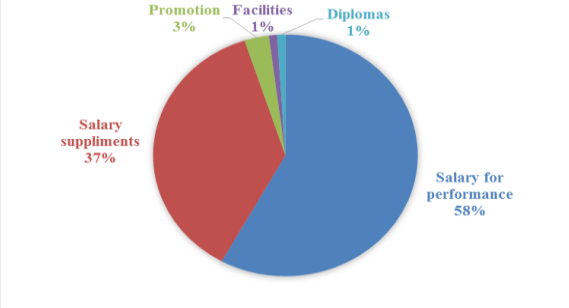

Fig. 4. Rewards requested by employees according to performance achieved
Source: Elaborated by author based on the analyzed sample.

The data in Figure 4 demonstrates that financial rewards play a decisive role in obtaining performance this year and are about 58% of the interviewees.

In addition, the benefits paid on several occasions stimulate employees to work better.

Even if only 1% of those surveyed would receive praise for the performance achieved, moral and spiritual motivation finds its place in the Moldovan companies.

CONCLUSIONS

Motivation is a frequently discussed topic in both academic and economic or social environment.

If managers see motivation as an effective solution for the good course of the organization and achieving a certain level of performance, then employees consider it as an essential part for individual development.

However, excessive motivation or demotivation in an activity can lead to poor performance or even failure.

The salary remains the most common term for rewarding work and over 72% of respondents consider it as a decisive factor in motivating.

The financial rewards requested by employees based on the performance achieved holds the largest share in the opinion of those interviewed.

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PRODUCTIVITY OF LABOUR IN AGRICULTURAL ENTERPRISES IN SELECTED EU COUNTRIES

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Abstract

The objective of the article is to indicate the differences between labour productivity in the Polish agriculture and the EU countries, with special emphasis on the largest producers of food. The article makes use of the data from the Central Statistical Office (GUS) and Eurostat. The difference between the labour productivity in the Polish agriculture and in leading European farms is very significant (German, British or French productivity is 6-7 times higher). The limited growth of labour productivity in agriculture results from endogenous and from exogenous factors.

Key words**:** *labour productivity, agricultural, SO, AWU*

INTRODUCTION

Labour productivity is the basic factor determining the level of economic development of a society, resulting in differences in the level of wealth among the respective sectors of the economy. It follows from the Eurostat data that the level of labour productivity in European farming is lower than in other areas of national economy.

The productive use of labour resources in the agriculture also constitutes one of the factors decisive for the competitiveness of enterprises in the domestic and international markets. Labour productivity is specified based on the consumer goods produced by people in a unit of time, it allows to determine the manufacturing or service-related effects per one person employed in the agriculture. Labour productivity is an economic category which expresses the socially necessary labour input that is changing over time, together with the development of production capacities. The research into productivity of agricultural labour, in terms of the endogenous and exogenous factors that shape it, allows, among others, to assess the current condition of agriculture, including from the social point of view. The value of the goods produced by the given employee determines the level of its personal remuneration and living condition. Obtaining high labour productivity is commonly considered to be one of the most important developmental parameters of economies, because it leads to a reduction in production costs and an increase in supply of goods. It adds dynamism to the market and increases the purchasing power of societies, their wealth and competitive capacity.

That is why this article attempts to assess whether that condition results from the objective conditions of agricultural production, resulting, for example, from its limited and natural character. Or maybe are dynamic parameters decisive, such as, for example, the slow pace of agrarian changes in the European Union. The discussed issues belong to mainstream economy and refer to the problem of balance among production factors, mainly the relationship between the land and the labour factor.

MATERIALS AND METHODS

The objective of the article is to indicate the differences between labour productivity in the Polish agriculture and the EU countries, with special emphasis on the largest producers of food. Gołaś (2016) and Golas & Kozera (2008) indicated that labour productivity is an economic category which expresses the socially necessary labour input that is

changing over time, together with the development of production capacities [3, 4]. The article indicates the differences in agricultural enterprises, taking into account their size, in compliance with the neoclassical model of structural changes taking place in the agriculture which emphasizes the relationships between the size of agricultural enterprises and the scale and capacity of production. That model assumes that only a sufficient scale of production may provide high management efficiency [2]. The increase in the physical and economic size of entities leads to consolidation of their competitive position in the market through benefits of scale, to improvement of their negotiation position in business relationships, etc.

There are many studies devoted to the issue of productivity of labour in agriculture. Retinger and Kristkova stated that its level mainly depends on the outlays on research and development [7]. In turn, there is observed a rising relationship between productivity in the agriculture, access to knowledge resources, and the level of outlays on R&D.

Muguera with his team emphasizes the sources of changes in productivity and profitability at the level of agricultural enterprises, by their size and specialization. The main source of total factor productivity change is technical change. The upward-shifting frontier results in declining technical efficiency. Results point towards the need to support research and development without ignoring efforts to encourage the uptake of existing technologies [5]

It follows from Popescu's research that the level of productivity of the labour factor in agriculture is several times lower than outside it. [6]. The author indicates that, for the purpose of improving labour productivity, advanced technical resources should be introduced, the transfer of knowledge to farmers should be increased, and their level of training and managing skills should be improved. These complementary activities should be executed both within the Common Agricultural Policy, and within the economic policies of the respective EU member states.

The study takes into account the dynamics of changes in labour productivity and the factors determining it in comparison with the period from before Poland joined the European Union. That is because the implementation of the Common Agricultural Policy instruments was conducive towards the adaptation of structures of the Polish agriculture. The applied measure of labour productivity in the form of standard output (SO) in EUR per an annual working unit (AWU) is of estimated character. It results from the manner of calculating standard production which does not reflect the factual condition of agricultural enterprises. The article makes use of the data from the Central Statistical Office (GUS) and Eurostat.

RESULTS AND DISCUSSIONS

Trends in employment in agriculture and their impact ob GDP

Table 1 presents the tendencies in employment in the agriculture and its impact on the gross domestic product in the years 2002 – 2014. The selection of that period allows to analyze the changes from both before and after Poland joined the European Union, as well as in the period of over a decade of experiences associated with the accession of Poland, including the experiences of the agricultural sector. It follows from the data presented that the share of people employed in the agriculture decreased slightly, by 1%. It mainly results from the increase in employment in the whole domestic economy. However, in terms of absolute values, there was recorded an increase in employment in the researched period by ca. 65,000 people, mainly visible in the last two years, i.e. 2013 – 2014. That increase was caused by an impairment of the pace of economic development, measured based on the indices of dynamics of the gross domestic product, and thus by a lower influx of labour resources to the non-agricultural areas of the economy. In the analyzed period, the value of GDP in current prices increased almost 2 times, while GDP in the agriculture – 1.7 times. Against the background of quite dynamic growth of the whole economy, the pace of development of agriculture was slightly lower. The result was the maintained

difference in labour productivity in comparison with the productivity of the persons hired in other sectors of national economy. However, taking into account the data from the 1990s [9], we find that the process of increasing difference in the productivity of the people employed in the agriculture and in other sectors of the national economy, was stopped. This definitely resulted partly from the accession of Poland to the European Union, and from the opening of markets to agricultural and food products [1].

Table 1. Share of people employed in the agriculture and share of agriculture in the gross domestic product in Poland

Years	Share of people employed in agriculture among all the people employed [%]	Share of agriculture in the gross domestic product [%]	How many times general work is more productive than work in agriculture
2002	16.3	2.7	6.0
2003	16.5	2.6	6.4
2004	16.5	4.5	3.6
2005	16.2	4.1	4.0
2006	15.8	3.7	4.3
2007	15.1	3.8	4.0
2008	14.8	3.3	4.5
2009	15.0	3.2	4.7
2010	15.2	3.3	4.6
2011	15.1	3.6	4.2
2012	16.8	2.9	5.8
2013	15.6	2.9	5.4
2014	15.5	2.6	6.0

Source: Own study based on the 2003 – 2015 Statistical Yearbooks, issued by ZWS, Warsaw [8].

It follows from the Eurostat data that the highest employment rates in the agricultural sector appeared in the regions with majority of rural areas – in Romania, Bulgaria, Poland. The share of agricultural employment above average was also observed in Portugal and Greece. In turn, the share of agricultural employment below 5% in rural areas was noted in six member states – Belgium, Denmark, Germany, the Netherlands, Slovakia and Sweden.

The high level of employment in agriculture is accompanied by the relatively low share of that sector in the generation of the added value in the whole economy. This means that work productivity is lower than in the case of –on-agricultural sectors of the economy.

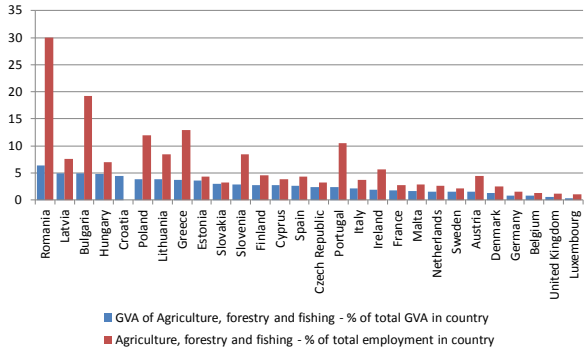

Fig. 1. Share of agriculture in gross value added in % and the share of employees in agriculture in EU in 2014. Source: Own calculation.

Figure 1 presents the dependence between the share of the agricultural sector in the added value of the economy, and the proportion of people working in agriculture in the EU countries in 2014. The works situation is in the case of Romania, Bulgaria, Poland, Greece and Portugal.

Work productivity

The average labour productivity in agriculture in EU-27 was 14,786 euro per work unit in the period of 2010-2014. In 15 old EU states, the average labour productivity in SO per AWU (EUR 25,140/AWU) is six times higher than the average for 12 states that joined the EU in 2004 and later (EUR 4,730/AWU). The highest labour productivity was recorded in Denmark (EUR 53,600/AWU, i.e. 3.5 higher than the EU-27 average), then in the Netherlands (EUR 48,450/AWU) and Belgium (EUR 38,620/AWU). In turn, Latvia, Bulgaria, Poland and Romania were characterized by the lowest labour productivity in agriculture, from EUR 3,340/AWU for Latvia to EUR 4,318/WAWU for Romania.

The value of standard production (SO) per AWU increased in the whole EU by ca. 27% (4.5% annually on average) between 2005 and 2014. The highest increased in labour productivity was recorded in the Baltic states (+ 11.25% annually on average), then in Bulgaria and Romania (+10% annually). On the other hand, many older member states (e.g. Ireland, Germany, Spain and the

Netherlands) have very low or even negative growth rates of the value of standard production per AWU. This may mean that those countries reached the maximum level of labour productivity which will be difficult to exceed with unchanged conditions.

Despite the recorded increase in labour productivity by ca. 30% in the period of 2005-2014, Poland is one of the countries with the lowest labour productivity, below EUR 20,000 per person employed in a statistical agricultural enterprise. Labour productivity in a Polish agricultural enterprise is three times lower than the EU average. Taking into account the size of agricultural enterprises, the smallest distance from the EU average is visible in the agricultural enterprises in Poland of the area of over 100 ha of usable agricultural land, 50-99.9 ha and without usable agricultural land [Eurostat]. In those groups, the differences in productivity among Polish enterprises and the EU average amounted to 27,45 % and 46%, respectively. At the same time, the largest differences in labour productivity referred to the enterprises with 2-4.99 ha and 5-9.99 ha – over 60% in terms of standard production per AWU.

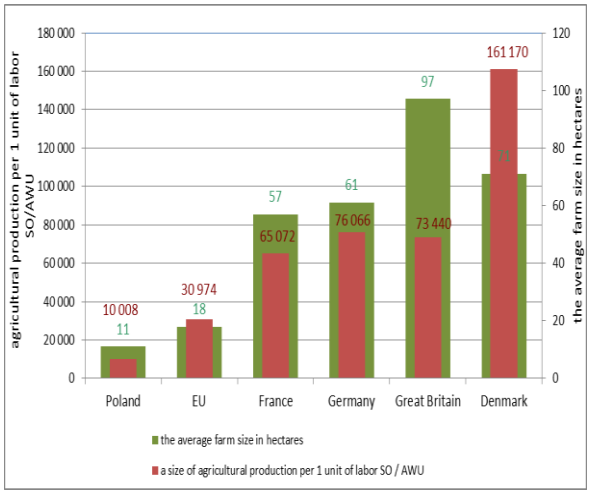

Fig. 2. Average farm size in Poland in ha and SO/AWU in comparison to EU and selected countries in 2014
Source: Own presentation based on EUROSTAT. http://ec.europa.eu/eurostat/web/agriculture/data/main-tables (10.10.2016)

Figure 2 presents the information on the average area of agricultural enterprises in Poland and selected EU countries. Even bigger differences, to the detriment of the Polish agriculture, are visible in comparison with the largest agricultural producers of the EU. A statistical agricultural enterprise in Poland is smaller, in terms of surface area, than the EU average, and several times smaller than those of the main competitors.

Labour productivity in a Polish agricultural enterprise was several times lower than in the countries leading in agricultural production. The highest labour productivity was demonstrated by the agricultural enterprises in Denmark (over 160,000 euro of standard production per AWU), the productivity of which was 16 times higher than in Poland. In turn, the labour productivity in Germany, Great Britain and France was ca. 6-7 times higher than in Poland.

CONCLUSIONS

The labour productivity in the Polish agriculture is affected by the high level of employment, in particular in comparison with the countries of the EU. The rate of people employed in agriculture was 15.5% in 2014, and was one of the highest ones in the EU, next to Romania and Bulgaria. In 2014, the people working in the Polish agriculture constituted 1/5 of all the people working in the EU agriculture, so almost the same number as France, Spain and Germany together.

Labour productivity in the Polish agriculture is many times lower than in the remaining sectors of the economy. It follows from the first table that labour productivity in agricultural enterprises is ca. six times lower than in other sectors.

The difference between the labour productivity in the Polish agriculture and in leading European farms is very significant (German, British or French productivity is 6-7 times higher).

Due to the complex situation in the market of agricultural products in Poland, the significant overproduction of food, and sustaining effects of the Russian export embargo, a fast improvement of the labour productivity in agriculture is not to be expected.

The limited growth of labour productivity in agriculture results from endogenous factors,

i.e. high level of labour resources in agricultural enterprises, and from exogenous factors, i.e. complex market condition resulting from restrictions on exports.

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ASSESSMENT OF MECHANIZATION CHALLENGES OF PEASANT FARMERS IN GBOKO LOCAL GOVERNMENT AREA, BENUE STATE OF NIGERIA

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Abstract

This study assesses the mechanization challenges of peasant farmers in Gboko Local Government Area of Benue state in Nigeria. The peasant farmers produce over 90 % of Nigeria's agricultural output and these peasant dwell in the rural areas wherein about 60 % of the population live. The vast majority of these farmers have serious challenges in accessing modern inputs and other productive resources, including education and they are unlikely to have access to assortment of fertilizers, hybrid seeds and irrigation. This study employed a multi stage sampling techniques to collect information on the socio-economic characteristics of the farmers and available machinery. Analysis revealed that farmers in the study area were relatively low educated. Most of the farm sizes in the study area are in the range of 1-5 ha, most of the needed modern machinery were not available and many of the farm operations were carried out manually, that is, land clearing (70.56 %), tillage (91.77 %), planting (78.79 %), fertilizer application (84.85 %), weeding (65.80 %), and harvesting (80.52 %). This study also show that majority of respondents were smallholder farmers who were often too poor to employ the available machinery. Despite this ugly situation, over 75 % of the foods consumed in this country come from these peasant farmers in rural areas. The current world food situation, socio-economic and population displacement as result of internal and external conflict of all kinds, this situation of peasantry should not be allowed to continue if the population must be salvaged from hunger.

Key words**:** *assessment, agricultural mechanization, farm operations, peasant farmers, Gboko LGA*

INTRODUCTION

Agricultural mechanization is a complex field embracing the science of materials and forces of nature in development, exploitation and management of equipment and installation that enhance scientific production in agriculture. Agricultural mechanization does not only mean the use of tractors (tractorization), it also includes the exploitation and management including the selection and replacement, of mechanical facilities and equipment for field production, water control, material handling as well as post-harvest operations [25]. [14] stated that agricultural mechanization encompasses the use of farm equipment including the power sources that are used to operate the various machines. [15] take it to imply increase in production per worker and per hectare of land cultivated while others take it to be the act of making judicious use of agricultural inputs such as seeds, irrigation water, fertilizers, fungicide herbicides/insecticide and farm equipment in order to promote cost efficiency through maximum output and economy of large scale.

Agriculture is the most important economic activity in Nigeria, in terms of revenue (apart from oil sector revenue) especially in the rural areas. According to the national survey conducted by the Federal Ministry of Agriculture which assessed the quality and quantity of food production and agricultural development in Nigeria in the period 1973-1985, there was an enormous problem of modernization of the country's agriculture being devoid of the dissemination of modern technologies for agricultural production [16]. This was to be brought about by investment in

mechanical technology programmes through public delivery system such as Agricultural Development Agencies (ADP), Operation Feed the Nation (OFN), Green Revolution, River Basins Development Authority (RBDA) and other agricultural development institutions.

Mechanization is a new technology to the farmers in the study area; this is as a result of limited spread of machine use, the prevalence of small and fragmented farm holdings, lack of sufficient capital to acquire the machines and also the effect of cultural practices [6]. In addition, illiteracy of the majority of the farming populace, inadequate rural infrastructural facilities (road, water and electricity), unavailability of spare parts, insignificant number of trained machinery operators, poor credit facilities, inadequate research programmes, etc contribute to in their inability to cope with the much needed foreign technology [19].

Mechanization inputs are often subsidized by government to lower prices for tractors and machinery purchase and/or hiring to small and medium scale farmers. Though this may appear to be disadvantageous to private large scale farm holders but the insignificant number of such farm holders as often justified such intervention of government concerned with ensuring adequate supply of food and raw materials for the populace [3]. Another point of consideration is the cost of the labour supply. It is difficult to assess the costs of power in near-subsistence farming where human labour and in some areas, draught animal power are likely to be the dominating power sources [2]. Consequently it is not possible to make a convincing exact comparison of costs for alternative farming systems under varying degrees of mechanization and with a variety of power sources. Smallholding farmers readily accept cost payment in cash or kind, that is to say there is flexibility in medium of exchange of services. In the advanced nations of Europe, United State of America and the “Asian Tiger” the introduction of mechanization brought about optimization of inputs, labour efficiency and high output. The initial application of agricultural mechanization was tractor entrance to the land, but during last century or so, it has found several interpretations; and the description was changed from tractorization to precision farming [7]. Consequently there emerged improved agricultural output as well as deliberate conscious departure from the peasant and subsistence agriculture into commercial agriculture [22]; [20]. Today it is an obvious fact that agricultural mechanization has made a significant contribution to agricultural and rural development in many parts of the world, Levels of production have increased, soil and water conservation measures have been well developed; profitability of farming improved which in turn improved the quality of rural life thus stimulating the development of the industrial and service sectors which transformed the rural areas [24]; [4]. It is the progression of technological innovations that have influenced the emergence of all societies throughout the world in the twentieth century [10]. [9], including high crowded populations, which made it difficult to attract or retain labourers to work in the farms. Much of the stimulus for agricultural mechanization has come from labourer shortages in the more economically advanced countries. Mechanization reduces agricultural labour and can reduce or remove high labour costs in countries where energy is cheap. But for poorer countries, mechanization activities increase costs as a result of high consumption of fuel, diesel, oil, spare parts [21]. The present state of mechanization in Nigeria agriculture is still far from foundational and therefore left much to be done, moreso, in the study area. This is because mechanization plan has not been formulated following a well-designed, reliable and thorough analysis [17]. The current level and practice of agriculture in Nigeria is characterised by low level of distribution and utilization of farm machinery and associated implements for farm operation [18];[12]; [23].

The government policy on agricultural mechanization was to encourage the development of efficient "home grown" tools, equipment and systems which improve agricultural production and productivity,

relieve the continuously increasing labour constraints, enhance farmer's income, reduce food imports, increase food export and save foreign exchange [8]. Consequently the National Centre for Agricultural Mechanization (NCAM) was established and it was envisaged that it would accomplish these tasks through carrying out, among other functions, the standardization and certification of agricultural tools, machines and equipment in Nigeria, as well as testing and evaluating the suitability of all types of imported and locally developed agricultural tools, machines and equipment already in use and those proposed to be used in Nigeria [6]. Thus, there has been a long felt need in Nigeria by the government, concerned institutions and individuals to use standardization to promote the evolution of appropriate agricultural mechanization through a rapid development of indigenous agricultural equipment since it was realized that standardization represents the "fastest vehicle" to integrate agricultural mechanization to technological and economic development of the nation [1].

The objective of this study was to see how the challenges of farm mechanization in the area could be confronted for the benefit and progress of the farmers and Gboko LGA. Taking into consideration the environmental features: topography, hydrography, soil, climate, land tenure/ownership system and economic empowerment of the people.

MATERIALS AND METHODS

Area of Study

This study was conducted in Gboko Local Government Area of Benue State, Nigeria. The local government has a population of about 419,800 people according to the 2011 population census and a landmass of 1,206 Square Kilometres. The local government area is located between Latitude 7^{o} 13'and 7^{o} 35'N and Longitude 8^{o}30'and 9^{o}03' E. The occupation of the people of the local government area mainly farming. They produce food crops as well as cash crops. This research was carried out using direct contact/interaction with the farmers using questionnaire completed on the spot by the researchers. Six communities were randomly selected in the local government area. These communities are: Mbayion, Ipav, Mbatierev, Yandev, Mbatiav and Gboko Town as shown in Fig. 1 below.

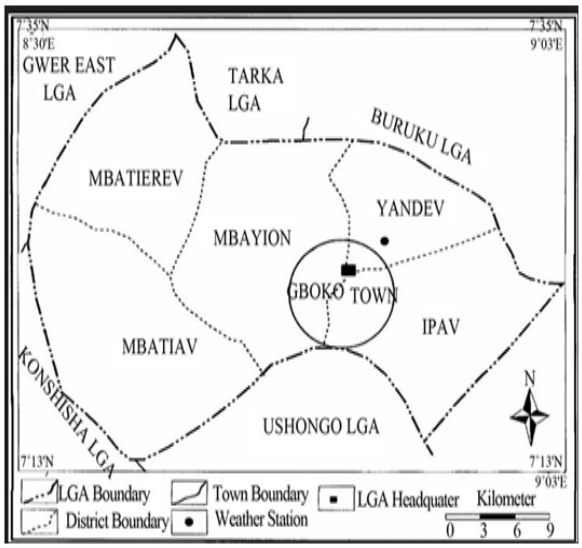

Fig. 1: Map of Gboko LGA of Benue State
Source: Adapted from Benue state Map

Sampling Techniques

The data collected for this study were mainly primary data collected from six communities in the Local Government Areas (LGA) which were selected based on their agricultural activities using multistage sampling technique. Forty farmers from each of the community were randomly selected giving a total of 240 respondents. 9 farmers did not give response for the completion of the specifically structured questionnaires. After the completion of the questionnaires, the researchers visited the farms to physically observe the farmers discharging there farming activities as a way of verifying the information contained in the questionnaires. The primary data include farm size, cropping patterns, availability of chemical inputs, kind of farm machines, type of tools and time required for each operation, etc. in the farm production activities.

RESULTS AND DISCUSSIONS

Table 1 shows some socio-economic characteristics of the respondents in the study area that were considered for the study. This

includes sex, marital status, age, education, household size, years of farming experience, farm size and means of land acquisition**.**

Table 1. Socio – Characteristics of farmer in Gboko LGA Benue State

Item	Frequency	Percentage (%)
Sex		
Male	195	84.42
Female	36	15.58
Marital status		
Single	40	17.32
Married	163	70.32
Divorced	12	5.19
Widow/Widower	16	6.93
Age (years)		
21 – 30	82	35.50
31 – 40	96	41.56
41 – 50	26	11.26
51 – 60	17	7.40
Above 60	10	4.33
Level of Education		
Primary	106	45.89
Secondary	73	31.60
Tertiary	16	6.93
Non-formal	36	15.58
Family Size		
1 -5	68	29.44
6 – 10	152	65.80
11 above	11	4.76
Farming Experience (Years)		
1 – 5	47	20.35
6 – 10	62	26.84
11 – 15	18	7.79
16 – 20	68	29.44
21 – 25	21	9.09
Above 25	15	6.49
Farm Size (hectares)		
1 - 5	165	71.43
6 – 10	46	19.91
11 – 15	14	6.06
Above 16	6	2.06
Means of Land Acquisition		
Purchased	36	15.58
Hired	14	6.06
Gift	9	3.90
Inherited	172	74.46

Source: Field work, 2016 and and Own Calculation.

The table reveals that majority of the farmers' (165) farm sizes between 1–5 hectares (71.43%), 46 farmers (19.91 %) have access to 6 – 10 hectares of land, 14 farmers (6.06%) have access to 11-15 hectares while 6 farmers (2.60 %) have 16 hectares. Fragmentation of farm lands or small land holdings and poor capital base is one the many problems of agricultural mechanization in the study area [11]. Proceeds from these small landholdings will not meet the expenses on machinery and other farm inputs [13]. [5] affirmed that land fragmentation with numerous canals and drainage ditches, narrow access roads to individual farm plots seriously restrict the use of mechanical aggregates. Peasant farmers' production problems are intensive labour as a result of the poor technology applied, low operating capital, no fixed capital investment and poor management [7].

It was observed that literacy level was low among the respondents 106 (45.89 %) for primary schools, 73 (31.60 %) for Secondary education, 16(6.93 %) had tertiary education, and 36 (15.58 %) for no formal education. T his may make enlightenment programmes on agricultural mechanization difficult to pass across to the respondents consequent upon their low level of education. This has serious negative implications for agricultural production, particularly, the receptiveness of farmers to extension services and the adoption of innovations.

Table 2 presents machines used by the farmers in the LGA, it was observed that most of the respondents do their farm works manually; only 7.79 % use planting aggregate (tractor and planting equipment).

Table 2. Equipment Used by Farmers and Numbers of Users

Operation	Equipment Used	Frequency	Percentage (%)
Land Clearing	Cutlass and Hoe	163	70.56
	Plough	68	29.44
Tillage	Hoe	212	91.77
	Plough	19	8.23
Planting	Cutlass and Hoe	182	78.79
	Tractor	18	7.79
	Hand planter	31	13.42
Fertilizer Application	Manual	196	84.85
	Machine	35	15.15
Weeding	Cutlass and Hoe	152	65.80
	Machine	79	34.20
Irrigation	Watering can	24	10.39
	Machine	53	22.94
	Non Irrigation	154	66.94
Harvesting	Manual	186	80.52
	Machine	45	19.48

Source: Field work, 2016 and Own calculation.

Cutlass and hoes are the major tools used for planting as shown by their highest percentage in the table. 186 (80.52 %) manually harvest crops and 45 (19.48 %). farmers have used machine in harvesting upland rice.

Table 3 shows agricultural tools and machinery available in the LGA. The few farm machinery and implements available are used for tillage operations. The farmers who were able to use rice harvester hired the equipment from Benue state capital (Makurdi). The table shows that only 35 (15.15) % of the respondents had their farm partially mechanized and only 39.83 % of the respondents owned some equipment.

Table 3. Agricultural Machinery and Implements Available

Determinant	Rating	Frequency	Percentage (%)
Plough	Available	56	24.24
	Not Available	175	75.76
Harrow	Available	86	37.23
	Not Available	145	62.77
Ridger	Available	24	10.39
	Not Available	207	89.61
Method of acquisition of Implements	Purchased	92	39.83
	Hired	139	60.17
Irrigation Facilities	Available	16	6.93
	Not Available	215	93.07
Storage Facilities	Available	11	4.76
	Not Available	220	95.24
Mechanical Crop Processing	Available	18	7.79
	Not Available	213	92.21
Mechanized Agricultural Practice	Fully Mechanized	16	6.93
	Partially Mechanized	35	15.15
	Non-Mechanized	180	77.92

Source: Field work, 2016 and Own calculation.

Table 4 shows prevailing problems encountered by the respondents in carrying out their farm operations in the study area. The prevailing problems in the study area were inadequate capital as identify by 100 % of respondents, land tenure identified by 91.77 %, lack of equipment (97.84 %), lack of storage facilities (95.24 %) insufficient farm inputs (99.13 %).

From the results it can be inferred that inadequate capital and insufficient farm inputs were identified as the prevailing and major problems of the peasant farmers in the study area (Gboko LGA, of Benue State).

Table 4. Agricultural Mechanization Challenges in the Study Area

Problems	Frequency	Percentage (%)
Land Tenure	212	91.77
Inadequate Capital	231	100.00
Lack of Equipment	226	97.84
Lack of Storage facilities	220	95.24
Insufficient farm inputs	229	99.13

Source: Field work, 2016 and Own calculation.

CONCLUSIONS

From the above result and the analysis and interpretation the data most of the farmers are small farm holders with most of their land fragmented and individual farm size not more than 5 hectares with most of their labour coming from manual source. With the introduction of mechanisation and its efficient management together with good soil conservation practices there is bound to be a positive impact on farm productivity and income. The soil management expertise and machinery capital base will have to be provided under the Public-Private arrangement since the farmers are willing to improve their socio-economic status by improving their agricultural production through the application of modern technology based primarily on mechanization having seen the benefits derivable as seen in the experience of the very few farmers who were able to apply machines in their farms. There is need also for the government and other organizations to provide a forum for education for the rural farmers on how to adopt and accept the modern technology in agriculture which will enable the realization of quality, timely and quantitative works as well as quality and economic produce/products from minimum physical labour.

Modern technology in agriculture in the study area has high potentials in increasing farm productivity. However, it is generally agreed that appropriate agricultural mechanization

technology for Nigeria must evolve from a gradual development of indigenous technology. The mechanization approach must be an integrated one to include most, if not all, the agricultural production processes and operations and must also be part of and include the essential elements of the overall agricultural and rural development strategies in order to get to the roots of rural poverty. The following are recommended:

-The roles of the government, financial institutions, the research institutes, the private sector and other interest groups must be carefully and effectively articulated if the dream of developing sustainable agricultural productivity in Nigeria is to be realized.

-There is need to create awareness on farm mechanization, this will help the local farmers to appreciate and adopt agricultural mechanization.

-Government should provide financial assistance to specialist in agricultural mechanization in partnership with specialist in soil conservation and management to establish prototype mechanization unit to render hiring services to local farmers.

-The Federal and state Governments should set up agricultural engineering research and development centre and separate and distinct from agricultural mechanization centres.

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MANAGEMENT OF PRODUCTION AND DISTRIBUTION OF ORGANIC PRODUCTS. THE CASE OF ORGANIC FARM MANAGERS AND DISTRIBUTORS IN ATHENS' ORGANIC OPEN FARMERS' MARKETS

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Abstract

Agriculture is one of the main axis of our national economy, but it can get further improvement not only in environmental level but also for the human resources who consist it. The main purpose of this study was to examine the behavior of organic farms managers. Specifically producers' demographics were investigated through a questionnaire. The results of this study indicates, that the majority (87.76 %) of the organic farmer managers are male. As for the educational level, the majority of farmers were high school graduates and their age comes close to an average of approximately 43 years old. Furthermore the main source of income (83.67 %) for organic farm managers proves to be agriculture. In addition we examine the farmers' opinion on the necessity of subsidies and potential obstacles acquiring organic certification. The recorded percent of the organic farmers responded positively to the necessity of the subsidies is 42.9 %. The study also presents the main given products in organic open farmers' markets and the cultivation characteristics such as land, fertilization and distribution of the cultivated products. The majority of the products that sold in organic open markets are vegetables followed by olive oil and legumes. An important feature of this study, also linked to the attempt to convert the current mode of production into a closed farm management system, corresponds to the percentage of organic farm managers who rear farm animals in an organic way as well (32.65%).

Key words**:** *distribution, Greece, organic Agriculture, organic open farmers' markets, closed farm management system*

INTRODUCTION

Throughout the world, a genuine concern exists over the increased use of chemicals in conventional agriculture, due to environmental pollution and public health problems for both producers and consumers [9]. In several countries, programs have been developed to reduce the use of pesticides, fertilizers and other chemicals in order to make agriculture more environmentally friendly and sustainable for the future [4]. Towards this direction organic farming emphasizes on a sustainable agro-ecosystem management that uses the locally- derived renewable resources to solve many key problems related to conventional agriculture in modern societies [8]. In Greece more and more farm managers convert their cultivating methods to organic, taking into consideration the environmental protection, their own health and the constantly increasing consumers' demand on organically cultivated products [7]. Therefore it is observed that an ongoing growing number of young-highly educated group of people turns to organic farming [1] and distribute their products to organic open farmers' markets. In this way they manage to sell their products in higher prices than conventional ones. Advanced prices combined with subsidies can offer to organic farm managers' a satisfying benefit. We conclude that organic farming creates more job opportunities either for members of the family or for employed personnel. All above attempt to approach the profile of the human resources involved in the organic agriculture sector in Greece.

MATERIALS AND METHODS

Data were collected by personal interviews in

organic farmers' markets in the city of Athens, by completing questionnaires from November 10, 2013 to January 20, 2014.
Quantitative research was used to describe the collected data of a population related to the studied subject, using quantification methods and statistical analysis in interpreting the results.
The total number of questionnaires obtained is 49. It has to be noted that the questionnaire consisted of open and closed type questions, while the method followed was personal interview.

RESULTS AND DISCUSSIONS

The results of this study indicate, that the majority of the organic farmer managers are male (Fig. 1). Traditionally Greek women don't usually choose this profession [6] but they occasionally help the cultivation process as members of the family in parallel with either another profession or housekeeping.

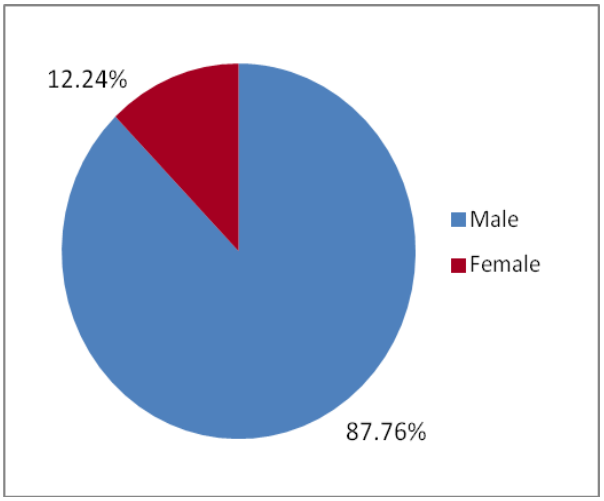

Fig. 1. Organic Farmers' Sex
Source: Own Calculation

As for the educational level (Fig. 2), the majority of farmers were high school graduates. It is noteworthy that the percentage of compulsory education graduates is zero.
Another striking set of statistics relate to educational level is that approximately 34.7 % of the respondents, hold a degree from a Technological Institute, University or a Master degree.
This indicates the tendency that although farmers hold a degree in different specialties [2], they have consciously chosen this profession, mainly because of the high rates of unemployment and the land occupation.

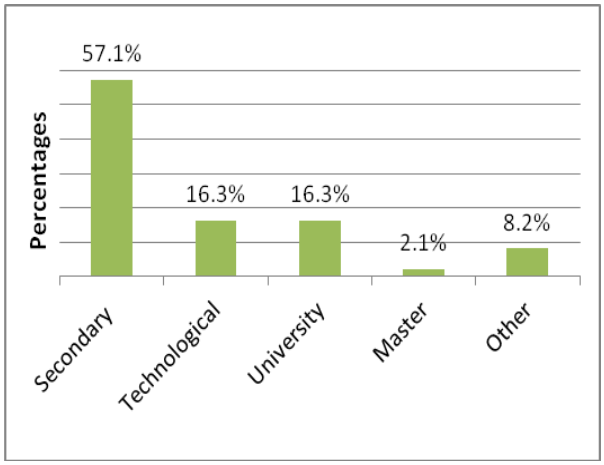

Fig. 2. Educational Level
Source: Own Calculation

In Fig. 3 it is shown that the farmers' age was within a wide range (from 21 to 73 years old), with an average of approximately 43 years old.

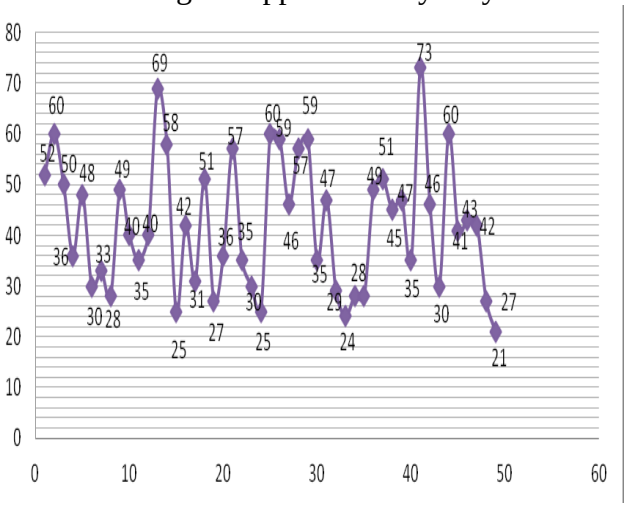

Fig. 3. Age of the respondents
Source: Own Calculation

This noticeable feature shows that the age of the people involved in the agricultural sector in Greece remains high but with a declining trend compared to the past [8].
The main source of income for organic farmer managers is agriculture (Fig. 4).
This states that apart from the main source of income, farming is a professional choice and not an additional income.

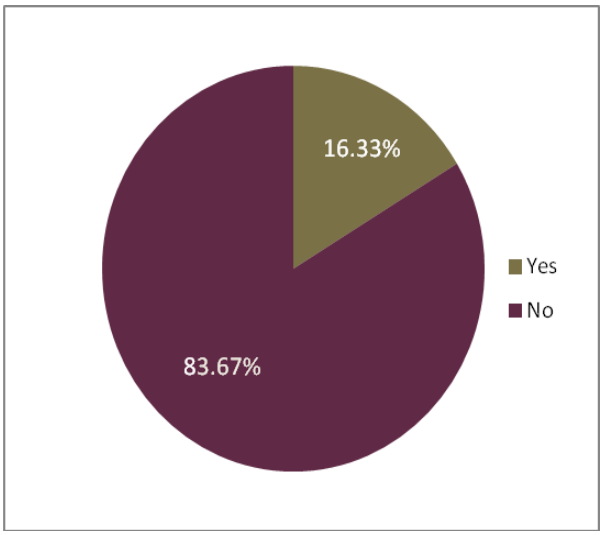

Fig. 4. Respondents' other income examination
Source: Own Calculation

As can be seen from the Fig. 5, 42.9% of the organic farmers responded positively to the necessity of the subsidies. On the other hand 57.1 % of the respondents believe that subsidies are not necessary as the amount of the subsidies is low and there are many delays in the payments.

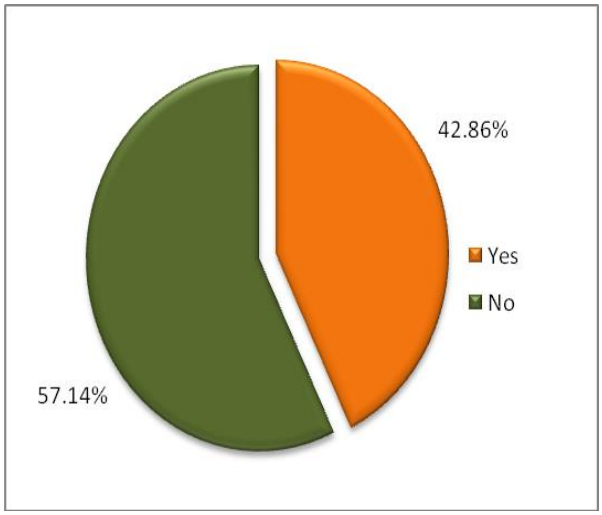

Fig. 5. Necessity of subsidies
Source: Own Calculation

As shown in Figure 6 and as far as the difficulties in certification are concerned, the majority of the respondents state that they didn't face any kind of obstacles. The farmers who faced problems claim that the main obstacles are bureaucracy and delays in issuing their certificates.

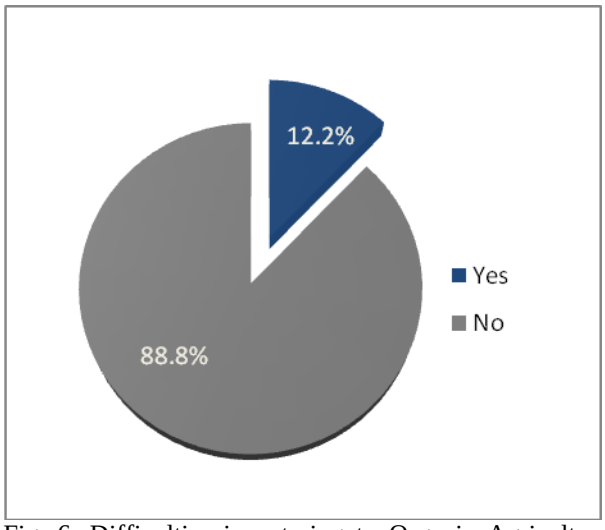

Fig. 6. Difficulties in entering to Organic Agriculture Certification Program
Source: Own Calculation

A noticeable feature of the Fig. 7, is that the majority of the products that sold in organic open markets are vegetables which are more than twice as many as the next most popular products shown, olive oil and legumes.

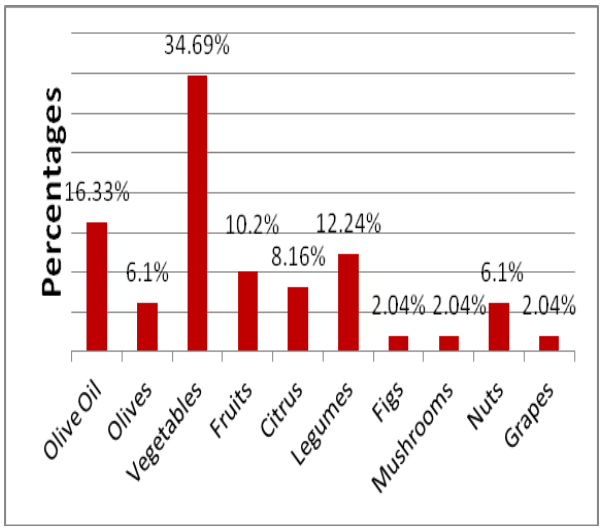

Fig. 7. Main Products
Source: Own Calculation

The data provided by the Fig. 8 demonstrate that many organic farmer managers (32.65 %), rear farming animals.
The majority of these farmers made clear that they use the manure produced by their animals in order to fertilize their crops as they are aiming to create a whole close farm management system [3].
Furthermore, by applying these cultivating techniques they manage to reduce the

production cost.

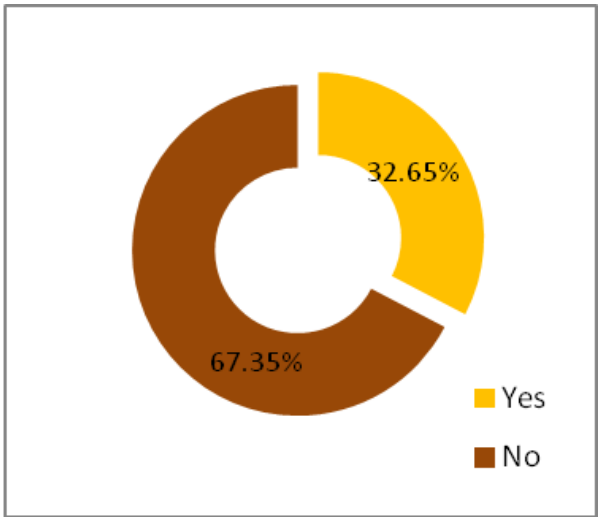

Fig. 8. Animal Rearing
Source: Own Calculation

The data from Table 1 demonstrates that the majority of organic farm managers of the specimen choose to cultivate tree crops, following by vegetables and legumes.

Table 1. Crop characteristics, allocation of labor and product distribution

		Tree Crops	Vegetables	Legumes
Farmers		32	27	6
Land (ha)		5.2	7.1	3.7
Labor	Personal or Family	55%	45%	40%
	Employed	45%	55%	60%
Distribution	Open Markets	60%	85%	85%
	Wholesale	40%	15%	15%

Source: Own Calculation

On the contrary the highest average land cultivation corresponds to vegetables and the lowest to legumes. Moreover from Table 1, can be seen that the highest level of personal or family labour observed in tree crop cultivation (55%), followed by vegetables (45%) and legumes (40%). Consequently employed labour necessity is higher in legumes than in the other crops. Last but not least producers of all three kind of cultivation distribute the largest amount of their products in organic open farmers' markets and the remaining amount through wholesale.

As far as the fertilization is concerned (Table 2), the majority of the farm managers, who cultivate tree crops in their farms, use manure and organic preparations.

Table 2. Fertilization characteristics

			Tree Crops	Vegetables	Legumes
Fertilization	Manure	Farmers' Percentage	84.37%	85%	35%
		Average Quantity (kg/ha)	1,630	6,000	2,000
	Compost	Farmers' Percentage	33%	33%	35%
		Average Quantity (kg/ha)	1,122	3,500	2,000
	Organic	Farmers' Percentage	80%	85%	85%
		Average Quantity (kg/ha)	234	1,000	1,000

Source: Own Calculation

The same tendency in fertilization is observed at the farmers who cultivate vegetables in contrast with the legumes cultivators who use mainly organic preparation instead of compost and manure.

CONCLUSIONS

To conclude the results of this questionnaire rebound to the fact that the majority of the organic farm managers are of male sex. Features from recent researches [5], were also confirmed by this study, indicating that more and more young producers with high level of education are involved in organic agriculture as the average age of farm managers in the organic sector is slightly dropped. It should be also mentioned that the farm managers used to cultivate more than one crops (olive-citrus, citrus-vegetables etc) to extend the production and enhance their purchasing power.

Our results revealed that, the majority of the organic products are distributed in organic open markets and most of the farmers use

provided preparations in combination with several agronomic practices such as tillage in order to fertilize and protect their crops against pests and pathogens. Moreover under a financial point of view, the prices of organic products are higher than conventional derivatives. In recent years the difference in prices fall significantly, as farmers extent their products' distribution to alternative market channels. As so organic cultivation when it is coupled with subsidies can provide a more profitable income to organic farm managers.

The organic cultivation methods contribute to environmental protection, the rational use of natural resources, reduced energy consumption and improve farmers' and consumers' health. Organic farming creates more job opportunities either for members of the family or for employed personnel. As a result organic agriculture can provide an economical improvement strategy to a national level in order to overcome the current economical crisis. It is also appearing the attempt to convert the current mode of production into a closed farm management system. Representative of this attempt is the rearing of farm animals also in an organic way.

In Greece the future of organic farming can have an optimistic prospective as long as all the participant members, such as the state, the university community, organic farmers, certification organizations, retailers and consumers can provide an organized and collective action.

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IMPROVEMENT OF THE INVESTMENT CLIMATE AS A MAIN CONDITION FOR THE ENHANCEMENT OF THE QUALITY OF LIFE IN RURAL AREAS

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Abstract

This work reflects results of the study on the improvement of the investment climate and the analysis of foreign direct investments in the economy of the Republic of Moldova. At present the basic priorities of the Ministry of Economy of the Republic of Moldova are the improvement of the investment climate in order to enhance the quality of life, the improvement of tools designed to attract foreign and local investors, as well as the promotion of local products in order to increase the competitiveness of economy. This is explained by the fact that investments increase the competitiveness of businesses, facilitate technology transfer, create new jobs and stimulate foreign trade, which are the basic elements in the process of development and implementation of policies aimed to attract investments and promote export.

Key words**:** *entrepreneurs foreign capital investment, investment climate, rural areas*

INTRODUCTION

Nowadays the national economy is characterized by macroeconomic and sectorial structural misbalance; therefore, investment policy must be a policy of national interest and a factor that improves economic performance and economic and social progress.

The investment climate is seen as an effective mechanism aimed to change people's attitude and behavior in order to increase social activism and community solidarity, as well as to improve the quality of life of both population and vulnerable groups by increasing the access to better social services[3].

Investment activity plays a central role in the economic life, both in the production of goods and services and in the sphere of consumption, being the factor that simultaneously influences both supply and demand. The statement is proved by the processes of training and multiplication of effects, which are generated by any investment project, regardless of the activity sector that is implemented. The realization of an investment project in the sphere of goods and services production results in increased and diversified supply and, therefore, if it is validated by the market, increased incomes of economic agents. However, the degree of employment will be influenced directly or by means of a driving effect. Thus, the increased number of employees and / or their wages ultimately lead to the increased demand for goods and services. On the other hand, there will be increased both economy and available funds of economic agents, which look for more efficient structures according to investment options.

So, we can state that investments play a dual role within the national economic circuit:

- First, economic agents that trigger investment actions and implement various investment projects, increase the supply of goods and / or services by enhancing their productive capacity, creating additional revenues;
- Secondly, any investment project generates additional needs or demands in related sectors (suppliers of raw materials, utilities, etc.) or oval (distributors and / or consumers of goods and services that are offered). All economic agents that are involved will also experience an increase in the revenue chain. [1]

The realization of projects or investment

programs leads mainly to the increased fixed capital stock. Investments are the main tool to achieve economic modernization by establishing new improved structures in compliance with strategic options and future needs of the society.

From the social point of view, investments play the role of regulator / compensator in employment and improvement of the quality of life.

Implementation of investment projects or programs involves changes in the labor market, creating an increased demand for the workforce in the sectors, where investment beneficiaries exploit new production capacities. Investments may be also viewed as a bridge between generations, by creating new jobs for a younger generation and by "inheriting" fixed capital, which is received from previous generations. Not least, investments act as a material support for the promotion of the scientific and technical progress in various activity sectors. The implemented investment projects are the primary means to assess new technical and technological solutions, provided by the scientific research. [2]

The role of investment activities in solving major issues of the contemporary world is relevant too, as most problems are related to environmental protection and ecological balance where it was disturbed (most often because of ignorance).

If we analyze opportunities and efficiency, any investment project must also have an ecological component, and ecological criteria must be included in the system of criteria, based on which investment decisions can be made.

Our statement originates from a widely recognized assertion: "prevention is better than cure".

Therefore, it should be noted that many international financial investments set conditions on the nature's ecology, which have to be met by the projects or programs that are to be funded. Moreover, there is a need for investment efforts aimed at ensuring national security.

MATERIALS AND METHODS

The reflected researches were achieved on informational materials of the National Bureau of Statistics of the Republic, the National Bank, etc. There were used the following research methods: monographs, comparison, analysis, inference.

RESULTS AND DISCUSSIONS

In order to develop the private sector the Government of the Republic of Moldova receives funds from its development partners under favorable conditions. Taking advantage of this assistance (credit schemes, grants or subsidies), Moldovan entrepreneurs can develop their businesses, significantly increase the quality and export capacity of their products, thus, becoming more competitive and creating new jobs. Interest rates for these favorable funds are lower or do not exist in case of grants and subsidies. Moreover, the repayment period of loans is several times higher than in case of commercial loans, many of them have grace periods as well. [5]

Thus, we should mention that in recent years authorities have launched a series of investment programs and projects aimed at changing the quality of life in rural areas, bringing additional comfort and creating new development opportunities.

The total budget of international programs and projects that are eligible is 86.8 million USD; 340.3 million Euros and, respectively, 1,546.9 million MDL. (Table 1).

The European Bank for Reconstruction and Development (EBRD) is among the most important funders of investment projects in rural areas. [2]

By the end of 2013 the Bank signed 105 investment projects in the country that cover energy, transport, agricultural economic activities, industry and banking sectors with the aggregate value of 818 million EUR back to the initialization of its operation in the Republic of Moldova in 1991.

The total value of these projects, including the funding provided by the Bank, equalled 1.65 billion EUR. Cumulative payments amounted to 447 million EUR. 43% of the Bank's funds

were directed to the financial sector, 32% – to the infrastructure sector, 19% - to the corporation sector and 6% - to the energy sector.

Table 1. International programs and projects started in the economy of the Republic of Moldova

Program Name	Funded by	Budget
Inclusive rural economic & climate resilience programme for young entrepreneurs (ifad vi)	International Fund for Agricultural Development (IFAD)	12.7 mln USD
Programme on the development of small-scale irrigation systems	European Union	24.9 mln MDL
Irrigated high value agriculture 2kr hire-purchase program	US Government	4.6 mln USD
The moldova energy and biomass project (pccf / pebm-undp)	UNDP Moldova, European Union	0.4 mln EUR
Food security project for underprivileged farmers	Government of Japan	157.9 mln MDL
Second competitiveness enhancement project: cep ii (part of co-financing grants)	International Development Association (IDA)	3.0 mln USD
Moldova agriculture competitiveness project (mac-p): "enhancing land productivity through sustainable land management (slm)"	World Bank, Global Environment Fund	3.0 mln USD
Program for purchasing biomass boilers	European Union	
Innovative business development for local sustainable economic growth	Ministry of Foreign Affairs of Norway	1.6 mln USD
Competitiveness enhancement project ii (cep 2), line of credit	World Bank	29.4 mln USD
Inclusive rural economic & climate resilience programme (ifad vi) - infrastructure	International Fund for Agricultural Development (IFAD)	3.8 mln USD
Inclusive rural economic & climate resilience programme (ifad vi) – for sme	International Fund for Agricultural Development (IFAD), Government of the Republic of Moldova	4.8 mln USD
Inclusive rural economic & climate resilience programme (ifad vi) – rural inclusive financing	International Fund for Agricultural Development (IFAD)	3.7 mln USD
Inclusive rural economic & climate resilience programme (ifad vi) - conservative agriculture and value chains	International Fund for Agricultural Development (IFAD), Global Environment Fund (GEF)	4.6 mln USD
The european union programme horizon 2020	European Union	80.0 mln EUR
The european union programme cosme	European Union	2.3 mln EUR
Small business support project in moldova	Government of Sweden, European Union	
Public-private business partnership programme	Austrian Development Agency	
Moldova agriculture competitiveness project, horticultural sector	World Bank, Government of Sweden	7.0 mln USD
Moldova agriculture competitiveness project, conservative practices	Global Environment Fund, World Bank	3.0 mln USD
Wine sector restructuring programme "filiera vinului"	European Investment Bank	75.0 mln EUR
Programme on attracting remittances into the economy - pare 1 + 1	National Public Budget, European Union	85.6 mln EUR
Credit guarantee fund	National Public Budget, European Union	47.8 mln MDL
Line of funding for energy efficiency in the republic of moldova	European Bank for Reconstruction and Development, European Union	42.0 mln EUR
Energy efficiency financing facility in the residential sector of the republic of moldova	European Bank for Reconstruction and Development, European Union, Government of Sweden	35.0 mln EUR

Source: based on the data provided by the National Bank of Moldova

The EBRD is also engaged in the dialogue with the authorities on public policies to address the key challenges of the transition period.

The International Fund for Agricultural Development (IFAD) is an important funder of investment projects in rural areas, later there was established the Project Implementation Unit (PIU) by the Government Decision no. 980 of September 25, 2000.

Basic IFAD objectives are oriented towards resource mobilization, providing the poor in rural areas with new opportunities to improve nutrition and increase the production of agricultural products and incomes. IFAD provides direct financing by arranging loans and grants on favourable conditions, as well

as attracts co-financing resources for the realization of projects and programs initiated by IFAD. IFAD cooperates with many organizations, including the World Bank, regional development banks, other financial regional institutions, as well as agencies of the UN family, most of which jointly co-finance projects IFAD.

Thus, 411 loans were granted to the total of 2,170 beneficiaries (founders of credited companies) with the total value of 9,926 thousand US dollars within the Rural Financing and Small Enterprise Development Project (IFAD I). As the result of financed investment projects there were created 6,171 new jobs, 3,490 of which are permanent and 2,691 - seasonal ones; there were credited 5,700 members from 27 savings and loan associations, the total amount of loans equals 1,170 thousand US dollars. However, there were created 16 savings and loan associations within the project, which later benefited from technical assistance and advisory services that were provided in order to strengthen them.

33 municipalities have received financial support for the village development plan within the Agriculture Recovery Project (IFAD II) (2006-2013); as a result, 103 of them were funded. Over 400 people, including rural entrepreneurs, employees of commercial banks, representatives of consulting companies and the Ministry of Agriculture and Food Industry were trained during the whole period of activity in order to develop institutional skills of the partners that are involved in the project implementation. There were granted 214 loans to 549 beneficiaries with the total amount of 14,180 thousand US dollars for the SME development. Loans were disbursed through 8 commercial banks in 30 districts of the country.

There were created 3,888 new jobs as a result of funded investment projects. 152 rural entrepreneurs have benefited from the support provided by 7 companies specialized in the development of business plans within the Rural Business Development Programme (IFAD III) (2006-2011). Moreover, 5,696 rural entrepreneurs were provided with advice. There were granted 131 loans to 359 beneficiaries with the total value of 10,816 thousand US dollars for the SME development; loans were disbursed through 7 commercial banks. 1,700 new jobs were created as a result of funded investment projects in order to develop SMEs. There were funded 32 investment projects in infrastructure, including 12 projects on construction / rehabilitation of roads with the total length of 12 4 km, three water pipes with the total length of 10.1 km, two gas pipelines with the total length of 4.6 km and 15 projects to rehabilitate irrigation systems for the total area of 3.9 hectares of farmland. 108 businesses, 1,842 farms and 39,228 individuals benefited from the implementation of these projects.

Rural Financial Services and Marketing Program (IFAD IV) (February 2009 - March 2014) helped the population with a range of activities regarding the development of the chain of value. There were trained 3,497 people at 146 local training seminars, 11 international study tours and 7 visits of international experts. There were granted 207 loans to 268 beneficiaries with the total amount of 3.5 million US dollars for the SME development. Loans were disbursed by means of five commercial banks and the Rural Finance Corporation. There were created 279 new jobs as a result of financed investment projects for the development of SMEs. There were organized 19 training sessions for the development of institutional skills of financial institutions; the training sessions were attended by 18 loan officers – representatives of 8 financial institutions and 222 employees of savings and loan associations. There were awarded grants with the total value of 2.3 million US dollars to finance 25 investment projects in infrastructure; 23,474 individuals, 2,535 SMEs / small farmers and 23 local public authorities benefited from these grants. 9.39 km of roads, 34.95 km of water pipelines and 8.20 km of irrigation systems for 649.47 ha were rehabilitated and/or constructed by means of these funded projects.

The following projects are currently carried out: Rural Financial Services and Agribusiness Development Project (IFAD V) and Inclusive Rural Economic & Climate

Resilience Programme (IFAD VI), which are also to help the rural population with the following objectives: to enable poor rural entrepreneurs to increase their revenues and strengthen resilience; to improve the farmers' ability to adapt to climate changes; to increase the rural population's access to credits by providing appropriate and affordable financial products; to increase productivity and competitiveness, to increase investments and to improve access to the market. [10]

Virtually all governments stipulate the need to attract foreign investments in their programmes. Foreign investors' contributions, even if increased from $ 25.9 million in 1995 (Table 2) to $ 353.1 million in 2014 (a 13.6 times increase) remains far too low and does not meet the existing demand.

Table 2. The analysis of foreign direct investments of the Republic of Moldova as compared to other countries, million US dollars

	1995	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**
Estonia	201	387	3,127	2,053	511	1,592	884	1,597
Latvia	180	412	812	433	1,502	1,076	990	782
Lithuania	73	379	1,189	865	1,538	576	708	375
Romania	419	1,037	6,866	3,204	2,557	2,629	4,108	-
Moldova	**25.9**	**127.5**	**190.7**	**212.0**	**301.4**	**204.9**	**249.0**	**353.1**
Ukraine	267	595	7,808	6,451	7,207	8,175	4,509	847
Russian Federation	20,650	27,142	15,508	43,168	55,084	50,588	69,219	20,958

Source: developed by the author based on the information provided by http://data.worldbank.org/indicator

Table 3. Investments in fixed capital, per types of economic activities, billion lei

	Year							
	1995	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**
Investments in fixed capital	0.84	1.76	7.80	13.80	16.45	17.15	19.13	20.85
in: agriculture, hunting and forestry	0.09	0.06	0.46	1.05	1.82	1.66	1.85	2.30
processing industry	0.16	0.26	1.14	1.43	2.11	2.31	2.87	2.31
construction	0.02	0.03	0.20	0.42	0.46	0.48	2.12	2.35
wholesale and retail trade	0.04	0.16	0.79	1.52	1.99	2.12	2.22	2.47
transport and communications	0.08	0.77	1.66	3.47	3.60	3.63	2.16	2.39
higher education	0.012	0.037	0.11	0.36	0.46	0.52	0.63	0.91
health care	0.013	0.006	0.08	0.65	0.69	0.81	0.91	1.28

Source: developed by the author based on NBS statistical yearbooks

It should be noted that in 2014 foreign direct investments in our country increased 13.6 times as compared to 1995, in Estonia - 7.9 times, in Latvia - 4.3 times, in Lithuania - 5.1 times, in Romania - 9.8 times, in Ukraine - 3.2 times. Even if foreign direct investments have greatly increased in our country, in 2014 they were 4.52 times lower than in Estonia, 2.2 times lower than in Latvia, 2.4 times lower than in Ukraine and 11.6 times lower than in Romania.

Investments are undoubtedly a decisive factor in the improvement of the technical and material basis, promotion of efficient technologies, environment protection, professional training, etc. However, investments should be first directed towards regeneration or purchase of equipment, installations and machines in order to achieve the desired outcome.

Investments unquestionably make a direct contribution to the maintenance and / or development of the national economy branches as the whole. In 1995-2014 increased investments in fixed capital were registered in all the branches of the national economy. For instance, investments increased from 0.09 billion lei in 1995 (Table 3) to 2.3 billion lei in 2014 (a 26.5 times increase) in agriculture, hunting and forestry, in processing industry there was a 14.4 times increase, in transport and communications – a 29.9 times increase, in wholesale and retail trade – a 61.7 times increase, in higher education - a 75.8 times increase, in health care – a 98.5 times increase.

If in 1995 investments in agriculture, hunting and forestry were 10.7%, in processing industry - 19%, in construction - 22.2%, wholesale and retail trade - 4.8%, in higher education - 1.4% and in health care - 1.5%; then in 2014 they equaled respectively 11.0%, 11.1%, 11.3%, 11.8%, 4.4% and 6.1%. Investment dynamics and value influenced the situation in the national economy, including economy values in rural areas of our country.

However, in recent years the countryside has experienced a remarkable development, investments in infrastructure, drinking water pipelines, the sewage system, modernization of schools, kindergartens, clinics, improvement of parks, gyms - these are just some of the projects implemented in rural areas that have radically changed people's lives and prospects for the development of the region.

Although there are still some serious social problems, such as lack of jobs, poverty, unemployment. Every authority tries to propose a solution, but they will be probably able to overcome these problems only if they develop an entire system and offer everyone equal opportunities. The best way to find a solution is obviously to make various social actors (a city hall, schools, local businesses, churches, etc.) contribute to this process.

However, the Moldovan economy remains unattractive for investors. The investment climate is not Moldova's advantage, the fact that shows both Moldova's position in international ratings and direct comparison of macroeconomic and performance indices regarding FDI attraction among countries. FDI inflows generally decreased since 2008.

Investment flows directed towards the national economy fell sharply as a result of the global crisis. The economic and financial crisis has sharply reduced foreign investors' confidence in the ability to revive economies in transition; the Republic of Moldova is among them. Many investment projects were abandoned or postponed.

According to experts who participated in debates, at present corruption, political instability and inefficient government keep investors far from the Moldovan economy. Other constraints that reduce investment attractiveness of our country are related to workforce qualification, rigid labour legislation, infrastructure, weak institutional and legal framework, inefficiency of investor protection mechanisms.

Adrian Lupusor, the director of Independent Analytical Centre Expert-Grup, said: "Customs and Treasury institutional approaches are directed against investors that are focused only on fines and penalties, and the plan of fines and financial penalties is still a source of income for the national budget. These constraints significantly reduce investment attractiveness. The examples are the following: increased energy prices, administrative obstacles for attracting investments, increased regional competition, fierce competition in external commodity markets, processes of labour migration in the region".[6]

These are some of the reasons why in the past four years we missed the entry of several large investors in the Republic of Moldova

CONCLUSIONS

Foreign direct investments have become vital for its economic growth and development. Investments directly contribute to the replenishment of resources and the development of competitive factors of production. Although one needs to create favorable investment climate to benefit from these investments, which involves economic and legal stability, appropriate fiscal policy, human capital adjustment, developed business infrastructure, etc.

Mayors' and vice-mayors' points of view regarding the difficulties encountered in recent years are varied and they pay special attention to bureaucratic problems that authorities face while developing investment projects. Another fundamental problem is the bureaucracy that is very well illustrated by the activity of various institutions and organizations that are related to investment projects.

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THE HIERARCHIZATION OF THE IMPORTANCE OF CONSULTANCY CONCERNING THE MAIN TECHNICAL AND ECONOMIC ISSUES AT THE LEVEL OF THE AGRICULTURAL EXPLOITATIONS IN OLT COUNTY

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Abstract

Although the information sources became more diverse, the agricultural consultancy activities remain an important resource for modern agriculture. This one has its role, within which the technological changes became so frequent. To these ones, the climatic changes are added, that assume a vast experience in the field of plant culture. The study aims to highlight the interest of agriculturists by the consultancy that has been offered to them, according to the activities they deploy: development of investment projects, plant protection, procurement of fertilizer, procurement of agriculture machineries, livestock, marketing of agricultural production, and association in various forms. For comparison, they were analyzed according to the farm size, to the geographical (mountain, plain, meadow) and administrative (village area) location. The study revealed the influence of the locality surface, which had a very significant power over the consultancy offered to the activities under analysis.

Key words**:** *rural consultancy, locality surface, dimension of the agricultural exploitation, geographic areas*

INTRODUCTION

Located in the South of the country, between the Danube and the Getic Piedmont and axed on the inferior course of the river having the same name, Olt County occupies approximatively 2.3% of the country surface. It has a surface of 5,507 km², being, according to the dimension, the 24th county of Romania. [4]

At the level of Olt County, most of the localities have surfaces framed between 3,001ha and 5,000ha (62.25 %). The agricultural farms detain the majority, in the localities with surfaces over 3,000ha (3,001-4,000 ha: 21.6%; 4,001-5,000 ha: 17.7%; over 6,001 ha: 26.8%) [7].

The average size of the agricultural exploitation in 2012 used to be 4.56 ha, where prevail the farms under 3 ha (39.7%), between 5-7 ha (30.1%), and those between 5-7ha (14.2%). *The vegetal and animal products in Olt County* were based on the changes interfered in the property system that had and still has a direct effect on the decisions of allotting landed resources, on the conservation and protection of the soil. In Olt County, there are few zootechnical specialized farms, and most of the livestock are bred in personal households and used in order to provide a minimum standard of living [7].

In terms of localities, the biggest average surface on an agricultural exploitation is in Redea, having 8.16 ha and the smallest one has 0.54 ha in Vulpeni [10].

In 2012, the number of APIA (Agency for Payments and Intervention in Agriculture) eligible farms was 43,761 (48% out of the total) with an agricultural surface of 333.6 thousand ha (81% out of the total). In terms of relief areas, 81.1% out of the total number of exploitations are in lowland, 14.4% in hilly areas and 4.5% in meadow areas.

In Olt County, only 3,049 of the total number of agricultural exploitations have a legal form, which represents 3.38%. [7]

Different studies approach the issues presented in this article. The study [12] at

page 35 reminds of the different occupations for the unemployed in the rural areas, such as "they are open-minded for professions with local specific, buildings, public catering, services, IT initiation or foreign languages", without reminding the livestock, the development of vegetable- or fruit-growing. Another study analyzes the situation in Romania, that currently has no agro-alimentary distribution chains and without them, the country cannot have food safety and will always depend on the outward for food supply [2] (p.14); the current politics help foreign agricultural business develop in Romania, and render Romania more and more dependent on external food sources, that must be transported in Romania [5] (p. 14); that the lack of credit institutions in Romania, that be willing to grant loans to farmers [5] (p. 5), renders the level of credits in France 40 times major, in Germany 32 times major and in Spain 24 times [3] (p. 139); that the problem of endowment of the Romanian farms with tractors cannot be efficiently solved but by increasing the dimension of the exploitation [6] (p. 74); that in the rural area exists a poor information of the producers' associations, confirmed by other studies as well, that assert that "only 6% know about these associations" [12] (p. 24). A comprehensive study was made by ASE Bucharest, *Establishing the socio-economic potential of rural areas* [1], that hierarchizes the localities within the country, in order to determine the development potential according to five groups of indicators, specifically: endogenous potential (5 indicators), physical-geographical characteristics (4 indicators), human capital (6 indicators), economic activities (6 indicators), technical urbanistic endowment (4 indicators) [6] (p. 74).

MATERIALS AND METHODS

The study aimed a correlative thoroughness of the relationship given by the consultancy activities as regards the size of the localities, the relief area and the dimensions of the farm. The time duration provided was framed as: very long; long; medium; short; very short. The date were collected from the level of Olt County, by the agricultural consultants, in 2013. [8]

The assessment of the results was performed with the test $\chi 2$. There were taken three significance degrees for the probabilities of: 0.001(if $t_{cal} > t_t$: very significant significance ***); 0.01 (if $t_{cal} > t_t$: distinctly significant significance **); 0.05 (if $t_{cal} > t_t$: significant significance*) and if $t_{cal} < t_{t0.05}$ (insignificant). Pearson correlation coefficient has been calculated in order to find the intensity of the studied correlations. Bibliographic studies that analyze rural development in general terms and rural development in Olt County or within Oltenia South-West development region have been used.

RESULTS AND DISCUSSIONS

The projects accessed during the period 2007-2013 were mainly SAPARD projects that had as objective the increment of competitiveness of agricultural and silvic sectors. In Olt County, the investments in vegetable production were supervised, in order to ensure some farms that be viable, by means of: mechanization of the vegetable sector farms, by endowing them with tractors, combines and farm equipment, irrigation plants and by storing the agricultural products produced within the farm.

1. From the assessment of the importance of projects elaboration, especially SAPARD, the following are ascertained: the highest number of elaborated projects was registered for the localities whose size was between 2,001- 5,000 ha, 61 % of the total number of projects.

Table 1. Assessment of the importance of "projects elaboration", using the test $\chi 2$, in Olt County, during the period 2007-2013

Level	MU	Significance $\chi 2$	
Locality size	n^o	$\chi 2$ cal.	37.5**
	%	$\chi 2$ (0.01)	40.08; r=0.54
Geographical area	n^o	$\chi 2$ cal.	10.7; N
	%	$\chi 2$ (0.5)	15.5; R=0.31
Dimension of the exploitation	n^o	$\chi 2$ cal.	31.4*
	%	$\chi 2$ (0.1)	37.57; r=48

The importance given to SAPARD projects, according to the locality size, is statistically justified as distinctly significant (**) (Table 1, Fig. 1).

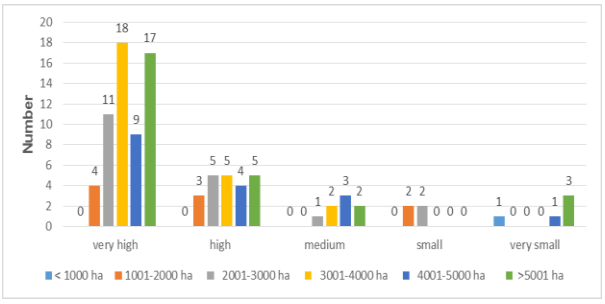

Fig.1. Repartition of agricultural exploitations according to the locality size, regarding the importance of ”project elaboration”

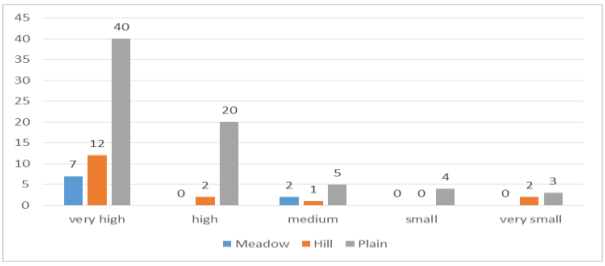

Fig.2. Repartition of agricultural exploitation according to the geographical area, regarding the importance of ”projects elaboration”

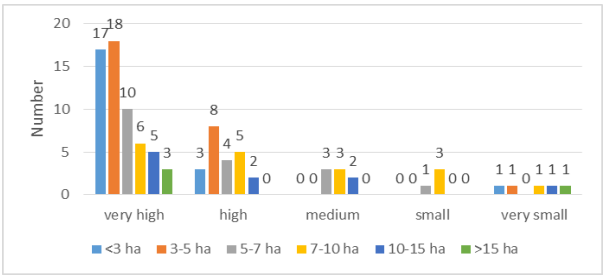

Fig.3. Repartition of agricultural exploitations according to the dimension of the exploitation, regarding the importance of ”projects elaboration”

From the analysis of the importance of projects elaboration according to the relief area, the following were determined: the importance of elaborating the projects is high, even predominant in the plain areas (72 % of the total number of localities situated in these areas), and the cumulated level of 82.65 considered as very high and high, shows the importance of projects elaboration (Table 1, Fig. 2).

The assessment of the importance of projects elaboration according to the farm surface, highlights the following: a special interest for projects elaboration is manifested in the case of exploitations having surfaces between 3-5 ha (27% of the localities); it indicates the existence

of some significant differences in assessing the importance of SAPARD projects ($\chi 2$ calculated of 30.0 > 31.41 theoretic).

2. Assessment of the importance of plants protection in the consultancy activity

Starting from the premise that about 1/3 of the potential agricultural production is destroyed by diseases and pests, together with the diminution of quality, the plants protection has a special importance for the managers of the agricultural exploitation.

According to the surface of the locality, the assessment of the importance of consultancy in plants protection is highlighted by the following (Table 2, Fig. 4); from the total of the 98 localities, for the size groups between 2001 ha and 5000 ha, the importance is significant (62.25 % of the total numbers of localities); regarding the trust degree, a very significant can be ascertained (for the risk level, which is 0.001, $\chi 2$ calculated of 62.6 > 45.3 theoretic).

According to the relief area, the assessment of the importance of plants protection, according to the substantiation values represented in *Table 2*, *Figure 5*, the following can be highlighted: for the plain area, the importance given to plants protection is much higher than the one given in the hill and meadow areas (73.47 % and respectively 17.35 % and 9.18 %).

Table 2. Assessment of the importance of „plants protection” using the test $\chi 2$, in Olt County, during the period 2007-2013

Level	MU	Significance $\chi 2$	
Locality size	n^o	$\chi 2$ cal.	62.6***
	%	$\chi 2$ (0.001)	45.31; r=0.62
Geographical area	n^o	$\chi 2$ cal.	9.2;N
	%	$\chi 2$ (0.5)	15.5; r=0,29
Dimension of the exploitation	n^o	$\chi 2$ cal.	22.4; N
	%	$\chi 2$ (0.5)	31.4; r=0.43

It appears, for the same plain area, to be significant the high importance with a percentage of 33.6 %; the significance threshold is insignificant, resulting that the

consultancy demand is relatively the same (χ2 calculated of 9.2 < 15.5 χ2 theoretic, for a risk of 0.05%).

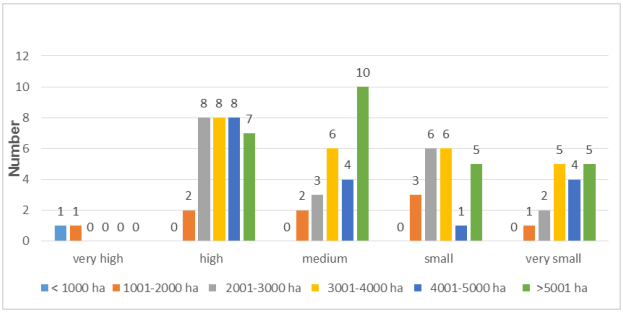

Fig. 4. Repartition of agricultural exploitations according to the locality size, regarding the importance of ”plants protection”

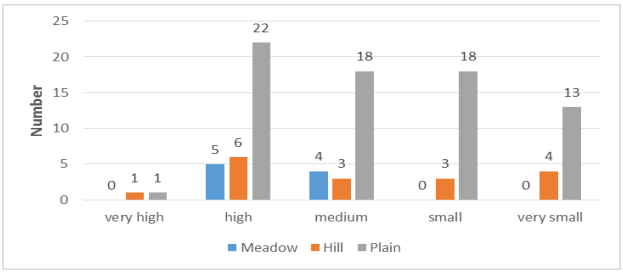

Fig. 5. Repartition of agricultural exploitations according to the geographical area, regarding the importance of ”plants protection”

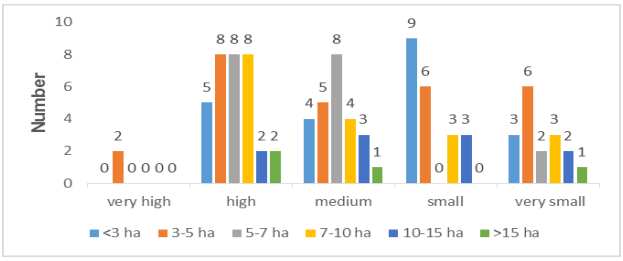

Fig. 6. Repartition of agricultural exploitations according to the dimension of the exploitation, regarding the importance of ”plants protection”

In relation to the exploitation surface, regarding the importance of plants protection (Table 2, Figure 6) the following were determined: the most receptive exploitations are those whose dimension is between 3-5ha (27.5%); in this, framing, according to the appreciation scale, the percentage is estimated “high” with 33.67 %, after which, in-sequence, there are exceptions registered; from the analysis of the significance threshold, it can be ascertained that the importance of plants protection activities is uniform, not dealing with significant abnormalities (χ2 calculated of 22.48 < χ2 theoretic of 25.04 for a risk of 0.052 %).

3.Assessment of the importance of fertilizer procurement in the consultancy activity

The fertilization of cultures and the principles of a rational fertilization represent one of the permanent preoccupations in any of the practiced agricultural systems. The correct knowledge of the management and use of fertilizers is an essential preoccupation in order to obtain high harvests.

According to the locality surface, the importance of chemical fertilizer procurement, represented in *Table 3 and Figure 7*, highlights the following: the localities having surfaces between 2,001 and 5,000 ha cumulated have the highest percentage of procurement importance (of 62.2%) with a maximum situated in the interval of the surfaces between 3,001-4,000 ha; the importance of fertilizers procurement as regards the locality surface is appreciated as uniform, as there are no significant abnormalities between the localities groups (χ2 calculated of 18.02 < 22.76, for a risk of 0.05).

Table 3. Assessment of the importance of ”chemical fertilizers procurement” with the aid of the test χ2, in Olt County, during the period 2007-2013

Level	MU	Significance χ2	
Locality size	n°	χ2 cal.	20.92; N
	%	χ2 (0.5)	31.42; r=0.42
Geographical area	n°	χ2 cal.	18.0 **
	%	χ2 (0.01)	16.8; r=0.39
Dimension of the exploitation	n°	χ2 cal.	25*
	%	χ2 (0.5)	26.7; r=0.42

The importance of consultancy in fertilizers procurement as regards the location area of the farms, *Table 3, Figure 8,* highlights the following: in the case of the localities, the „medium” procurement has a percentage of 50.00 %; the importance of chemical fertilizer procurement has a significance degree distinctly significant of 0.01 % (χ2 calculated by 18.00> 16.61, for a risk of 0.01%).

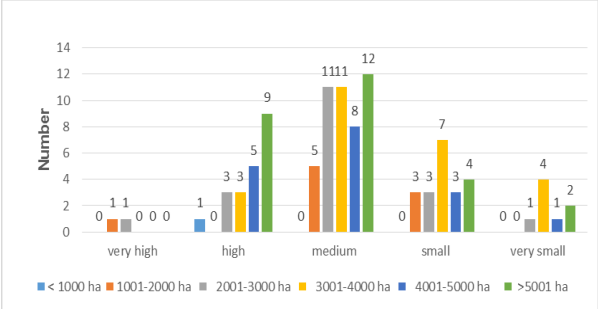

Fig. 7. Repartition of agricultural exploitations according to the locality size, regarding the importance of "chemical fertilizer procurement"

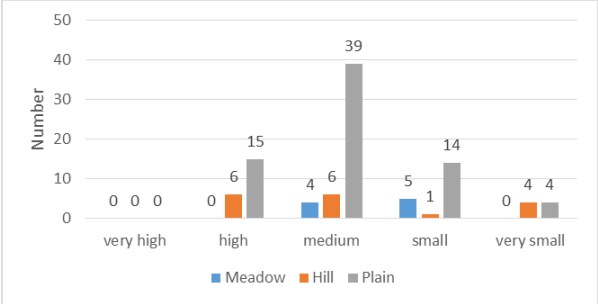

Fig. 8. Repartition of agricultural exploitations according to the geographical area, regarding the importance of "chemical fertilizer procurement"

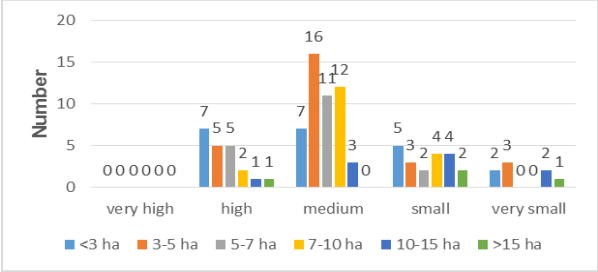

Fig. 9. Repartition of agricultural exploitations according to the dimension of the exploitation, regarding the importance of "chemical fertilizer procurement"

The farm surface is considered to be a fundamental element in appreciating the importance of consultancy in fertilizers procurement, and the levels represented in *Table 3 and Figure 9*, highlight the following aspects: the exploitations sized up to 10 ha manifest a high receptivity in fertilizers procurement (the maximum in the case of exploitations sized 3-5 ha (27%)); the appreciation of the farms considered as "medium" (50.00 %) has a significant significance ($\chi 2$ calculated of 26.27> 25.00, for a risk of 0.05%).

4.Assessment of the importance of agricultural machines procurement in the consultancy activity

Agricultural machines represent a major importance element in any of the agricultural production systems. Knowledge of the interest in agricultural machines procurement was based on the territorial aspects of the locality, area and agricultural exploitation (farm).

The spatial level of the locality influenced the importance of consultancy in agricultural machines procurement, is represented in *Table 4 and Figure 10*, from which the following result: the predominance of the interest is situated at the classes of sizes between 2,001 and 4,000 ha (62.25 %); in the structure of qualitative hierarchization, category "small" occupies 44.90 % of the total number of localities.

Table 4. Assessment of the importance of "agricultural machines procurement" in the consultancy activity, with the aid of the test $\chi 2$, in Olt County, during the period 2007-2013

Level	MU	Significance $\chi 2$	
Locality size	n^o	$\chi 2$ cal.	13.7; N
	%	$\chi 2$ (0.5)	31.4; r=0.35
Geographical area	n^o	$\chi 2$ cal.	13.7; N
	%	$\chi 2$ (0.5)	31.4; r=0.35
Dimension of the exploitation	n^o	$\chi 2$ cal.	26.1*
	%	$\chi 2$ (0.5)	25.0; R=0.46

Regarding the significance threshold, it is insignificant, showing a "medium" interest for agricultural machines ($\chi 2$ calculated of 13.7<31.4 $\chi 2$ theoretic, for 0.05 and r=0.35).

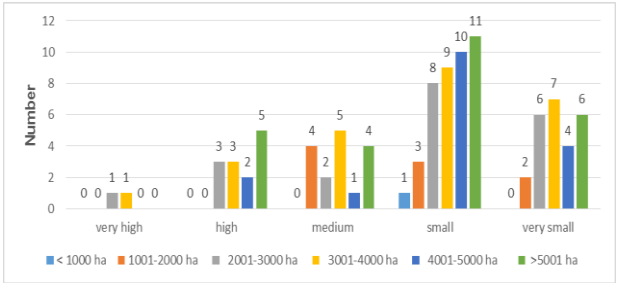

Fig. 10. Repartition of agricultural exploitations according to the locality size, regarding the importance of "agricultural machines procurement"

According to the geographical area (meadows, hills, plains), the importance of the consultancy regarding the procurement of agricultural machines, *Table 4*, *Figure 11*, the following result: the importance appreciated

for the "small" category holds a percentage of 44.9% of the total number of localities; the degree of trust is insignificant, appreciating an medium interest level for agricultural machinery procurement, ($\chi 2$ calculated that is of 13.7 < 31.4 $\chi 2$ theoretic, for the risk of 0.05 and r=0.35).

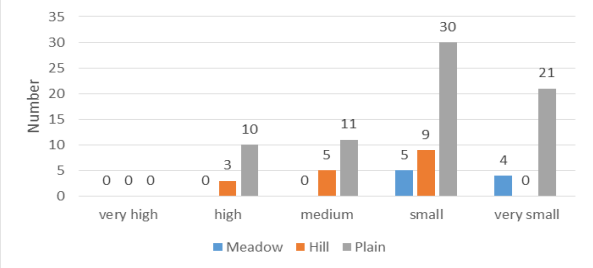

Fig.11. Repartition of agricultural exploitations according to the geographical area, regarding the importance of "agricultural machines procurement"

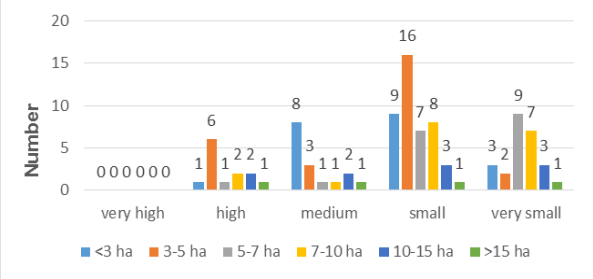

Fig.12. Repartition of agricultural exploitations according to the dimension of the exploitation, regarding the importance of "agricultural machines procurement"

The correlation between the exploitation surface and the interest for agricultural machinery procurement, represented in *Table 4 and Figure 12*, highlights the following: the predominance over the agricultural machinery procurement is framed at exploitations of 3-5 ha (de 27 %); the importance of agricultural machinery procurement is framed at "small", the percentage being of 44.90 %; The correlation between the exploitation surface and the interest for agricultural machinery procurement, represented in *Table 4 and Figure 12*, highlights the following: the predominance over the agricultural machinery procurement is framed at exploitations of 3-5 ha (de 27 %); the importance of agricultural machinery procurement is framed at "small", the percentage being of 44.90 %; from the analysis of the significance threshold, a connection is ascertained at medium level, significant between the two variables ($\chi 2$ calculated of 26.1> $\chi 2$ theoretic of 22.3, for a risk of 0.05%).

5.Assessment of the importance of livestock in the consultancy activity

The consultancy provided in livestock represents, in a way, something new for the zootechny of the last decades, when livestock diminished at all animal species and the specialists in this field, in consultancy field, are very few.

The assessment of the importance of consultancy in the field of livestock according to the locality surface, represented in *Table 5 and Figure 13* highlights the following: the localities whose territorial area is between 2001-5000 ha also have the highest percentage in the assessment of the importance of consultancy in livestock activities (62.25 %); the assessment of the importance is given by a maximum of the percentage appreciated as "high" (of 27.55 %), and afterwards, there is a successive decrease until the category "small" (that reaches 15.31 %); the test $\chi 2$ is insignificant ($\chi 2$ calculated is of 26.5 < $\chi 2$ theoretic of 29.5, for a risk of 0.05% and r=0.46), that means a uniform interest in the consultancy for livestock.

Table 5. Assessment of the importance of "livestock", with the aid of the test $\chi 2$, in Olt County, during the period 2007-2013

Level	MU	Significance $\chi 2$	
Locality size	n^o	$\chi 2$ cal.	26.2; N
	%	$\chi 2$ (0.5)	31.4; r=0.46
Geographical area	n^o	$\chi 2$ cal.	5.7; N
	%	$\chi 2$ (0.5)	15.5; r=0.37
Dimension of the exploitation	n^o	$\chi 2$ cal.	16.3; N
	%	$\chi 2$ (0.5)	31.4; r=0.38

Analyzing by relief areas the importance of consultancy in the field of livestock, a maximum level for the "high" degree of the importance, and afterwards, a successive decrease, at 27.5% for medium and at 15.3% for small); a percentage of 43% for the exploitations in the plain areas, for the levels "high" and "medium"; the test $\chi 2$, indicates a level of interest equal for all the relief areas

(χ2 calculated of 15.7< χ2 theoretic of 15.5, for 0.05 and r=0.37).

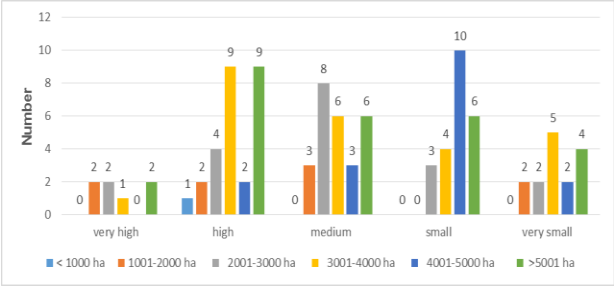

Fig.13.Repartition of agricultural exploitations according to the locality size, regarding the importance of "livestock"

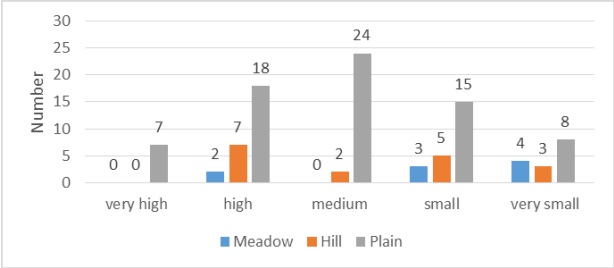

Fig.14.Repartition of agricultural exploitations according to the geographical area, regarding the importance of "livestock"

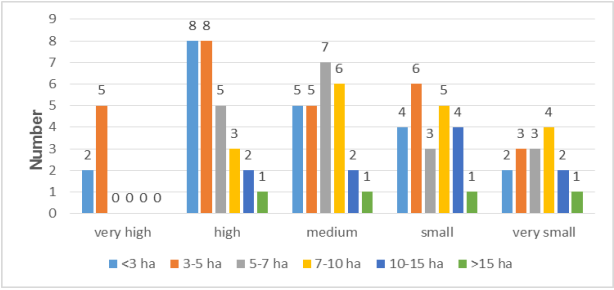

Fig.15. Repartition of agricultural exploitations according to the dimension of the exploitation, regarding the importance of "livestock"

From the analysis of the exploitation and the correlation with the consultancy for livestock, represented in *Table 5 and Figure 15*, the following aspects result: for an increment up to 10 ha, the cumulated percentage is of 85.7%; on appreciation degrees, there is a relatively uniform repartition ascertained, resulting that there are no significant differences in terms of consultancy provisions; the test χ2 is insignificant, because χ2 calculated is of 16.3< χ2 theoretic is of 25.0 and r=0.38.

6.Assessment of the importance of marketing of agricultural production in the consultancy activity.

The consultancy activities in marketing of agricultural production aim knowing both the market forms (in time and space), as well as the structure of the producers group. An association of agricultural producers has as purpose, in this respect, the identification of markets, and, on the other side, the adaptation of the production according to the market necessities. In Olt County, the consultancy forms in the field of marketing of agricultural production are adapted to the agricultural producers, and it has been aimed at the level of the territorial area of localities, landforms and agricultural exploitation.

The assessment of the importance of consultancy according to the locality surface is represented in *Table 6 and Figure 16*, from where the following result: the communal areas between 2,001-5,000 ha have the highest percentage in terms of assessment of the marketing of agricultural production (of 62.2%).

Table 6. Assessment of the importance of "marketing of agricultural production", with the aid of the test χ2, in Olt County, during the period 2007-2013

Level	MU	Significance χ2	
Locality size	n°	χ2 cal.	59.7***
	%	χ2 (0.001)	45.3; r=0.62
Geographical area	n°	χ2 cal.	8.65;N
	%	χ2 (0.5)	15.5; r=0.23
Dimension of the exploitation	n°	χ2 cal.	13.6; N
	%	χ2 (0.5)	31.4; r=0.35

In the structure of the appreciation level, the highest level of the percentage corresponds for "high" with 43.8%; the analysis of the trust threshold with the test χ2 shows that there is a very significant difference between the appreciation of consultancy (χ2 calculated of 62.6> χ2 theoretic of 51.1 and r=0.62).

According to the relief area, the assessment of the importance of marketing of agricultural production, represented in *Table 6 and Figure 17*, highlights the following: the assessment of the importance of consultancy regarding the marketing of agricultural production in the plain area is of 21% for "very high" and of 32% for "high"; the "high" level is predominant (with 43.88 %); the test χ2 shows us that the

appreciation of the importance of "marketing of agricultural production" was made uniformly within the county ($\chi 2$ calculated of 8.6 < $\chi 2$ theoretic of 11.0 and for r=0.23).

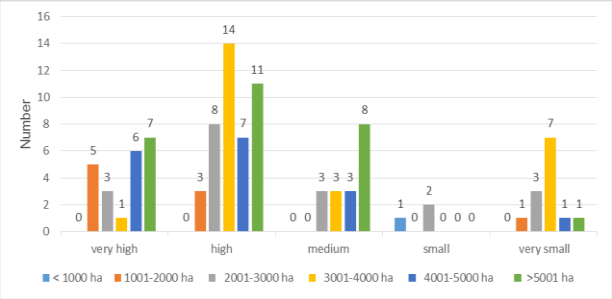

Fig.16. Repartition of agricultural exploitations according to the locality size, regarding the importance of "marketing of agricultural production"

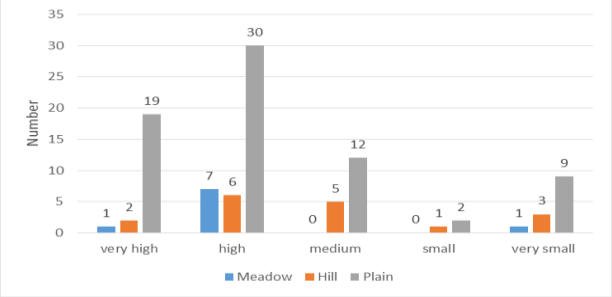

Fig.17. Repartition of agricultural exploitations according to the geographical area, regarding the importance of "marketing of agricultural production"

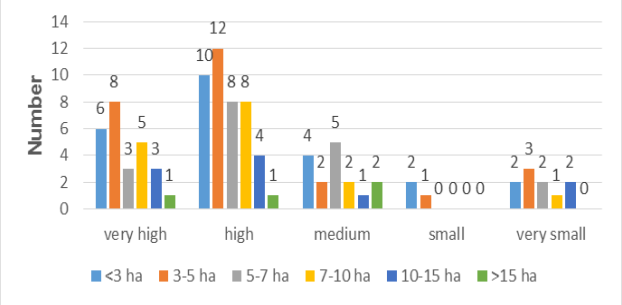

Fig.18. Repartition of agricultural exploitations according to the dimension of the expoitation, regarding the importance of "marketing of agricultural production"

According to the dimension of the exploitation represented in *Table 6 and Figure 18*, the following result: agricultural exploitations whose size is <10 ha frame the highest percentage in the assessment of consultancy (cumulated is of 95.9 %); the importance of the assessment is significant for the situation "high", the percentage having a maximum level of 43.88 %; the test $\chi 2$ shows us that there are no significant differences between the modalities to provide consultancy ($\chi 2$ calculated of 13.6< $\chi 2$ theoretic of 25.0 and r=0.35)

7.Assessment of the importance of the association on various forms in the consultancy activity

The importance of the consultancy activity for the initiation of some association forms from agriculture represent a way in solving many issues, especially for the exploitations that have small surfaces of agricultural terrain.

From the analysis of the importance of consultancy according to the locality size, represented in *Table 7 and Figure 19*, the following aspects result: the importance of association consultancy for the localities ensemble by the expression "very small" is of 55.1% from the exploitations and of "small" of 22.3% from the exploitations, manifesting a lack of interest in respect to various forms of association; the test $\chi 2$ is very significant ($\chi 2$ calculated of 128.8 < $\chi 2$ theoretic of 45.3, for 0.001 and r=0.75), which shows us great differences between the levels of qualitative appreciation.

Table 7. Assessment of the importance of "association on various forms", with the aid of the test $\chi 2$, in Olt County, during the period 2007-2013

Level	MU	Significance $\chi 2$	
Locality size	n°	$\chi 2$ cal.	128.8***
	%	$\chi 2$ (0.001)	45.3; r=0.75
Geographical area	n°	$\chi 2$ cal.	5.72; N
	%	$\chi 2$ (0.5)	15.5; r=0.28
Dimension of the exploitation	n°	$\chi 2$ cal.	14.3; N
	%	$\chi 2$ (0.5)	31.4; r=0.35

The correlation of consultancy at the level of the exploitations with the landforms, represented in *Table 7 and Figure 20*, represents the following: the association form "very small" has the highest percentage of 53.1%, followed by "small" with 19.8%; the significance threshold is insignificant ($\chi 2$ calculated of 5.72< 15.5 theoretic, 0.05 and r=0.28), showing that the relief area has no influence on the consultancy on association issues.

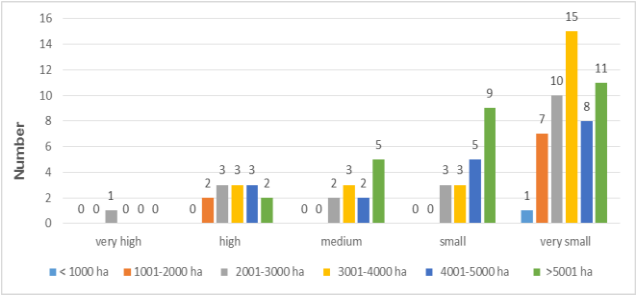

Fig.19. Repartition of agricultural exploitations according to the locality size, regarding the importance of "association on various forms"

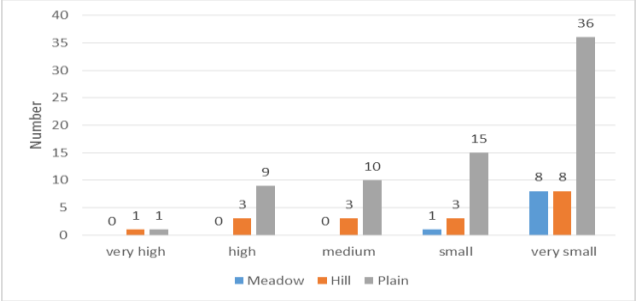

Fig.20. Repartition of agricultural exploitations according to the geographical area, regarding the importance of "association on various forms"

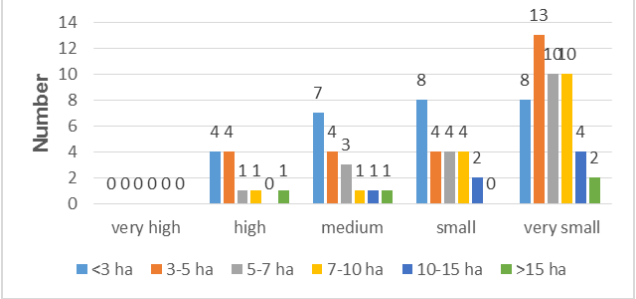

Fig.21. Repartition of agricultural exploitations according to the dimension of the exploitation, regarding the importance of "association on various forms"

Analyzing the relation between the consultancy regarding the association in agriculture and the size of the agricultural farm, represented in *Table 7 and Figure 21*, the following result: for the ensemble of agricultural exploitations, the level "very small" has a percentage of 55.10 %, "small" of 26%; the size of the exploitation does not influence the level of consultancy, due to the fact that $\chi 2$ is insignificant ($\chi 2$ calculated of 14.3< $\chi 2$ theoretic of 41.4, 0.05, r=0.35).

CONCLUSIONS

The study comprised the highlighting of the influence level of the size of localities, relief areas and agricultural farms (exploitations) sizes, on the consultancy provided on the main consultancy activities: projects elaboration, mainly SAPARD projects, plants protection, chemical fertilizers procurement, livestock, marketing of agricultural production and association on various forms

In the consultancy activity, the size of the locality has a very significant influence on the importance of consultancy on issues regarding projects of investment in production farms, of plants protection, of chemical fertilizers procurement, of livestock, of marketing of agricultural production and association in various forms and a significant influence on the agricultural machines procurement. It has no influence on the consultancy level in the field of plants protection and livestock.

The relief area and the dimension of the agricultural exploitation have no influence on the consultancy level given for the analysed issues.

The study highlights the fact that in the localities having a smaller dimension, the consultancy is provided at an inferior level as regards the localities with larger surfaces. This applies due to the small number of consultants and to the difficulty to reach the smaller localities (damaged roads and few transport means).

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RESEARCH ON VEGETATION INDEX OF CROP PLANTS IN AN EXPERIMENTAL GARDEN

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Abstract

Precision agriculture is a new agricultural concept relying on the existence of new variables in the field. Modern technologies are used, such as global positioning (GPS and DGPS), sensors, satellites or aerial images, and information management tools (GIS) to assess and understand some variation of an agricultural crop. The information collected for this type of agriculture can be used to more accurately assess the optimal density of seed, fertilizer use is estimated to culture and more specifically during the harvest. This type of agriculture is trying to avoid the application of inefficient practices to a crop, regardless of soil, climatic conditions, and can help to better assess the phytosanitary status of crops and changes in different stages of vegetation. Crop Circle is an equipment of last generation and can be used successfully in this direction, for this type of agricultural practice.

***Key words*:** *measurements*, *Sibiu, Romania, Crop Circle, vegetation*

INTRODUCTION

This study was conducted on the surface of 4,800 m^2 vegetable garden inside the Evangelical Church in Gusterița neighborhood in the city of Sibiu. GPS location coordinates are 45 ° 44 '13.74' north latitude and 24 ° 06 '22.26' 'East longitude. (Photo 1).

Photo 1. Environmental Education Center Evangelical Church Guşteriţa- Sibiu (orig.)

Evangelical-Lutheran parish in Sibiu has proposed a new project: to achieve overall fortified church Sibiu Gusterita an Educational Center for Environment and youth. Sibiu Parish certification in the Community's management and Audit Scheme EMAS as a second institution in the country underlines the importance that we attach to protecting Creation. Analysis and evaluation of the effects they have actions on the environment. The focus is on reducing the consumption of electricity and fuel, renewable energy [5], waste recycling, biodiversity [1,2,10-12], urban mobility and appropriate food produced organically. The application is carried transparently and communicate experiences and stated desire to continue to make contributions to protecting the environment [6,8,14]. An important part of the activity is to sow love and respect for the environment into the consciousness of the young generation. Based on these principles was the idea of reuse of an entire Saxon fortified church on the outskirts of Sibiu: by turning it into an educational center on themes of environmental protection.

MATERIALS AND METHODS

Crop Circle ACS-430 appliance was purchased CEMPER Research Centre of the Faculty of ŞAIAPM in 2010 through a project PNCDI - 2 and was first used in collecting field data to determine "the degree of green" a

default location.

The data measured by Crop Circle ACS-430 allowed us to calculate the classic index of grassland vegetation of the plants analyzed, such as NDVI and SRI indexes. These data were collected in the field from October 2015 to experience being continued and in March 2015 until June 2016 (Photo 2). The study was aimed at acquiring and mastering skills in handling the device, field data collection and processing in order to perform statistical interpretations. The device Crop Circle ACS-430 allowed us to use dozens of indices of vegetation detected measurements overhead and transmitted via satellite using GPS applications by remote sensing plot analyzed in a certain time when vegetation from grassland was in various stages of evolution.

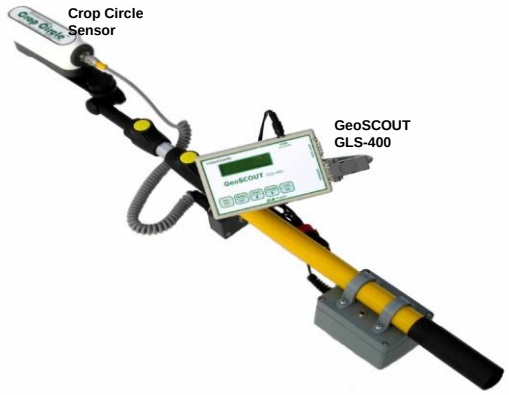

Photo 2. Crop Circle ACS-430

Field visits and data collection were performed over 24 field trips, we try to capture the state of green meadow since the autumn months when vegetation is approaching dormant, in spring when the explosion of vegetation it was at its peak and then make measurements during all summer months.

For measurements during each trip to collect field data we mounted sensor on the camera body and the data measured in the field come from a certain position of the appliance by a desired spacing (at an angle of 30° C), surface analysis or target plants (Photo 3).

The sensor device Crop Circle ACS-430 incorporates a proprietary technology[4] polychrome consisting of a light source and principle of operation is to illuminate and detect green part of the leaf carpet which we have reviewed [3].

Source of light emitted by the machine during the measurements in the field simultaneously emits visible light spectrum and in the near infrared (NIR) from a single LED light source.

The major benefit of this technology Recent already farmers practice in European countries has a principle of operation of the light source can be detected on the surface of the plant to be examined is identified for both light spectra both visible and bands of infrared light [18].

During the research by we managed to highlight and measure using the apparatus Crop Circle ACS-430 simultaneous measurements in three bands: 670 nm, 730 nm and NIR bands.

The data measured by Crop Circle ACS-430 allowed us to calculate the index vegetation classic of the plants that formed analyzed grassland habitat, such as NDVI and SRI indexes.

Serial data were generated by sensor processing by computer and are shown in the tables in Appendix, where NDVI is the Normalized Differential Vegetative Index) value reflctanţei NIR near infrared reflectance and VIS is value in the visible.

Photo 3. Experimental field where measurements were made (orig.)

Crop Circle can be used in two ways data acquisition in the field. These modes are the type MAP (map) and how PLOT (data collection).

One of these two modes is selected by the user when the device is turned on.

If MAP mode is selected, it is necessary for the proper operation and installation of the GPS device (Photo 4).

SITE0003.CSV

	A	B	C	D	E	F	G	H
1	Plot	Sample	SF 1	SF 2	SF 3	SF 4	SF 5	SF 6
2	1	1	113100	49	1131	0.09	1.5868	1.325
3	1	2	113200	49	1132	0.09	1.586	1.325
4	1	3	113300	49	1133	0.089	1.5852	1.325
5	1	4	113400	49	1134	0.09	1.5887	1.327
6	1	5	113500	49	1135	0.088	1.5908	1.332
7	2	1	114400	49	1144	0.088	1.5954	1.336
8	2	2	114500	49	1145	0.088	1.5948	1.336
9	2	3	114600	49	1146	0.088	1.5961	1.337
10	2	4	114700	49	1147	0.088	1.5978	1.339
11	2	5	114800	49	1148	0.088	1.5955	1.338
12	3	1	115800	49	1158	0.088	1.6014	1.341
13	3	2	115900	49	1159	0.088	1.6016	1.341
14	3	3	116000	49	1160	0.088	1.6006	1.341
15	3	4	116100	49	1161	0.088	1.6002	1.341
16	3	5	116200	49	1162	0.088	1.6007	1.341
17	3	6	116300	49	1163	0.088	1.6002	1.34

SITE0003

Photo 4. Program data processing from measurements taken from ground (orig.)

RESULTS AND DISCUSSIONS

With the help of new generic device called Green detector we were able to analyze remote sensing measurements in the time period in the range October 2015 and June 2016 4,800 m2 plot, located in the Evangelical Church in Guşteriţa (Photo 5). We noticed measurements carried out and the degree of green vegetation evolution represented by the (NDVI) in the area with grass and vegetable crops inside the parish garden.

Photo 5. Crops under review (orig.)

Vegetation in plot has analyzed the property of absorbing solar radiation in the region of the electromagnetic spectrum called for photosynthetic active radiation (RAF) which is used as an energy source for the specific processes of photosynthesis [9,13,16]. The cells analyzed were leaf of the habitat ability to reflect solar energy in the near infrared spectral region, as the energy per photon in this area (wavelengths greater than 700 nanometers) is not sufficient to be useful to synthesize organic molecules. A strong absorption at this wavelength (if the leaves would not reflect) plant would result in overheating which could lead to tissue destruction. As a result, the analyzes carried out in the six months I noticed that green plants appear relatively dark in the RAF spectral column FS6 (VIS) [18].

The vegetation consists of vegetable crops in experimental fields analyzed absorb this radiation light in the near infrared spectral specific radiation SF 5 column (NIR) NIR reflectance due. Plants with chlorophyll, absorb visible radiation very strong (between 0,4şi 0.7 μm) and use it in photosynthesis.

Within the 33 charts that are processed field data was used formula for calculating the vegetation index NDVI (SF4 column):

$$\mathrm{NDVI} = \frac{(\mathrm{NIR} - \mathrm{VIS})}{(\mathrm{NIR} + \mathrm{VIS})}$$

NIR reflectance and VIS are obtained device (SF 5) for respectively visible and near infrared (SF4).

Positioning sensor during measurement of biomass is as shown below (Fig.1.)

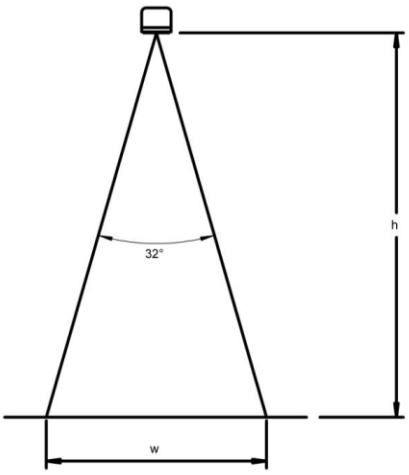

Fig.1. Positioning sensor (FOV)

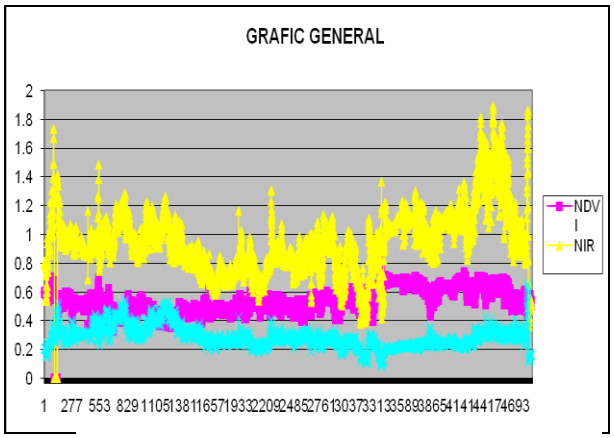

Fig.2. Centralization of data obtained from the survey (orig.)

CONCLUSIONS

The analysis of data collected during six months of monitoring of the parcel described herein can draw the following conclusions:

- Green plants in our case the layer of grass and vegetable [17] crops monitored due to the content of chlorophyll and the phenomenon of photosynthesis have the ability to reflect and transmit the visible (VIS) per wavelength blue and red reflecting the green, so the level of green,
- Using the apparatus Crop Circle ACS-430 which performs measurements reflecting these wavelengths have given us during tests index green herbaceous straw and vegetable crops analyzed. Thus we can conclude that during the spring months of March respectively in April and then in the summer months from May to June index was green meadow highest measured values ranged from 0.2 to 0.489 in the ranges found in graphs and tables at number 9 to number 33.
- Also during autumn and early spring when the infrared light (NIR) was stronger it is absorbed by soil carpet coverage because vegetation [15] was lower readings were between intervals 0.94 -1.2705, found in graphs and tables from number 1 to number 10.
- The measurements we observed the evolution of green vegetation and the degree represented by the (NDVI) values ranging from 0.38 to 0.733.
- Also over research using the apparatus Crop Circle ACS-430 have obtained information on the amount of green reflected from vegetation cover, these values are influenced certain days of atmospheric moisture, coverage of clouds and air temperature,
-Measurements representing different combinations of wavelengths represented biophysical characteristics of grassland vegetation under review [1,2,7], this index was influenced chlorophyll content of leaves and vegetation stage. Using these measurements carried out in agricultural crops, we could identify certain plant diseases which may lead to the timely application of phytosanitary treatments. But this was not possible because the crops were analyzed in an organic garden.
-The device Crop Circle ACS-430, operating on the principle of remote sensing, can be used in natural resource management for estimating vegetation cover land, in our case herbaceous layer DAFR and vegetable crops analyzed, estimating biomass which can lead to change use of certain parcels of Gușterița Ecological Garden.

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RESEARCH METHODS AND ANALYSIS USED TO DETERMINE FAKES IN FOOD (HONEY)

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Abstract

This work had the purpose to analyze the quality of five types of honey, methods and laboratory techniques to detect adulteration of foodstuff. After investigation and determinations, after an analysis of the results obtained it can be concluded that all five varieties were natural without added sweeteners or other food additives. It should be noted that honey used in the analysis was obtained from private local beekeepers in the county of Sibiu, without being bought from a supermarket network or food markets of the city.

***Key words*:** *honey, identification, quality, results, Sibiu, Romania*

INTRODUCTION

In its natural form, honey is rich in minerals, vitamins, enzymes, amino acids and carbohydrates. However prepared, cooked, loses many of these nutrients, they transformed into cells of toxic, harmful to the human body. Therefore, honey should be consumed exactly as 'cooked' by bees, without other interventions or additions. Plant flowers pollinated by bees and butterflies [7-11] insects around, they generally live strong colors and scents [14].

Unfortunately, in the market of Romania nearly half of the sold is counterfeit or enhanced with other additives causing enough inconvenience to consumer health [5]. Market in Romania accounts for 20,000 tons of honey annually.

A recent journalistic approach revealed that 10 jars of honey, chosen randomly from several supermarkets [10], contained adulterated or inferior quality honey than the normal one, shown on the label.

In laboratory [6] tests, it has been found that the honey containing glucose in the supermarket industry, sugar molasses, corn powder, coloring and gelatin [13]. Only traces of pollen, although on all the jars it was mentioned "natural honey" of linden, locust, polyfloral, sunflower[11]

First, natural honey has a specific flavor and provides a smooth sensation when swallowed. It also has natural impurities: pollen, micro wax and propolis sometimes. It has a fine texture, ooze and does not foam.

Instead, counterfeit honey has a stench or has no flavor. It can be separated into layers and is clear - no impurities. Spread the bread lightly and not least, fake foam product. The forgers and claims cost. Serious beekeepers sell honey in a jar of 500 grams at the price of Lei 10-12 lei and sold fake honey for Lei 15. The sellers tell the clients that the proof that their honey is natural is its cleanness and the lack of impurities.

MATERIALS AND METHODS

To detect adulteration of honey in the laboratory (Photo 1.), there were used five types of honey supplied from various local producers [1,2,12].

Several methods of analysis [6] were used for the detection of ounterfeits, working method and the results are presented in the work ahead:

-Identification of Hidroximetil furfurol (Hmf) using Fiehe method;

-Identification of sugar syrup added in honey;

-Determination of electrical conductivity of honey;

-Determination of using Gothe diastase index.

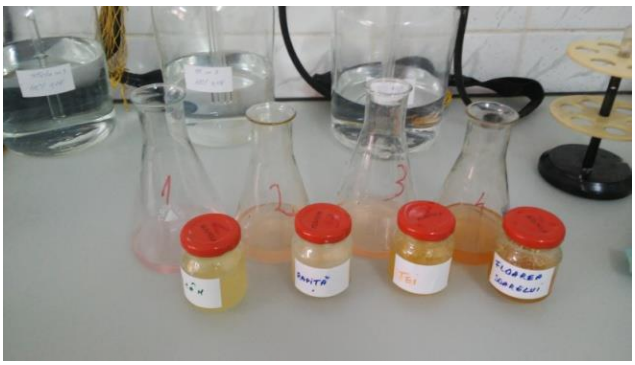

Photo 1. Preparing samples for analysis honey (orig.)

RESULTS AND DISCUSSIONS

Hidroximetil furfurol is an intermediate product resulting from the degradation of hexoses heat treated with an acid. Following fakes artificial sucrose, glucose and fructose releasing results degrade HMF (Photo 2).

Photo 2. HMF identification method Fiehe (orig.)

Hidroximetil furfurol formed with resorcinol, in a hydrochloric acid medium, a deep red colored complex.

In a mortar it is put 5 g honey, and about 25 ml of diethyl ether and they are milled for five minutes, the ether evaporates to be completed, if necessary. The ether extract was put into a porcelain crucible and was evaporated at ambient temperature[3].

Over the residue there were added a few drops of the solution of resorcinol. In the presence of HMF, a red colour appears which is increasing over time. If a pink or orange colour appears and disappears within five minutes, this is not considered.

If it is crystallized, we must look carefully at the crystals in the honey meal.

But because the experiment was conducted only on honey assortment of cornflowers, it has not taken the advantage of this feature.

After adding drops of resorcinol staining orange to red coloration but disappeared after 5 minutes which certifies that in the honey, it has been added sugar syrup, honey is a natural product.

Identification of sugar added syrup in honey

To 5 ml of 20% aqueous solution of honey, 2.5 g of lead acetate and 22.5 of methyl alcohol. If the addition of sugar syrup abundant sediment appears a yellowish white (Fig.3.).

Photo 3. Identification of sugar added syrup in honey (orig.)

The result showed the absence of sugar in honey syrup which led to the conclusion that honey is natural, and in its composition there are only specific ingredients.

It is essential that the bees themselves to procure the nectar of flowers and then to convert sucrose into glucose and fructose nectar.

Some beekeepers in order to get high profit, used to add sugar syrup, but this is an improper action for a professional.

This natural honey must not have more than 20% water, as bees 'capacity' to fill the combs cells develop only if the water evaporated in this proportion. Also, "saccharification" is another criterion that certifies the originality

of honey and it is important to know that sugared honey is not damaged.

Determination of electrical conductivity of honey

The electrical conductivity of honey (Photo 4) is directly related to the concentration of inorganic salts, organic acids and proteins.

This parameter shows high variability depending on the floral origin and considered the best to differentiate between different floral origin honey.

Electrical conductance [4] honey lies between 280-523 $\mu S \cdot cm^{-1}$. Electrical conductivity of honey ends with a conductivity at 20% solution in ultra pure water and was measured at 200°C.

Photo 4. Determination of electrical conductivity of honey (orig.)

Table 1. Determining conductivity results

Honey tye	**Electrical conductivity** $\mu S \cdot cm^{-1}$
Corn flowers honey	415
Rape honey	192
Sunflower honey	488
Acacia honey	180
Lime honey	378

Determination of using diastase Gothe index.

In the natural honey, there are several enzymes. Amylase is the enzyme with the highest resistance to thermal treatment, which is the last to be destroyed.

Based on this characteristic, amylase can be used as a general assessment test (enzyme or Diastase index) for the quality of natural honey (Photo).

Sugared honey must be subjected to heat treatment max. 45ºC, otherwise Diastase index can reach very low values, even 0. The same remarks for adulterated honey.

Diastase index is defined as the number of ml of a 1% solution of starch, which was converted to dextrin for one hour at a temperature of 45°C and pH optimum, the amylase contained in 1 g of honey.

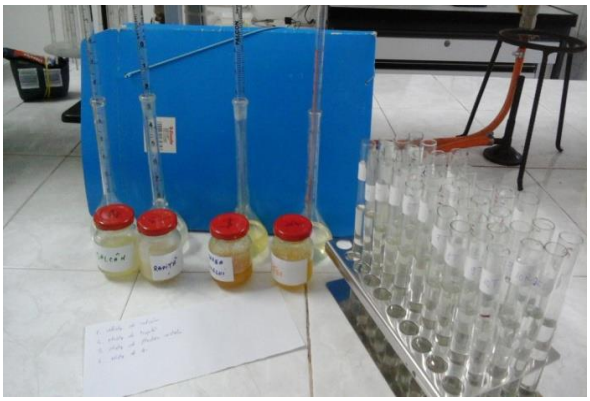

Photo.5. Determination of using index diastase Gothe (orig.)

A honey well stirred solution is placed in test tubes (numbered 1-10) in decreasing amounts, according to Table 1. Pipette 0.5 ml of each tube of acetic acid and 0.5 ml of sodium chloride. Further, in water content of each volume of 11 ml tubes, they are homogenized.

In each tube it is added 5 ml starch solution 1%, the it is homogenized again by repeatedly turning their content and then the tubes are inserted into a suitable stand in thermostat set at 45°C. The water from thermostat exceeds 1 cm or 2 cm liquid level in the test tube. From this moment they are timed for 1 hour.

Photo 6. Diastase index result in honey Rape (orig.)

After the mentioned time expired, the tubes were immediately cooled into ice water to stop the activity of amylase, and then they are arranged in an increasing order in the state. To each tube it is added a drop of iodine solution and mixed by inversion [3].

The tubes with the lowest content of honey, the starch hydrolyzation was not entirely, a blue color has appeared. The tubes where the starch was completely hydrolyzed, there were a range of colours: white, yellow, orange, red tic, purple, violet.

To determine the index Diastase, there were weighed about 5-6 g of honey from the five

analyzed varieties. The weighing was done using the analytical balance for 4 decimal places: Lime honey 5.0781 g, Acacia honey 5,0745 g, Rape honey 5.0355 g, Polyfloral honey 5.0377 g and Sunflower honey 5.0993 g.

The weakening the amylase activity (below the set) or its destruction (irreversible inactivation) can be found in many situations: warming honey brutal led to the inactivation of enzymes; the honey of several years old and kept at medium temperature, honey from the bees intensively fed with sugar syrup (Diastase index has a low value); adulterated honey, especially with artificially inverted sugar syrup.

However, there are situations when a very high value of Diastase index is wrong. One of these is recorded for the fermentative alteration, when most of amylase is developed by yeast fermentation. In this case Diastase index tends to 50 or even exceeds this level.

Another situation occurs when honey is adulterated with added malt extracts or sweet syrups prepared by enzymatic hydrolysis of starch.

CONCLUSIONS

Through this work there were highlighted the natural qualities of the 5 types of honey analyzed (sunflower, polyfloral, rape, acacia, lime), produced by bees without the artificial intervention of the beekeeper.

It is known that some beekeepers give the bees a kind of sugar syrup processed into a low-quality honey.

From these analyzes it was concluded that the bees have collected nectar from flowers and then turned nectar sucrose into glucose and fructose. All sorts of the analyzed honey types led to the conclusion that the honey was natural, even organic, because all the honey types had a water content below 20%. This was due to bees 'capacity' to fill the cells and put honey into combs only after the water evaporated until this proportion.

Candied or crystallization process is quite naturally and does not represent a deterioration of honey. Moreover, honey adulterated is not sugared. It's just a matter of taste, the choice between fluid and crystallized honey. Some Nordic nations even prefer to consume only crystallized honey because they find tastier and is safe natural.

On the other hand, sugared honey can be "solved", that is, it can be brought back to a fluid state by boiling in a saucepan jar with water. But unfortunately, such honey-crystallized lose some of its properties.

Natural honey crystallizes very quickly. The only honey type which does not crystallize is acacia honey.

The crystallization starts kidnapped from the honeycomb.

Linden, polyfloral, berries honey crystallizes in a few weeks from harvest and storage.

Then, it comes acacia honey or false honey, enriched with honey syrup sugar/glucose in a certain percentage or even honey syrup made from sugar/glucose 100%.

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QUALITY OF TREATED WATER IN CĂLĂRAŞI MUNICIPALITY

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Abstract

The wastewater, insufficiently treated, affect negatively the quality of emissary reached. Poorly treated urban wastewater discharge to surface water has serious consequences for the natural phenomenon of self-cleaning the waters of the Danube and Borcea branch is currently at the limit of the natural opportunities to restore natural biogeochemical balance. In the present study it was discussed about the wastewater with major contribution in pollutants that reach the terminal basin of the Danube, derived from the Wastewater Treatment Plant in Calarasi municipality. The quality indicators of wastewater monitored in the study were: chemical oxygen consume, biochemical oxygen consume, total nitrogen, total phosphorus. The best results were seen in the treatment in case of biochemical oxygen consume (over 96%). Among the main problems recorded in the Wastewater Treatment Plant, it is remarked lower efficiency in removing phosphorus and total nitrogen in the cold season, due to malfunctioning of biological stage, meaning a weak process of eutrophication in the emissary, Borcea Branch.

Key words: *emissary, quality indicator, wastewater treatment, treated water, treatment plant.*

INTRODUCTION

The effective management of wastewater is essential for recycling the nutrients, in order to maintain healthy ecosystems and to improve the environment through proper disposal of drainage and wastewater to preserve water quality [10]. The general objective of water management is to ensure a high standard of living, in terms of water for all citizens. This means improving water resources by increasing the quality of water resources, ecological rehabilitation of rivers, etc. [4]

Despite significant investments were made in the sewerage network and modernization of the Wastewater Treatment Plant Călăraşi, wastewater currently represents also a threat to the public health and natural ecosystems [8].

Călăraşi county has a varied hydrological potential, a great importance having the water surface of the Danube river and Borcea branch- considered to be a bird protection area [1]. The discharge actions of untreated or poorly treated wastewater into surface waters produce adverse effects on the natural phenomenon of self-purification [5]. As a result, the Danube and Borcea branch water reached today, in Călăraşi municipality, to the limit of natural abilities to recover the biogeochemical balance, imposing such control and sewage water discharged as efficiently as possible [7].

The main weaknesses of the collection system and wastewater treatment plant in Călăraşi county are represented by numerous damage in the sewage system, by breaking collectors and collapse, and the population benefiting from the service of wastewater collection represents 75% of the municipality population [3].

MATERIALS AND METHODS

In this paper, it is identified the current situation of the wastewater reaching Borcea branch and the Danube basins and the way of treating it. Călăraşi County Agency for Environment Protection makes analyses for the wastewater reaching the emissary.

Since 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 Sectoral Operational Programme "Environment", Călăraşi municipality has a performing wastewater treatment plant complying with the European Union standards [2].

Călăraşi Wastewater Treatment Plant is designed to operate with a maximum water flow daily from 21,800 m^3 , respectively 7,957,000 m^3/ year [3].

The balance of the quantities of wastewater influential daily in Călăraşi Wastewater Treatment Plant in 2015 was as follows: population - 5,965 m^3/day, public - 1,010 m^3 / day, economic agents - 2,087 m^3 / day, losses - 4,750 m^3/day, infiltrations - 684 m^3 /day [11].

In the dry periods, an abnormal situation occurs, the lack of adequate sewerage system facilities [9].

This situation is given by the high levels in Borcea branch, that through the channels of discharge from the Pumping Plant Jirlău and Pumping Plant Siloz, enter into their suction basins so as to the treatment plant, an additional flow of 100 - 140 l/day is pumped [11].

The main indicators of interest of the quality of treated water and wastewater analyzed in this paper are: CBO_5 (biochemical oxygen consume in water), CCO-Cr (chemical oxygen consume), N_{tot} (total nitrogen) and P_{tot} (total phosphorus). They were compared with the maximum permissible value under NTPA001 [6].

RESULTS AND DISCUSSIONS

For the more accurate evaluation of the impact of wastewater discharge, at the level of Călăraşi municipality, there were analyzed from a chemical point of view both the influent of wastewater and the effluent resulted from Călăraşi Treatment Plant.

In 2015, the main indicators of wastewater and treated water quality have the values presented in Table 1 [3].

We note that in Table 1, during the entire studied period, the efficiency of Wastewater Treatment Plant as regards the bio-chemical consume and chemical consume of treated water was over 83% treatment efficiency.

Table 1. Annual averages of the quality indicators CBO_5 and CCO-Cr ai of wastewater and treated water in Wastewater Treatment Plant Călăraşi, in 2015

Period	CBO_5 (mg/l)		CCO-Cr (mg/l)	
	Infl.	Efl.	Infl.	Efl.
01.2015	166.94	6,63	213.42	32.11
02.2015	164.62	9,82	213.10	34.65
03.2015	148.06	6,14	210.32	37.02
04.2015	129.67	6,00	177.56	36.15
05.2015	132.87	5,04	171.55	30.31
06.2015	135.23	5,53	187.87	30.73
07.2015	145.90	4,55	194.11	31.34
08.2015	124.90	4,79	176.92	31.12
09.2015	126.31	3,88	156.77	32.63
10.2015	144.65	6,11	200.31	31.69
11.2015	169.10	5,83	233.00	32.05
12.2015	140.50	5,81	191.40	30.51
Annual average	144.06	**5.84**	193.86	**32.53**
Plan efficiency	**95.90%**		**83.20%**	

Source: [3].

Table 2. Annual averages of quality indicators N_{tot} and P_{tot} of the wastewater and treated water in Călăraşi Wastewater Treatment Plant, in 2015

Period	Ntot (mg/l)		Ptot (mg/l)	
	Infl.	Efl.	Infl.	Efl.
01.2015	40.59	10.33	3.21	1.42
02.2015	41.57	17.73	2.95	0.71
03.2015	41.38	10.13	3.66	1.22
04.2015	40.35	10.45	3.85	1.44
05.2015	40.60	8.28	3.91	1.37
06.2015	37.28	10.04	4.09	2.21
07.2015	39.28	9.83	4.83	1.88
08.2015	35.25	9.00	4.49	2.40
09.2015	34.74	7.40	4.09	1.42
10.2015	39.16	7.66	3.42	0.53
11.2015	38.49	7.11	3.29	0.55
12.2015	39.31	10.06	3.84	1.33
Annual average	39.00	**9.83**	3.80	**1.37**
Plant efficiency	**74.80%**		**63.90%**	

Source: [3].

Analyzing the values in Table 2, we can deduce that the loading of nutrients (nitrogen and phosphorus) of the wastewater discharged in Borcea branch is quite low due to the treatment efficiency (of 74.8% for N_{tot} and respectively 63.9% for P_{tot})

The variation of biochemical oxygen consumption (CBO_5) of water discharged into the environment in 2015, in Calarasi Treatment Plant is presented by month in Fig.1. [11].

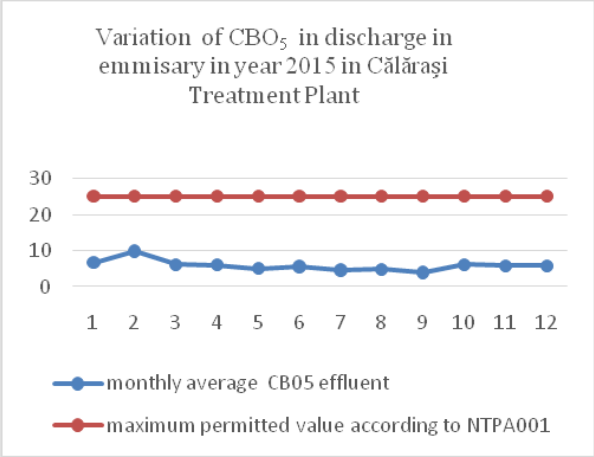

Fig. 1. Variation of CBO_5 in discharge into emissary in 2015, in Călăraşi Treatment Plant
Source: [11].

According to Fig. 1, it is found out that the highest biochemical consume of oxygen of water discharged into the environment was recorded in February 2015, when it exceeded the value of 9 mg/l. The biochemical oxygen consume variation from month to month was largely due to weather conditions or registered influent flow. However, during the entire period that was studied, we note that the values of biochemical oxygen consume of treated water were much lower than the maximum permitted NTPA001 namely 25 mg/l.

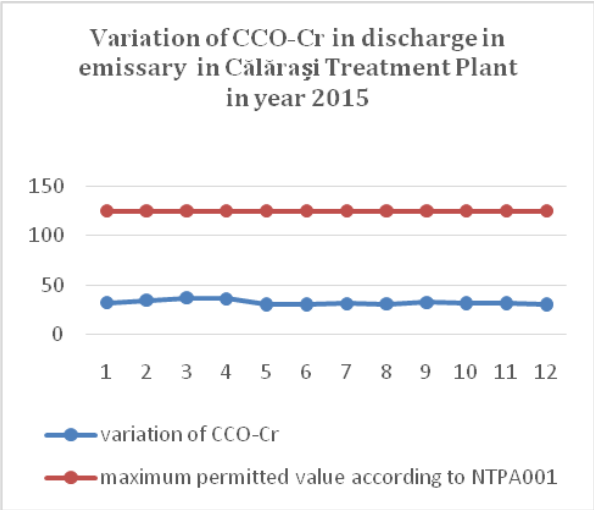

Fig. 2.Variation of CCO-Cr in discharge into emissary in 2015 in Călăraşi Treatment Plant
Source: [11].

The monthly variation of the chemical oxygen consume (CCO-Cr) of water discharged into the environment in 2015 is presented in Fig.2. [11].

As regards the variation of chemical consume of oxygen existing when entering the emissary [11], we note that in 2015 its value varied, the highest value of over 37 mg/l being recorded in March 2015. However, it was not exceeded the limit imposed by NTPA001, of 125 mg/l.

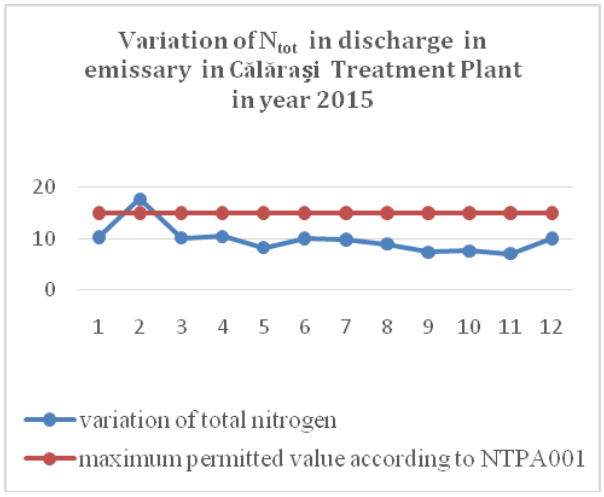

Fig. 3. Variation of Ntot in discharge into emissary in 2015, in Călăraşi Treatment Plant
Source: [11].

From Figure 3, it is found out that during the studied period, the values of total nitrogen discharged into the environment [11] exceeded in February 2015 the maximum permitted value according to NTPA001 (15 mg/l) by 2.66%, and respectively by 18.2% . This was due to the low temperature of wastewater from entering the wastewater treatment plant in winter (minimum temperature of 4^0C, the average temperature of 7^0C) resulting in a difficult operating of the biological stage, low speed of the biological processes, lowering the rate of biodegradation of organic compounds and thus increasing the concentration of nitrogen and of compounds in the effluent. In 2015, total phosphorus concentration recorded the following variation:

As regards the concentration of total phosphorus discharged into emissary [11], we note that, in June and August 2015, it exceeded the maximum permitted values according to NTPA001 (2 mg/l), by 10.5%, and respectively by 20%.

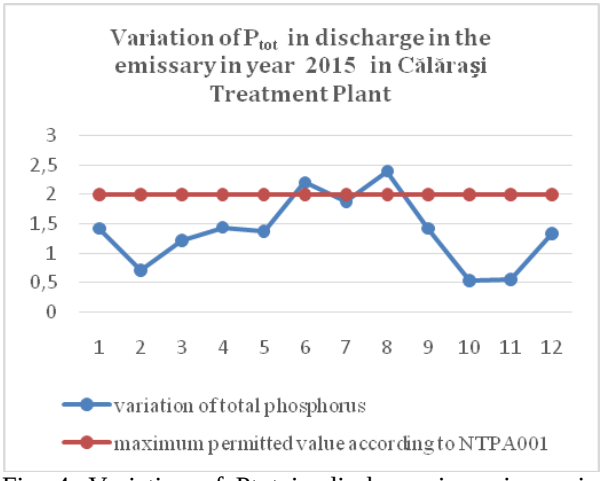

Fig. 4. Variation of Ptot in discharge in emissary in 2015, in Călăraşi Treatment Plant
Source: [11]

CONCLUSIONS

In order to evaluate the accuracy of the impact of wastewater discharge, at the level of Călăraşi county, there were analyzed from chemical point of view, both wastewater influent and effluent resulted from Călăraşi Treatment Plant.

Based on the analyzes made, there were drawn the conclusions presented below.

The actual load of the treatment plant is lower than the projected as follows: CBO_5 61%; CCO-Cr by 60%; Total nitrogen (N_{tot}) by 20%; Total phosphorus (P_{tot}) by 50%.

By making the difference of the values from influential and effective effluent, we estimated the efficiency of Călăraşi Wastewater Treatment Plant during 2015 to 79,45%.

In 2015, the highest possible degree of purification was found in the case of biochemical oxygen consume (over 96%), obtaining good rate in the case of chemical consume of oxygen.

The low temperature of wastewater from entering the wastewater treatment plant in the winter season (minimum temperature of 4^0C, the average temperature of 7^0C) lead to an a difficult use of the biological stage, low speed of the biological processes, lowering the rate of biodegradation of organic compounds, increasing the concentration of nitrogen and of compounds in the effluent.

So, the main problem identified in this study, within the wastewater treatment plant is lower efficiency in removing the phosphorus and total nitrogen in the cold season due to the malfunctioning of the biological stage, this bringing nutrients in the emissary and causing a process of eutrophication in much lower percentage compared to the previous period (the amounts reached the emissary are not high).

In order to solve the problems identified in Călăraşi Wastewater Treatment Plant, we propose to ensure the optimal conditions for the use during the cold periods by increasing the water temperature by providing the necessary energy from unconventional sources and facilitating some water heating installations using unconventional energy sources: heat pumps, solar energy.

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ASSESSMENT OF TRAINING NEEDS OF COCOA FARMERS IN BENDE LOCAL GOVERNMENT AREA OF ABIA STATE, SOUTH EAST NIGERIA

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Abstract

In Nigeria, low productivity of cocoa has been attributed to poor maintenance practices, planting low yielding varieties and incidence of pest and diseases. In order to address this, cocoa famers need appropriate training to increase productivity. This study therefore was undertaken to assess the training needs of cocoa farmers in Bende Local Government Area of Abia State, Nigeria. Purposive and multi-stage random sampling techniques were used to select 90 farmers from the cocoa producing communities in the Local Government Area. Data were collected with the aid of a structured questionnaire and analyzed using descriptive and inferential statistics (multiple regression analysis). The results indicate that 95.56% of cocoa farmers were males, with mean ages of 55.5 years, mean farm size `of 8 hectares, mean annual farm income of ₦1.3 M (10,000 USD), while 72.22% inherited their farm land and had extension contact once in a month (52.22%). The result showed that of the farmers' sourced information on cocoa production from farm field school (96.67%) and research institutes (74.44%). The farmers assert that the needed training on Plantation establishment and control of black pod disease ($\bar{x}$ =2.9), control of swollen-shoot virus and mirad control ($\bar{x}$ =2.8), punning techniques, cocoa bean storage and processing ($\bar{x}$ =2.7). Other areas were on cocoa bean marketing ($\bar{x}$ =2.6), fertilizer application ($\bar{x}$ =2.5) and nursery establishment techniques ($\bar{x}$ =2.4).The multiple regression analysis showed that coefficients for land ownership, age, farming experience, farm income and extension contacts influenced training needs of the cocoa farmers in the study area. The study recommends review of Land Use Act of 1990, increased extension contact and training and re-training of farmers on pesticide and fungicide usage for boosting cocoa production in the study area.

Key words**:** *assessment, cocoa farmers, needs, training, Abia State*

INTRODUCTION

Nigeria as a developing country had long ago commercialized her cocoa production and was rated the second highest producer of cocoa in the world ranking until 1971, when its export declined to 21,600 and 1,500 metric tons in 1986. Thus, reducing the country's market share to about 6 percent, and to the fifth largest world producer of cocoa with about 385,000 metric tons per annum, an increase of 215, 000 metric tons from the year 2000 [8]. Nigeria produces about 250,000 metric tons of cocoa [1]. By these ratings, Nigeria competed favourably with other front liners in cocoa industry like Cote d' Ivore, Indonesia and Ghana [18]. Cocoa *(Theobroma cacoa L)* is grown in 14 states out of Nigeria's 36 states; Abia, Adamawa, Akwa Ibom, Cross Rivers, Delta, Edo, Ekiti, Kogi, Kwara, Ogun, Ondo, Osun, Oyo and Taraba states [20]. The cocoa sector in Nigeria employs over 800,000 small holder farm families, providing employment, income and also as a major source of foreign exchange for the country. After petroleum, cocoa is the country's most important export. Before independence, cocoa generated 90 percent of Nigeria's foreign exchange earnings.

Training involves acquiring information and development abilities or attitudes, which result to greater competence in the performance of a worker. Training is mostly directed at improving the ability of individual to do their vocation more effectively and efficiently [4]. Training needs to cocoa farmers are needed for cocoa producers to

achieve their full productivity potential in order to bridge the imbalance of global demand arid supply [10]. The significance and value of training has long been recognized.

Therefore, extension organizations need to consider some important issues relating to farmers needs [11]. In most cocoa producing countries, cocoa extension seems agents to be inadequate [6]. Those continuous changes have challenged extension organizations to learn how to manage their contact farmers in the context of these continuous unpredictable technologies successfully through highly competent and skilled extension staff. [13] Identified training needs of cocoa farmers to include; nursery establishment, plantation establishment, agrochemicals, pruning, fertilizer application, storage and processing.

A number of problems militate against increased cocoa production. These problems range from planting low yielding varieties, poor maintenance practices, to pest and diseases such as black pod, capsid attack, die back, ageing of the farming population, lack of profitability of the farming in the case of the farmers, availability of land, marketing problems, training and legislation among others. In most cocoa producing countries, cocoa extension seems agents to be inadequate [2]. Nigerian government recognized the importance of cocoa as a cash crop, hence, these governments through policy statements, institutional arrangements, among others continuously intervened in the production and marketing of cocoa. In a bid to revamp the cocoa subsector in Nigeria and disseminate improved cocoa technologies to farmers, the Federal Government of Nigeria established the National Cocoa Development Committee (NCDC). The Cocoa Research Institution of Nigeria (CR1N) is another stakeholder's in the sector; established in 1964. As a Government agency, the institution conducts research on cocoa, distributes seedlings to farmers and trains growers in modern agricultural practice as well as in business development skills [5].

In view of the above facts, this study seeks to assess the training needs of cocoa farmers in Bende Local Government Area of Abia State, Nigeria.

The specific objectives were to: describe the socio-economic characteristics of cocoa famers in the study area; sources of agricultural information utilized by cocoa farmers in the study area; and ascertain the training needs of cocoa farmers in the study area.

Hypothesis

Ho: Socio-economic characteristics of cocoa farmers do not influence their training needs.

MATERIALS AND METHODS

Study Area

This study was conducted in Bende Local Government Area of Abia State, Nigeria. Bende Local Government Area has a land area of 679 km^2 and a population of 192,111 inhabitants [12]. Bende Local Government Area is in Abia North Senatorial Zone of Abia state. It is bounded in the North by Ivo Local Government Area of Ebonyi State and Afikpo South Local Government Area of Ebonyi State, North-west by Isukwuato Local Government Area of Abia State, East by Ohafia Local Government Area of Abia state, South-West by Umuahia North Local Government of Abia State, and South by Ikwuano Local Government Area of Abia State and Akwa Ibom State. The Local Government Area falls within the forest belt region of Nigeria, while the temperature range is between 27° and 36° Celsius. It lies between latitude 5° and 15° East of the equator and longitude 7° and 27° North of the Greenwich meridian. It is located within the rain forest zone of the state and has plain but undulating topography. Bende Local Government Area has 12 major communities; Bende, Ozuitem, Itumbauzo, Umuhu-Ezechi, Uzuakoli, Nkpa, Ugwueke, Ntalakwu, Alayi, Igbere, Item, and Umuimenyi. The soil is slightly fertile and slightly acidic. The major food crops grown are cassava, rice, yam, vegetables, and maize among others. The tree crops grown are mainly cocoa, rubber and oil palm.

Purposive and multi stage random sampling techniques were used in the study. Five (5)

communities namely Ntalakwu, Itumbauzo, Bende, Umuhu-Ezechi and Uzuakoli out of the 12 communities were purposively selected because they are the major cocoa producing communities of the Local Government Area. Also, from the selected five communities, three (3) villages each were randomly selected to give a total of fifteen (15) villages. Finally, six (6) cocoa farmers each were randomly selected from the selected villages to give a total of 90 cocoa farmers (respondents). Primary data were collected with the use of structured questionnaire which was used to obtain information from cocoa farmers (respondents) on the issues that bother on the set objectives of the study.

Data from the study were analyzed using frequency distribution, percentages and mean scores. In ascertaining the training needs of cocoa farmers, a 3-point Likert type scale of highly needed = 3, fairly needed = 2 and not needed = 1 was used. A mid-point was obtained, thus: 3 + 2 + 1 = 6/3 = 2. 0. Based on the obtained mean score decision rule, any mean score of 2.0 and above implied needed training and below 2.0 is not needed. Multiple regression analysis was used to test the hypothesis to determine socio-economic factors influencing training needs of cocoa farmers in the study area.

Model Specification

The four functional forms of regression model like: linear, semi-log, and exponential and Cobb-Douglas were tried. The best fit was chosen as the lead equation based on its conformity with econometric and statistical criteria such as the magnitude of R^2, F-ratio and number of significant variables. The four functional forms are expressed as follows:

Linear Function

$Y = b_o + b_1xb_1 + b_2xb_2 + b_4xb_4 + b_5xb_5 + b_6xb_6 + b_7xb_7 + b_8xb_8 + b_9 \times b_9 + b_{10} \times b_{10} + b_{11} \times b_{11} + ei$

Exponential Function

$LnY = bo + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} + ei$

Cobb Douglas Function

$LnY = Lnb_o + b_1Lnx_1 + b_3Lnx_3 + b_4Lnx_4 + b_5Lnx_5 + b_6Lnx_6 + b_7Lnx_7 + b_8Lnx_8 + b_9Lnx_9 + b_{10}Lnx_{10} + b_{11}Lnx_{11} + ei$

Semi- Log Function

$Y = Lnb_o + b_1Lnx_1 + b_3Lnx_3 + b_4Lnx_4 + b_5Lnx_5 + b_6Lnx_6 + b_7Lnx_7 + b_8Lnx_8 + b_9Lnx_9 + b_{10}Lnx_{10} + b_{11}Lnx_{11} + ei$

Y = Mean counts of training needed by cocoa farmers

X_1 = Gender (Male = 1, Female = 0)

X_2 = marital Status (married = 1. Otherwise = 0)

X_3 = Primary occupation (farming = 1, otherwise = 0)

X_4 = Land Ownership (Inheritance = 1, otherwise = 0)

X_5 = Age (years)

X_6 = Education (years)

X_7 = Household size (number)

X_8 = Farming experience (Years)

X_9 = Farm size (Hectares)

X_{10} =Farm income (Naira)

X_{11} = Extension contact (number of visit)

ei = Error term

RESULTS AND DISCUSSIONS

The results in Table 1 show that majority (95.56%) of cocoa farmers were males. The results indicate that cocoa farming in the study area is gender sensitive. Cocoa farming required tedious operations which require men to perform most of its agronomic practices such as bush clearing, chemical application, pruning and harvesting of pods. Majority (90%) were married with mean ages of 55.5 years. This indicates that cocoa farming is practiced by farmers who were not in their active ages. The ability of a farmer to bear risk and adopt improved technologies decreases with age. [16] noted that aged farmers were not energetic in farm practices. However, 50% of the respondents, representing half of the respondents had primary education, had mean household size of 8.5 persons, mean farm experience of 23.5 years and a mean farm size `of 8 hectares. The large household size has some implications on the amount of labour available for cocoa farming activities, since it requires more labour to sustain its rigorous operations. The size of land available to farmers is a strong determinant in output of a crop. A farmer acquiring large farm sizes requires appropriate

training needs in areas of production to maximize profits. Furthermore, the farmers had mean annual farm income of ₦1.3 M (10,000 USD), while majority (72.22%) of the cocoa farmers inherited their farm land and 52.22% of them claimed they were visited by extension agent once a month. The frequency of visit to cocoa farmers may be attributed to the presence of farmer field school in the area which played a complementary role in extension delivery. [14] identified infrequency visit of extension workers to cocoa farmers as a major constraints to cocoa farmers in Abia State, Nigeria.

Table 1. Socio-economic Characteristics of Cocoa Farmers in the Study Area (N =90)

Variables	Indices
Gender	
Males	95.56%
Marital status	
Married	90.0%
Age	55.5 years
Education	
Primary Education	50%
Household Size	8.5 persons
Farming experience	23.5 years
Farm size	8 hectares
Farm income	₦1.3 M (10,000 USD)
Land Ownership	
Inherited	72.22%
Extension Contact	
Monthly	52.22%

Source: Field Survey, 2014
IUSD = 130 NGN as @ the period the research was conducted

Sources of Agricultural Information

The result in Table 2 shows the sources of agricultural information used by the respondents. The respondents indicated that majority (96.7%) sourced information on cocoa production from farm field school, 74.4% claimed the sourced from research institutes. The result is not surprising because Bende Local Government Area is one of the beneficiaries LGA of the farmer field school. Also the sub-station Cocoa Research Institute of Nigeria (CRIN) is located in the Local Government Area which facilitates the discrimination of improved agricultural technologies in the study area. [7] opined that sources of information to cocoa farmers on improved production technologies have proved to enhancing their production.

Table 2. Sources of Agricultural Information among Cocoa Farmers in the Study Area

Sources	Frequency	Percentage*
Research institutes	77	74.4
ADP/Ministry of Agriculture	45	50.0
Agricultural workshops	36	40.0
Attending field days	28	31.1
Radio Programmes	26	28.9
Television Programmes	1	1.1
Other cocoa farmers	31	34.4
Farmer field school	89	96.7
Personal Observations	31	34.4
Printed materials	11	12.2

Source: Field Survey, 2014
*Multiple Responses Recorded

Training Needs of Cocoa Farmers

50.00 The distribution of cocoa farmers according to their training needs is shown in Table 3. The result indicates that cocoa farmers needed trainings on all areas except for HIV/AIDS.

Table 3. Training Needs of Cocoa Framers in the Study Area

Trainings Needed	Mean
Nursery establishment techniques	2..4
Plantation establishment	2.9
Training in Agrochemical application	2.7
Pruning techniques	2.7
Fertilizer application	2.5
Cocoa bean storage/ fermentation	2.7
Cocoa bean processing	2.7
Cocoa bean marketing	2.6
Control of black pod disease	2.9
Controlling of swollen-shoot virus	2.8
Mirad control	2.8
HIV/AIDS	1.3

Source: Field Survey, 2014
Values in parenthesis are nominal likert values multiplied by frequencies. Decision rule of 2.0 and above is training needed, below 2.0 is training not needed.

Plantation establishment and control of black pod disease ($\bar{x}$=2.9), control of blank pod

disease ($\bar{x}$= 2.8), controlling of swollen-shoot virus mirad control ($\bar{x}$=2.8), punning techniques, cocoa bean storage and processing ($\bar{x}$= 2.7). Also, the farmers indicated that they needed training in cocoa bean marketing ($\bar{x}$= 2.6), fertilizer application ($\bar{x}$=2.5) and nursery establishment techniques ($\bar{x}$= 2.4). Efficient management of cocoa farms especially disease control in black pod had shown to have produced healthy cocoa pods, which in turn leads to good qualify of processed cocoa beans and high market value [17]. [19] assert that when farmers are given appropriate and required training on their farm business, it helps them acquire information and develop abilities and attitudes which will result in greater competence in the performance of their work.

Determinants of Training Needs among Cocoa Farmers

The results in Table 4 show the regression estimates of the determinants of training needs among cocoa farmers in the study area. The linear functional form was the lead equation because of a high R^2 value, number of significant factors and agreement with a *prior expectation.* The R^2 value of 0.6032% variability in training needs was explained by the independent factors. The F value of 2.63 was significant at 5% level indicating goodness of fit of the regression line.

Table 4. Multiple Regression Estimates of Determinants of Training Needs among Cocoa Farmers in Bende LGA, Abia State, Nigeria

Variables	Linear +	Exponential	Cobb Douglas	Semi log
Constant	33.1613 (15.24***)	3.5304 (47.07***)	3.5872 (13.50***)	35.0044 (4.45***)
Gender	0.3546 (0.29)	0.01167 (0.26)	0.0244 (0.56)	0.7334 (0.56)
Marital status	- 0.4511 (- 0.58)	- 0.0156 (- 0.60)	- 0.0187 (- 0.62)	- 0.5273 (- 0.59)
Occupation	- 0.1966 (- 0.86)	- 0.0063 (- 0.82)	- 0.0071 (- 0.90)	- 0.2169 (- 0.92)
Land ownership	- 1.3335 (- 2.76**)	-0.0445 (- 2.74**)	-0.0461 (- 2.70**)	-1.3753 (- 2.71**)
Age	0.343 (3.20**)	-0.0011 (- 1.10)	-0.039 (- 0.77)	-1.1213 (- 0.75)
Education	0.0300 (0.29)	-0.0007 (- 0.29)	-0.0157 (- 1.30)	-0.4588 (- 1.28)
Household Size	0.0539 (0.43)	0.00206 (0.49)	0.0042 (0.18)	0.0646 (0.09)
Farming Experience	0.04525 (2.57**)	0.0014 (1.50)	0.0189 (0.80)	0.5945 (0.85)
Farm size	0.0048 (0.06)	0.00032 (0.12)	- 0.029 (- 0.72)	- 0.6880 (- 0.80)
Farm Income	0.0059 (2.42**)	0.0018 (2.14*)	0.0049 (0.29)	0.1857 (0.37)
Extension Contact	0.347 (2.8***)	0.0118 (2.00**)	0.0288 (1.67*)	0.8896 (1.68*)
R^2	0.6032	0.4030	0.3040	0.2783
R Adjusted	0.4909	0.3906	0.1443	0.1484
F- value	2.63**	1.81*	1.20	1.29

Source: STATA 84 RESULTS
*, ** and *** significant at 10%, 5% and 1% levels of probability respectively
Figures in parenthesis and t value, + = lead equation.

The coefficient for age was positive and significant at 5% level of probability. This implies that any increase in age will lead to a corresponding increase in training needs. This is expected because as cocoa farmers get older more training is required in the areas of need identified so as to keep space with new innovations in cocoa production. This result is in conformity with the findings of [15] where he found age influencing cassava processors'

training needs in Oyo state, Nigeria. The coefficient of farming experience was positive and significant at 5% level of probability. This implies that any increase in farming experience will lead to a corresponding increase in training needs. This also is expected because with more experience, farmers tend to adopt new ideas and technologies that will increase their performance and crop productivity. This result is in agreement with the findings of [9] as they affirmed that farming experience is a determinant of training needs of livestock women farmers in Oyo state, Nigeria.

The coefficient for farm income was positively signed and significant at 5% level. This implies that any increase in income will lead to increase in training needs. These result implied wealthier cocoa fanners are exposed to training than a poor ones, whereby they can afford to sponsor themselves for workshops and conferences and cocoa production. The coefficient for extension contact was also positively signed and highly significant at 1% level. This implies that any increase in extension contact will lead to increase in training needs among the fanners in the study area. This is expected and in accordance with *a priori expectation.* Extension as a veritable tool in technology dissemination enhances farmers' knowledge and ability to acquire more skills. This result is in consistence with [3] as they found that information from extension increased clustered fish farmers training needs in Delta state, Nigeria. The result of the hypothesis which states that the socio-economic characteristics of cocoa farmers do not influence their training needs is hereby rejected.

CONCLUSIONS

The result also revealed that the farmers sourced agricultural information on cocoa technology from farmer field school, research institutes. The results of this study show that cocoa farmers need training in the area of plantation establishment, controlling of black pod disease, controlling of swollen shoot virus, cocoa bean processing, pruning techniques, agrochemical application, cocoa bean storage/information, cocoa bean marketing, fertilizer application, nursery establishment and mirad control. It also revealed that land ownership, age, farming experience, farm income and extension contact were factors that influence training needs of the farmers.

Based on the research findings the following recommendations were made:

(i)Government should review the Land Use Act of 1990 to enable landless farmers have access to land for increased cocoa production.

(ii)Extension of packages for cocoa production to farmers should be intensified by extension agents. This will facilitate adoption of these technologies among farmers.

(iii)Provision of rural infrastructural facilities such as good roads will ease in evacuating bags of dried cocoa bean processed by farmers to the urban areas for high value of the product. In addition, youths will be encouraged to reside in the rural areas which will help provide cheap labour needed in cocoa production and in turn reduce cost.

(iv)Since pest/disease infestation is a major problem identified by cocoa farmers, training and re-training of farmers in pesticide and fungicide usage and application should be intensified.

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INFLUENCE OF CAPITAL FLIGHT ON BUDGET IMPLEMENTATION IN NIGERIA

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Abstract

The subject of budgeting in Nigeria has been a yearly affair which though good in content, but without an appreciable result. Consequently, this study examined the effect of capital flight on budget implementation in Nigeria. To achieve this broad objective, co-integration test and vector error correction were employed for the analysis using time series data spanning from 1986 to 2014. The dependent variable (budget implementation) was proxied by aggregate government expenditure, while the independent variables were capital flight, external debt, government revenue, economic openness, and real exchange rate. The co-integration results revealed that a long run equilibrium relationship existed among the variables. The error correction term indicated a rapid realignment to long run convergence by approximately 87 percent. The results further showed that capital flight was positive and significant in influencing government expenditure in Nigeria. Also, the Wald test showed that there is a significant short run causal relationship between capital flight and government expenditure in Nigeria. Based on these findings, the study recommended inter alia that government should set up a vibrant monitoring team to ensure that funds allocated for various projects are used efficiently.

Key words**:** *capital flight, budget implementation, government expenditure, government revenue, and external debt*

INTRODUCTION

According to the literature, among the lubricants that turns the wheels of an economy towards a successful trend are the various annual budgets articulated and implemented within a medium term plan and a medium term expenditure framework (Kwanashie, 2013) [15]. By definition, a budget refers to the framework of projected revenue and expenditure over a specified period of time, usually a year (Olurankise, 2012) [26]. Consequently, a budget is an instrument used to distribute public funds towards achieving some public values and decisions (Ibanichuka & Oyadonghan, 2014) [12]. As such, by implementing a budget, it is expected that resources be allocated to various sectors on the basis of the country's priorities and programme effectiveness, while taking responsibility for certain accounting operations as stated by the budget statement (Omolehinwa, 2014) [27]. According to Uche, Iheugba & Nwosu (2013) [34], sound budget implementation is hinged on planning as well as generating adequate revenue that will be sufficient to offset the planned expenditure of the state. However, notwithstanding the benefits of budget implementation, the process have been problematic in Nigeria and other developing countries of the world (Omolehinwa, 2014) [27].

Somewhat surprisingly, despite all pronouncements and relatively huge investments and oil revenue, Nigeria have achieved very little in improving the welfare of its citizens due to poor budget implementation resulting from fiscal deficit (i.e. a situation when government revenue falls short of government expenditure) (Ugoh & Ukpere, 2009 & Ojo, 2012) [35, 23]. Hence, budgeting in Nigeria have raised several controversies regarding the modalities for preparation, implementation and administration given the persistent change in government, policy and ideologies (Oke, 2013, & Omolehinwa, 2014) [24, 27]. These controversies have manifested over the years

and most recently in the Buhari's led administration which resulted to late passage of the 2016 appropriation bill.

Similarly, literature abound that budget implementation in Nigeria have been marred by poor monitoring, and embezzlement of public funds coupled with dominant individuals who influence the budget for their selfish interests and personal aggrandizement (Ugoh & Ukpere, 2009, Nwarogu, 2015, & Oke, 2013) [35,22, 24]. Also, the dwindling revenue, especially revenue from crude oil, taxation and agricultural products is responsible for the short fall in government revenue which have hindered the government from channeling funds for infrastructural development (see *inter alia* Nwarogu, 2015, Omolehinwa, 2014, and Maximus, 2013) [22, 27, 18]. However, a factor that have been neglected in the literature of budgeting is a phenomenon known as "capital flight."

A great deal of attention have been given to measuring and explaining the phenomenon of capital flight from Nigeria and other developing countries (see, *inter alia* Fofack & Ndikumana, 2014, Olawale & Ifedayo, 2015, Uguru, 2016) [10, 25, 36]. Literature abound that there is no widely accepted definition of capital flight. However, in this paper capital flight was referred to as all financial flows recorded in the balance of payment. Nevertheless, capital flight can be legal or illegal. According to Massa (2014), and Ajilore (2010) [17, 5,] capital flight can be defined as illegal if the funds are the proceeds from illicit activities (such as money laundering, tax evasion, child trafficking, smuggling etc.), if the transfer itself is illegal, or if legal obligations relating to the fund are not adhered to. On the other hand, capital flight have been defined to connote the investor's resolution to channel their investments abroad due to unfavourable economic situations (such as, high inflation rate, political instability, exchange rate depreciation etc.) (Isu, 2012) [13]. As such, these outflow in terms of capital flight could have an adverse effect on government expenditure by eroding the tax base (Uguru, 2016) [36].

Over the years, Nigeria have suffered from several economic injuries due to capital flight. According to Saheed & Ayodeji (2012), about ₦1,043.77 billion left the shores of Nigeria as capital flight [33]. Agu (2010) reported that capital flight-to-debt ratio and capital flight-to-gross domestic product ratio for Nigeria was 94.3 percent and 133 percent between the period of 1982 and 1991 [3]. Also, Waleru (2013) and Ajayi (2014) [38, 4] reported that about $51billion left Nigeria through the oil and gas industry within the period of 1998 and 2002. Dim & Ezenekwe (2014) [9] stated that approximately US$13.894 billion exit Nigeria between September and November, 2009 when several billions of US Dollars was traded by the bureau de-change and banks. Also, literature reveals that there are yet unrecorded and illicit transfers that have taken place in Nigeria, predominantly those perpetrated by contractors who connive with public servants to siphon funds mapped out for public utilities (Adeola, 2015) [2]. These estimates reflects loss of wealth which could be mounting serious pressure on domestic savings, investments, productivity and government revenue generation in a capital scarce economy like Nigeria (Adebayo & Ayodele, 2016, Uremadu, Onyele & Ariwa, 2016) [1, 37].

According to the tax depressing thesis of capital flight, due to the persistent erosion of domestic resources, potential government revenue is lost. This is because wealth held abroad are outside the control of the domestic government and cannot be taxed. As such, the debt servicing capacity of the government is reduced, and the debt burden is increased. Hence, the revenue generating potentials of the government declines, and budget implementation becomes unrealizable due to lack of government revenue (Uguru, 2016) [36].

Therefore, this study is based on the premise that the direct result of capital flight is the reduction in government revenue which accounts for low rate of budget implementation in Nigeria. Consequently, it is imperative to note that the concomitant effect of capital flight on budget implementation could be responsible for the lingering economic failure in Nigeria.

One of the means by which capital flight finds expression is through the corruption channel (Rotimi, Obasaju, Lawal & Ise Olurunkanmi, 2013, Cerra, Rishi & Saxena, 2008) [32, 7]. According to these authors, corruption is an enemy to economic development and good governance in Nigeria as it has degenerated to misappropriation of public funds, lack of innovation, low level of infrastructural development, and low investments. According to Makpor & Akpede (2014) [16], by way of corrupt activities (especially money laundering) the market economy is manipulated by interfering with currency fluctuations and investment outflows and inflows. By way of corruption, the composition of public expenditure is skewed away from needed operations and maintenance towards government expenditure on developmental projects (Nwaorgu, 2015, & Makpor & Akpede, 2014) [22, 16].

In Nigeria, corruption is mostly seen as one of the essential ways of bringing about wealth, hence resulting to the population desiring public offices with the mindset of looting public wealth to themselves. Consequently, by amassing these public funds mapped out for capital and recurrent expenditures towards economic expansion, corrupt leaders channel them abroad to be concealed or even use these funds to acquire personal fortunes abroad (Adeola, 2015 & Onishi, 1999) [2, 28]. As such, the amount money available to the government declines, and budget implementation becomes difficult (Rotimi, Obasaju, Lawal & Ise Olurunkanmi, 2013, Cerra, Rishi & Saxena, 2008) [32, 7].

At all levels of government, it is glaring that governance without sound budget implementation will definitely result into haphazard development if there is development at all (Kwanashie, 2013) [15]. As such, scholars have identified and investigated several channels through which capital flight constrains economic development of a country. Nevertheless, there is no literature known to the author that have addressed the influence of capital flight on budget implementation in Nigeria. As such, this study is aimed at filling this gap in the literature by examining the influence of capital flight on budget implementation in Nigeria.

With this background, the rest of the paper was organized as follows: section two reviewed prior empirical works and theories on the subject matter; section three dwelt on the methodology adapted for the study, while the fourth section of the paper is an in-depth analysis and discussion of the effect of capital flight on budget implementation (as proxied by total government expenditure) in Nigeria. Finally, section five concluded the paper with suggestions and recommendations.

Theoretical and empirical framework

There are four basic theories explaining the subject of capital flight in the literature. These theories have been highlighted and explained briefly as follows:

(1)The investment diversion thesis

This theory is based on the idea that due to macroeconomic uncertainties in developing countries and the opportunity of having a better investment climate in advanced countries, investors resolve to channel their investments abroad to take advantage of wide array of financial instruments, favourable tax climate etc. Therefore, these funds are not available for domestic investments resulting to low economic growth.

(2) Debt-driven thesis

This theory (also known as debt-overhang theory) states that capital flight decreases the incentive to save and invest. They idea behind this is that ; with large external debt burden, there is the likelihood of exchange rate devaluation, fiscal crisis, and the propensity of increasing taxes or even expropriation of assets to service the debt. As such, with this impending economic doom due to external borrowing, investors could channel their investments abroad for safety.

(3)Tax depressing thesis

This theory postulates that capital flight results to government revenue loss because wealth held outside the domestic economy cannot be taxed as it is out of the domestic governments' control. This implies that government revenue is reduced, debt-servicing capacity of government declines and budget implementation becomes a problem.

(4)Austerity generating thesis

This suggests that the poor in several indebted countries is due to capital flight. According to Pastor (1990) [30], the theory implies that the poor suffer more because they are vulnerable to excruciating austerity measures by government to pay for debt obligations to international banks.

Empirical literature on capital flight and budget implementation

Uguru (2016) [36], carried out an empirical study regarding the effect of capital flight on tax revenue in Nigeria and found that a unit increase in capital flight led to a 0.02 or 2 percent decrease in tax revenue. Similarly, Olawale and Ifedayo (2015) [25], discovered that capital flight had a negative impact on the economy of Nigeria. Also, Ndikumana (2013) [21], concluded that capital flight had a negative and statistically significant effect on domestic investments and that this effect holds even when other important determinants of investments were accounted for in the specification. With emphasis on the determinants of capital flight, Quan & Paul (2006) [31], found that political instability was the most important factor associated with capital flight. To further buttress the devastating effect of capital flight, Gusarova (2009) [11] studied 139 countries for the period of 2002-2009 and found that capital flight had a negative impact on gross domestic product growth rate. Also, Isu (2002) [13], analyzed the implication of capital flight on the development of Nigeria and concluded that Nigeria greatly suffered as a result of capital flight. Given these persistent outflows, Omolehinwa (2014) [27] stated that the basic problem of budgeting in Nigeria is lack of funds coupled with misappropriation the available funds in the process budgeting.

With emphasis on the availability of funds, Ibanichuka & Oyadonghan (2014) [12], analyzed the problem of budget implementation in Nigeria with the finding that cash basis is paramount to budget implementation and fair presentation of the financial position of a government. In a similar study, Nwaorgu (2015) [22], showed that dominant individuals (i.e. politicians) involves in manipulation of budget items before and after approval of annual estimate: embezzlement and fraudulent activities lack of proper budgeting processes are responsible for the failure of budget in Nigeria. With emphasis on the need for institutional capacity building in Nigerian states, Maximus (2013) [18] found that budget implementation in Anambra state has significantly positive correlation with the MDGs – related programmes of the state in education and health sectors. Uche *et al.* (2013) [34], assessed the causal relationship between the government expenditure on education and economic growth and revealed that expenditure on education was positively related to the gross domestic product. Similarly, Oke (2013) [24] & Bingxin *et al.* (2009) [6] concluded that budget implementation and government expenditure is a prerequisite for economic prosperity in Nigeria, Africa and Asia respectively.

MATERIALS AND METHODS

The *Ex post facto* research design was adopted for this study. The justification for the use is that required data cannot be manipulated. Time series data for the period 1981 - 2015 were sourced from Central Bank of Nigeria statistical bulletin 2015.

The data were analyzed using the Ordinary Least Squares (OLS) regression technique. This regression technique has been employed and found to be suitable in similar researches like Uche *et al.* (2013) [34], Olawale and Ifedayo (2015) [25], and Uremadu *et al.* (2016) [37] due to its unique properties of linearity, efficiency, sufficiency, least variances, unbiasedness and least mean errors. To avoid a spurious regression results, prior to the regression analysis, the data set was tested for unit root and co-integration using Augmented Dickey Fuller and Johansen co-integration to test for stationarity and long run relationship of the variables used.

Model specification

The researchers adopted the models of Oke (2013) [24] and Uremadu *et al*. (2016) [37] for this study with some modifications. The model was specified as follow.

$GVEX = \beta_0 + \beta_1 CFLT_t + \beta_2 DEBT_t + \beta_3 GREV_t + \beta_4 OPEN + \beta_5 EXCH_t + \mu_t$

…….. (1)

Where,

GVEX = Government expenditure (a proxy for budget implementation)

CFLT = Capital flight

DEBT = External debt

GREV = Government revenue

OPEN = Economic openness

EXCH = Exchange rate

Description of research variables

Dependent variable

Government expenditure (a proxy for budget implementation)

The goal of budget implementation is to assure citizens that public funds are used legally and efficiently. As such, following the studies of Oke (2013) [24], Maximus (2013) [18], & Kwanashie (2013) [15], changes in government expenditure have been used to proxy budget implementation in this study.

Independent Variables

Capital Flight (CFLT)

As earlier explained, capital flight is the outflow of domestic resources from less developed economies. Hence, with the persistent outflow of resources without repatriation, the amount of resources available domestically will be depleted and budget implementation becomes difficult. Capital flight was computed using the residual method as proposed by (World Bank, 1985) [39]. Negative figures represents net capital inflow, while positive figures represent capital flight.

CFLT = ΔEXD + NFDI – (ΔRSV + CAB)

……. .....(2)

where,

CFLT = Capital flight, ΔEXD = External Debt, NFDI = Net foreign direct investments,

ΔRSV = External reserves; and CAB = Current account balance

External Debt (DEBT)

According to the debt overhang and tax depressing theses of capital flight, lack of investment funds and tax revenue due to capital flight have necessitates a massive buildup of foreign debt. For developing countries (like, Nigeria), an increasing external debts usually bring about inflationary financing, which is equal to imposing more tax on domestic residents (Uremadu *et al.*. 2016) [37]. As the residents realize this tendency, they will avoid the future tax burden due to current fiscal deficits by moving their assets abroad to avoid depredation in value of such assets.

Exchange Rate (EXCH)

Exchange rate as a determinant of capital flight represents the notion that domestic currency depreciation reduces purchasing power. Hence, capital flight arises as investors seek to channel their investments cum savings abroad for higher returns due to weak currency at home (Onoja, 2015) [29]. A negative fluctuation of currency decreases the purchasing power of domestic currency leading to a high import prices, low return from exports and *vice versa.*

Economic openness (OPEN)

According to Crotty (1983) [8], Keynes specifically attributed the problem of capital flight as one danger posed by open economy. Economic openness have been used to control for trade globalization. It signifies the size of the external sector, and it is expressed as the sum of imports and exports as a ratio of gross domestic product. When an economy is liberalized, residents are allowed to open foreign exchange accounts and restrictions on foreign exchange management by banks are removed.

Trend Analysis

In order to obtain a more in-depth analysis, the variables were subjected to further analysis through graphs.

Unit Root Test

This is the test of non-stationarity under time series variables. Unit root tests are carried out on the individual variables in isolation; that is, it does not take into account any relationship that might be between the variables being tested and any variable selected to be in the model. The study used the Augmented Dickey – Fuller (ADF) test to examine the variables.

Co-integration Test

Co-integration is the statistical implication of the existence of long run relationship between the variables which are individually non-stationary at their level form but stationary after difference. Following Johansen approach to co-integration, there can be a maximum of n-1 co-integrating vectors each of which

forms a long-run equilibrium relationship amongst the selected variables (Johansen, 1988) [14]. According to this framework, a long-run solution exists where there is full rank, r, of n independent equations for an nxn matrix of parameters which may depend on the restrictions imposed on the VAR (Uche, *et al.* 2013) [34].

Lag selection criteria

After ascertaining that the variables are co-integrated, the information provided by the SC. tests are used to generate a set of error correction models (EC) to capture the short run and long-run behaviour of the exports relationship.

Vector Error Correction Model (VECM)

With the existence of co-integration (long run relationship) among the variables, the vector error correction (VECM) was generated to capture the short run and long-run dynamics of the variables used in the study.

RESULTS AND DISCUSSIONS

Trend analysis shows the fluctuations in capital flight and budget implementation (as proxied by aggregate government expenditure) 1981-2014. (Fig.1.)

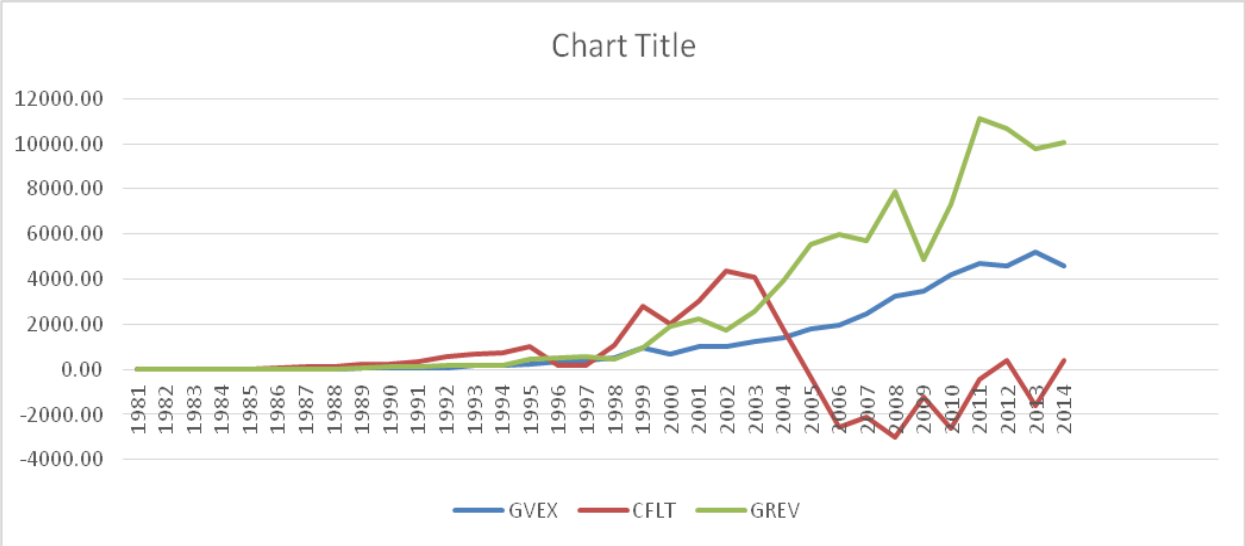

Fig. 1. Trend of capital flight, government expenditure and government revenue (1986-2014).
Source: Plotted by Author (2016) using Microsoft Excel 2010.

Unit Root Test results are presented in Table 1. The result of the ADF unit root test at level and first difference was reported in Table 1. From the results, all the variables are integrated at order 1 i.e. *I(1)*. As such, the co-integration test was carried out to check for the existence of a long-run relationship among the variables, in other to address the problem of spurious regression.

Table 1. Summary of Augmented Dickey Fuller (ADF) Test Results

Variables	ADF @ Level	ADF @ 1ST Difference	Order of Integration
CFLT	-2.013360	-5.305004***	I(1)
DEBT	-0.519737	-5.952864***	I(1)
EXCH	-2.145017	-5.316043***	I(1)
GREV	-1.920606	-6.665970***	I(1)
GVEX	-1.254785	-7.977610***	I(1)
OPEN	-1.656338	-7.581988***	I(1)

Source: Author's Eviews Computations (2016)

The co-integration results are presented in Table 2.

The Trace statistic indicates three co-integrating equations given that the trace statistic is greater than the 5 percent critical value at r = 0, r ≤ 1 and r ≤ 2. Likewise, the

Max-Eigen statistic indicates three co-integrating equations following that the Max-Eigen statistic is greater than the 5 percent critical value at r = 0, r ≤ 1 and r ≤ 2. Consequently, it was concluded that a long run equilibrium relationship existed between the dependent variable (government expenditure) and the explanatory variables (capital flight, external debt, exchange rate, and government revenue) in Nigeria.

Table 2. Johansen co-integration test results

Null Hypothesis	Trace Statistic	5% Critical Value	Max-Eigen Statistic	5% Critical Value
r = 0	208.4860	95.75366	117.9523	40.07757
r ≤ 1	90.53366	69.81889	39.26344	33.87687
r ≤ 2	51.27021	47.85613	29.07096	27.58434
r ≤ 3	22.19925	29.79707	11.41398	21.13162
r ≤ 4	2.443361	15.49471	8.053476	14.26460
r≤ 5	2.731796	3.841466	2.731796	3.841466

Source: Eviews Computations (2016)

Lag selection criteria

The results of the lag selection criteria are presented in Table 3, which shows a set of error correction models (EC) reflecting the short run and long-run behaviour of the exports relationship.

Table 3. Lag selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1066.463	NA	4.51e+22	69.19117	69.46871	69.28164
1	-903.9875	251.5750*	1.35e+19	61.03145	62.97427*	61.66476*
2	-863.1120	47.46836	1.31e+19*	60.71690*	64.32500	61.89305

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Vector Error Correction Model

The changes in the individual variables represent the short-run dynamics, while the coefficient of the error correction term (ECT) represents the speed of adjustment back to the long-run relationship among the variables. Consequently, the results obtained from the vector error correction were presented in Table 4.

It is obvious that the optimal lag length used for the study is two lag based on the information provided by the Schwarz Information Criterion (SC). The *-0.874885* coefficient of the ECT highlighted in Table 4 is significant and negative, which indicates a long run convergence.

The 87.4885 percent adjustment rate is relatively high and signifies a rapid realignment to long run convergence.

The adjusted R-squared for the regression is 0.582541, which implies that approximately 87.35 percent of the total variation in the dependent variable (GVEX) was explained by the changes in the explanatory variables (CFLT, DEBT, EXCH, GREV and OPEN), while the error term (ε) accounted for the remaining 41.7 percent variations in the dependent variable unexplained by the explanatory variables used in the model.

On the other hand, the F-statistic, indicates a substantially strong model with significant explanatory usage. The Prob (F-statistic) showed that the overall model is significant at 1 percent level. This implies that the explanatory variables used in the model were significant in explaining the changes in government expenditure in Nigeria. As such, the model was accepted to be satisfactory for the current study.

The results in Table 4 shows that one lagged value of capital flight have a positive influence on government expenditure and is

significant at 5 percent level. The results tend to contradict the finding of Ndiaye (2010) [20] that a positive relationship existed between capital flight and government capital expenditure in selected African countries. However, Uguru (2016) [36] confirmed that the tax depressing thesis of capital flight holds for Nigeria. This implies that the reduction in government revenue occasioned by increased capital flight did not overweigh capital inflow into Nigeria. This could be due to the fact that a government can borrow from abroad to bridge the resource gap in the domestic economy, since external debt is a major component of capital flight (Ajayi, 2014) [4].

Table 4. Vector Error Correction (VECM) Estimates

Variables	Coefficients	Std. Error	t-Statistic
ECT(-1)	-0.874885	0387967	-2.25505**
D(GVEX(-1))	0.083512	0.52787	0.15821
D(CFLT(-1))	0.323395	0.13043	2.47936**
D(DEBT(-1))	-0.627104	1.56424	-1.67947
D(EXCH(-1))	-10.16348	4.39862	-2.31061**
D(GREV(-1))	3.492966	7.40697	0.47158
D(OPEN(-1))	-4.597249	4.30786	-1.06718
C	264.7698	88.3325	2.99742**
R-squared	0.798468		
Adjusted R-squared	0.582541		
F-statistic	3.697860		
Prob(F-statistic)	0.008720***		

Source: Eviews Computations (2016)

However, this finding is in contrast with the *a priori* expectations probably due to the limitation of this study as it failed to capture the amount of capital flight occasioned by corrupt activities such as, money laundering, drug trafficking, bribery etc.

Capital flight leads to poor growth, which calls for the necessity to borrow from abroad. However, going through the results, external debt caused government expenditure to decline. This is in line with the debt-driven thesis of capital flight that with large foreign debt, there could be fiscal crises as government use the available resources to service the debt. Consequently, further indebtedness promotes capital flight, which in turn hampers growth in government expenditure (a proxy for budget implementation).

Also, one of the assumptions of the debt-driven thesis of capital flight is that higher external borrowing could result to exchange rate depreciation. The exchange rate coefficient in this study supports this assertion given its negative coefficient and significant t-value. Hence, it can be concluded based on this study that a vicious circle exists between capital flight, external debt, exchange rate and government expenditure in Nigeria. On the other hand, the coefficient of economic openness is negative and insignificant. Therefore, firm conclusion cannot be based on it.

In line with the *a priori* expectation, government revenue exerted a positive effect on government expenditure, though insignificant at 5 percent level. An increase in last year's revenue increased government expenditure in Nigeria.

A plausible reason for the insignificant coefficient could be given to the fact that Nigeria's revenue comes largely from the oil sector.

As such, it can be concluded that the fluctuations in oil price and oil production over the years might have caused a disastrous effect on government fiscal behavior. Similarly, Uguru (2016) [36] concluded that government revenue depreciated due to capital flight.

Wald test

The results regarding the application of Wald test are presented in Table 5.

Table 5. Short run causality results

Test Statistic	Value	df	Probability
t-statistic	-2.662593	15	0.0177
F-statistic	7.089403	(1, 15)	0.0177
Chi-square	7.089403	1	0.0078

Source: Eviews 9.0 output

CONCLUSIONS

The current study critically analyzed the influence of capital flight on budget implementation in Nigeria. The analysis demonstrated that capital flight was a significant factor in determining the changes in budget implementation (proxied by government expenditure) in Nigeria. This positive trend in budget implementation amidst capital flight was attributed to the fact that the Nigerian government borrowed from external sources coupled with aids from abroad. A vicious circle was found to exist between capital flight, external debt, exchange rate and government expenditure. Consequently, it was concluded that a persistent increase in capital flight will remain a threat to the economic life of Nigeria, especially in the area of mobilizing revenue to implement the planned financial plans of Nigeria. As such, state's public spending is crucial to Nigeria's fiscal sustainability and progress on economic indicators that will lead to the achievement of MDGs (Maximus, 2013) [14]. Therefore, public officials should spend funds lawfully or risk impeachment or dismissal.

In view of the above findings and conclusions, this paper recommended the following:

-With a high rate of capital flight from Nigeria through poor economic regulation and laundering of public funds meant for developmental projects. Government should set up a vibrant monitoring team to ensure that funds allocated for various projects are used efficiently. A step towards achieving this is by ensuring clarity of roles and responsibilities for the various officials and institutions in order to know the job specifications.

-Also, since the federal government have reported that they have recovered some amount of funds from identified looters, such funds should be built into the current budget plans and immediately diverted into profitable projects that will benefit Nigerian citizens.

-Given the rate of external borrowing to make-up for shortages in domestic resources, the government through financial and economic experts should set a limit to the amount of borrowings. Unless, the limits are set, Nigeria may go back to reckless borrowings.

-Mobilization of domestic resources is also crucial for sound budget implementation. Hence, the need for conducive economic environment that will attract foreign investors and also encourage domestic investors to retain their investments in Nigeria. To achieve this, the mono economy nature of Nigeria should be abolished so as to create multiple sources of government revenue which will in turn aid the implementation of budget in Nigeria.

-Finally, since investors will like to flee from a weak currency for investment in an economy with stable exchange rate. The monetary authorities can make efforts to ensure that a favourable exchange rate policy is achieved by consulting with the three tiers of government.

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AMARA, A SPA WITH AN EXTRAORDINARY NATURAL POTENTIAL

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Abstract

Spa tourism in Romania is a crucial sector of the tourism industry because of its specific features. Economic growth quality of life of modern human being, bring, besides the positive, some negative aspects: stress, power imbalances, negative actions of the environment on the body due to physical and chemical pollution. To mitigate those negative aspects more and more tourists choose spas as a holiday destination. The purpose of the paper was to analyze Amara resort potential for health tourism. Based on a profound documentation and on the collected data on the statistical data provided by National Institute of Statistics, Ialomița National Environmental Protection Agency, the research work was focused to process the data and interpret the results. The main conclusions highlighted the importance of mud, which is the key mean in preventing and treating various diseases. It is successfully used in wraps, baths or massage. Amara spa is one of our country's resorts treating musculoskeletal disorders, gynecological diseases, endocrine disorders, dermatological diseases, hepatobiliary diseases and cures of diuresis. The analysis of the tourists flow over a period of 14 years pointed out that the increased number of tourists is due to the good promotion of the resort and of its high quality services.

Key words**:** *Amara resort, mud, natural resource, recovery, spa*

INTRODUCTION

Given its geographic location, Romania has an abundance of natural resources giving the possibility of practicing a wide range of forms of tourism [8].

Spa tourism is one of the forms recently remodeled at European level, because of the concept that "health is a state of well-being".

The content of health tourism involves several stages of indications and forms of treatment which differ in accordance with the proposed purpose: *prevention* dealing with disease prevention and *prophylactic cures* against body degradation by reducing harmful influences (stress, pollution) frequently met in the developed society; therapeutic spa cure and recovery cure are destined to treat the chronically sick persons by including activation exercises, recovery and functions stimulation [10].

In this context, the purpose of the paper was to analyze the role played by Amara spa resort in health tourism of Romania.

MATERIALS AND METHODS

To accomplish this work, the statistical data provided by the National Institute of Statistics and Ialomița National Environmental Protection Agency have been processed using the usual modern methods for such a research work. The results were converted into tables, graphs and then interpreted, and finally the main conclusion were drawn.

RESULTS AND DISCUSSIONS

Amara resort's natural tourism potential.

The natural environment where Amara resort belongs is Bărăganul Înșurăţeilor with a relief ranging between 25 to 45.5 m. The specific climate is a continental one, characterized by hot summers and cold winters. The amount of precipitation falls in the range 450-500 mm [9].

The main water source is the Amara Lake, falling into the category of lakes with salt water and silt mud. The lake surface has changed over the time from 40 ha in the year 1939 to 168 ha at present.

Among the highlights natural resources of

Amara Lake there are: water chemistry, mud and water mineralization.

Amara Lake water chemistry is the sum of anions and cations dissolved in water and a series of chemicals that are formed directly on the lake, through the decomposition of organic matter and sludge. Amara Lake is a brackish lake type, with low salinity 1-25 g / l [3].

Being fed by rainfalls, the lake has shown a an increasing trend in the period 1956-1966. Between 1970-1971 the lake reached depths of 4 m, but to prevent flooding nearby land and buildings it was built a channel for draining excess [1].

This measure has had a negative impact on salinity. Thus, in 1887, Petru Poni calculated for Amara Lake a salt concentration of 89.45 g/l in about 90 years and in 1976 it reached 7.7 g/l, which favored the development of a fauna specific to freshwaters.

The seasonal variations of salt content are related to the amount of rainfalls [3].

Currently, the lake water has a concentration of 31,038.1 mg/kg, predominantly SO_4 anion with 12,846.9 mg/kg, Cl 7,478.7 mg/kg and Na cations with 7,858.2 mg/kg and Mg 1,768 4 mg/kg.

The mud of the Amara Lake, called "black gold", is black (with air becomes gray), greasy, salty and has a very strong smell of hydrogen sulfide. It contains 41% inorganic salt, 39% organic matter and 20% water.

The substances from the lake water have a positive influence in treating various diseases, a reason as the number of tourists coming to treatment to grow.

The water sweetening and fish fauna development have reduced sludge whose thickness increases from the shore to the center by almost a meter (0.03 m to 1.10 m), requiring long periods of formation. The thickness of the sludge is currently 30-60 cm [4].

Analyzing Table 1 and Fig.1. it was noticed a significant decrease across 36 years, starting from 409,000 cubic meters in 1961 to 150,000 cubic meters in 1997.

Table 1. The decrease of the mud reserve in the Amara Lake during 1961-1997

Year	Quantity (mc)
1961	409,000
1974	287,000
1984	217,000
1997	150,000

Source: National Environmental Protection Agency, Ialomița [6].

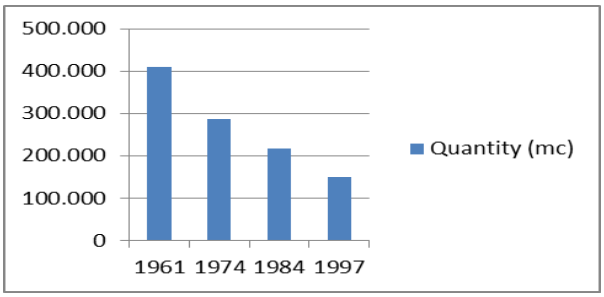

Fig. 1. The decline of sludge reserve in Amara Lake during 1961-1997.
Source: Own design.

The lake is said hydrogeological protection zone for sludge reproduction, but this requires restoring forest belts deforested after 1989 ban in the area of irrigation, wastewater discharges, harvesting aquatic vegetation and the pace of exploitation of sludge on preferential areas. This also required the creation of a natural treatment thereof, for inactivating pathogenic microorganisms and assuring a hygienic sanitary lake.

Amara Lake water mineralization values are shown in Table 2.

Table 2. Amara Lake water mineralization values

Year	Determination source	Mineralization g/l
1887	Petru Poni	89,45
1933	P. Petrescu	28,60
1973	V. Bulgăreanu	4,46
1993	National Agency for Environmental Protection Laboratory Ialomița	9,5
2013	National Agency for Environmental Protection Laboratory Ialomița	11,3

Source: National Environmental Protection Agency Ialomița [6].

Looking at Table 2 and Fig. 2 we can say that in 1887 Petru Poni determined the highest values of mineralization, 89.45 g/l, but in

1933 the values accounted for only 28.60 g/l, reflecting a continuous decline. The lowest value was recorded in 1973, accounting for 4.4 g/l.

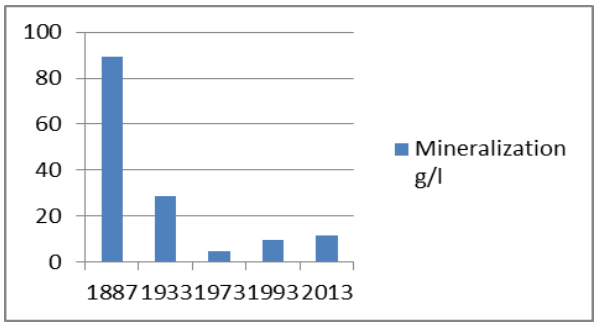

Fig. 2. Changes in Amara lake water mineralization
Source: Own determination.

These changes in mineralization of the lake water is due to: changes in hydrology, massive deforestation curtain forest on the Southern shore, building area of the resort Amara does not have sewer and water coming from rain and snowmelt drained directly into the lake, operating with outdated equipment producing turbulence in the water, a phenomenon negatively influencing mineralization [5].

Anthropic tourism potential. Treatment base. By its nature, the Amara resort receives patients with chronic diseases even from infancy. The resort has facilities for anointing with cold mud followed by bathing in the lake, installations of warm baths and mud, physical therapy installations for warm baths in tubs and pools with water from the lake, installations for electrotherapy and hydrotherapy, buveta for internal treatment with mineral water jets, medical gyms, massage rooms, three swimming pools and beaches for sun tanning, one of which with 10,000 seats [6].

Diseases and illnesses treated

The main diseases treated in Amara are musculoskeletal disorders, gynecological, endocrine, dermatological, hepatobiliary diseases, cures for diuresis.

Contraindications

Amara Resort has contraindications for the following diseases: neuroses, active pulmonary tuberculosis, cardiovascular disease, Basedow disease, and asthma [10].

Accommodation

Amara resort has several types of accommodation units such as: hotels (Lebăda, Park, Ialomița), villas (Carmen, Dana, Irina, Livia), and a Camping.

Accommodation at the resort Amara has registered an upward trend especially in the category of hotels (Table 3) [7].

Table 3. Tourist accommodation capacity in the period 2001-2014 in Amara resort

Years	Hotels	Cam ping	Camp	Villas	Small houses	Total
2001	1,665	83	500	188	105	2,541
2002	1,665	83	474	188	105	2,515
2003	1,689	70	337	206	105	2,407
2004	1,763	40	337	214	105	2,459
2005	1,781	36	120	122	105	2,164
2006	1,660	36	120	122	105	2,164
2008	1,785	38	120	26	105	1,949
2009	1,845	34	120	26	105	2,070
2010	1,845	44	120	26	105	2,140
2011	1,839	44	212	26	105	2,232
2012	1,971	342	92	26	105	2,404
2013	1,971	342	90	26	105	2,534
2014	1,894	342	90	26	105	2,534

Source: National Institute of Statistics, Ialomița [7].

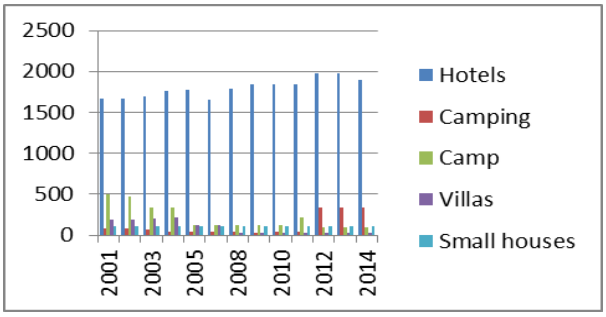

Fig.3.Evolution of tourist accomodation units in Amara resort
Source: Own design.

Looking at Table 3 and Fig. 3, one can see that the number of beds is relatively constant during the period 2001-2014. In 2001 there were 2,541 places, in 2002 they accounted for 2,515, but in 2003 their number declined to 2,407 places. After a period of decrease in 2003, then, the number of places recorded a slight increase in 2004, reaching 2,459 seats. These small fluctuations in the number of beds for tourists were due to the restoration works of the rooms. After the year 2010, the number of seats has continuously raised.

The number of tourists in these accommodation units ranged from a year to another, reaching the lowest level in 2010, 15,985 tourists and the highest level, 25,688 tourists in the year 2007. (Table 4).

Table 4. The number of tourists accommodated in Amara resort in the period 2001 - 2014

Years	Hotels	Camping	Camp	Villas	Small houses	Total
2001	15,415	429	1,763	1,037	520	19,164
2002	14,997	120	727	69	30	15,943
2003	19,346	274	1,013	31	60	20,724
2004	19,661	223	845	134	20	20,883
2005	15,818	10	249	189	77	16,344
2006	17,759	40	727	680	10	19,216
2007	24,002	0	906	636	144	25,688
2008	18,208	180	894	3,480	15	22,777
2009	19,535	183	470	34	50	20,272
2010	14,879	265	735	71	35	15,985
2011	18,238	500	418	107	10	19,273
2012	17,335	260	463	547	140	18,745
2013	15,647	130	334	160	100	16,371
2014	16,587	140	480	70	122	17,399

Source: National Institute of Statistics, Ialomița [7].

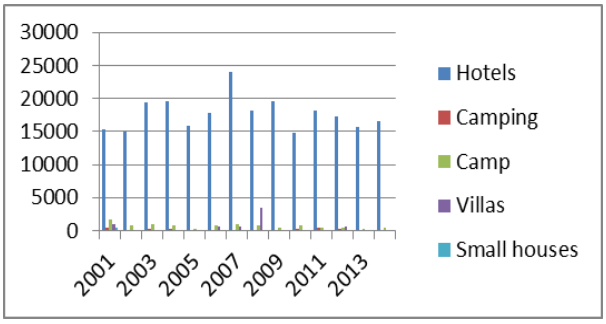

Fig. 4. The number of tourists in the Amara resort during
2001-2014
Source: Own design.

Looking at Fig. 4 and Table 4, one can see that highest number of arrivals was recorded in 2007 (25,688) and the fewest arrivals were registered in 2002 (15,943).
Despite of the fluctuations of the number of tourists arrivals, Amara resort is one of the most visited spas. The increased number of tourists is due to the development of the resort, improved quality of services and their diversity [8].

CONCLUSIONS

Amara resort has a considerable potential for health tourism.
The therapeutic value of water and sludge has been gained from the natural conditions of formation of the environment. The salt water of the lake is a favorable environment for the Artemia salina crustacean, whose decomposition is formed by mud.
Mud is the key of the development of tourism in the resort of Amara, being used in wraps, baths or massage treatment or prevention of disease.
The main diseases treated in Amara are musculoskeletal disorders, gynecological, endocrine, dermatological, hepatobiliary diseases, cures for diuresis.
Spa tourism is addressed to those who want to relax, regain vitality, and to have a good physical, mental and spiritual condition.
The resort has a hospitality network, composed mainly of three hotel complexes, Lebăda, Park, Ialomița, a properly equipped spa with treatment rooms to ensure appropriate services throughout the year.
Analyzing the flow of tourists, studied over a period of 14 years, we can conclude that the resort has a large flow of tourists, thanks to good promotion of the resort, and the quality of services.
There are Romanian and foreign, young or middle-aged tourists who choose Amara resort for treating various diseases. Amara resort is a natural source of health and living that highlights its curative valences which is endowed with.

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NATURAL RESOURCES AND ANTHROPOGENIC FACTORS OF TOURISM DEVELOPMENT IN CLUJ

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Abstract

The paper presents the tourism sector in the county of Cluj, combining physical and geographical, historical and economic elements favored over time by the emergence of tourism activities in the area. This paper presents an analysis of several components of the tourism sector as well as tourism potential of the county, adjacent infrastructure and sector-specific types and forms of tourism practiced in Cluj by the existing natural potential, movement and tourism demand. The major objectives of this work are: establishment of the potential attractiveness of the county by inventorying and assessing its natural and anthropogenic aspects; determining the extent to which infrastructure present here is valued and able to contribute to the economic development of the county and determining how tourist traffic has evolved over time. The data were provided by Cluj County Council, Cluj County Development Strategy 2007 - 2013, and National Institute of Statistics, Cluj. The data were processed and converted into tables, graphs and then analyzed. The presence in various proportions of the attractive natural resources and the different accessibility of the road network and the position in the territory of Cluj-Napoca - a nodal landmark, the dispersion of tourist flows in Cluj County and the entire region of North -West constitute the favorable conditions for practicing a wide variety of different types and forms of tourism. (with whom they could develop new forms, provided accommodation is in charge of planning and modernization, diversification and functional readjustment) and allow drawing a tourism profile.

Key words**:** *financial resources, infrastructure, modernization, potential, travel*

INTRODUCTION

Located in Transylvania, Cluj County offers visitors a pleasant combination of three geographic units on the East and Southeast, the Transylvania Plain with a vast underground riches; North, the Someș Plateau with its wealth of fruit; West, the Apuseni Mountains a scenery of natural treasures [6].
In this area, by combining sightseeing with the anthropogenic natural resources one can find a particular area that prevails among the most visited counties in Romania.
The purpose of the paper was the analysis of the potential attractiveness of the Cluj county by inventorying and assessing its natural and anthropogenic aspects; determining the extent to which infrastructure present here is valued and able to contribute to the economic development of the county and determining how tourist traffic has evolved over time.

MATERIALS AND METHODS

To conduct this work it was needed to carry out a review of literature on topics such as: urban tourism, cultural tourism, heritage and tourism natural and human potential, general and specific infrastructure for tourism sector, movement and tourism demand.
Qualitative and quantitative research methods were used to analyze several areas of tourism.
For example, for the qualitative aspects, there were applied the following research methods: documentation on the literature on the topic that could be accessed and on the official documents, and also on the observation method,.
The quantitative aspects were studied using the following research methods: analysis method and data processing, graphic and cartographic method, the method of observation and interpretation.
The data were provided by the following institutions: Cluj County Council, the Cluj County Development Strategy 2007 - 2013,

National Institute of Statistics, Cluj.
The data were processed and converted into tables, graphs and then interpreted and analyzed.

RESULTS AND DISCUSSIONS

Cluj county's tourist potential based on natural and human resources.
Among the most important physical and geographical units of Cluj county, are the Apuseni Mountains, the Transylvania Plain and the Someș Plateau showing a great diversity of geographic features that provide an unique mountain landscape.
The County possesses within its boundaries, a number of hydro resources, mainly represented by aquifers containing chlorine and sulfur (in Băița Baths, for example). The presence of these accumulations are related to springs, salt lakes and therapeutic mud baths encountered Someşeni Baths, Cojocna Baths, Baița, Șic, Dej, and Turda Baths, but also in other subunits of the Transylvanian Plain.
The complexity of the landscape and vegetation of Cluj County favors the presence of a rich spontaneous fauna. In terms of tourist interest, only part of fauna is important in terms of hunting and fishing [5].
Cluj has a varied and rich anthropic potential composed of cultural-historical elements, ethnographic and religious towns and villages and reception structures.
The cultural life of the county is intense, the Transylvania International Film Festival and the Jazz Festival Transylvania are just some of the most important events with musical character, cinema, theater, poetry animating Cluj county and other cities. Popular fairs, feasts, folk festivals and events that take place in several villages, representing significant opportunities for the preservation of traditions and customs and to boost rural tourism [1].
Cluj county infrastructure, reception facilities, accommodation and catering
Tourism capacity of Cluj County in 2001 comprised 26 hotels (2,489 seats), 5 inns and motels (182 seats), 7 chalets (852 seats), three campgrounds (1,610 seats), 27 villas (209 seats) and 2 camps for students and preschoolers (140 seats); besides these accommodation units in recent years, the city operates with 206 accommodation units and 33 boarding houses with 423 seats. (Table 1)[10].

Table 1. Tourist accommodation units in Cluj in 2013

Cluj County	Number
Total	206
Hotels	56
Inns and motels	7
Chalets	4
Campgrounds	1
Villas	15
Guesthouses	45
Rural locations	73
Hotels apartment	1
Hostels	1
Tourist stops	2

Source: Cluj County Council, Cluj County Development Strategy , 2007 – 2013

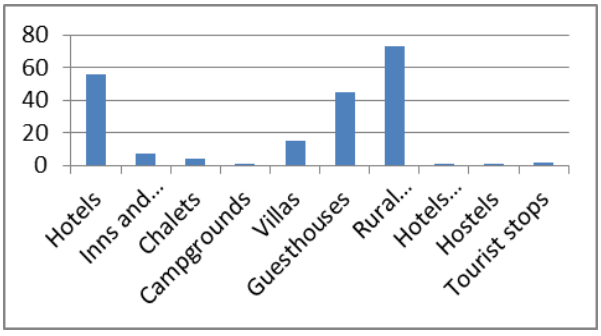

Fig. 1. The distribution of tourist accommodation establishments in the county of Cluj, in the year 2013
Source: Own design.

Analyzing the data presented in Table 1 it is observed that the most accommodation units are hotels with a total of 56, followed by rural locations, accounting for 73 and guesthouses, present in a number of 45 [2].
To meet the growing demand for quality accommodation, in the recent years, many hotels were opened in Cluj-Napoca, and others are under construction.
In 2004 there were opened more than 7 hotels, especially in Cluj-Napoca, providing a total of 4,606 beds in the entire county. The largest share of customers in Cluj hotels are business people and foreign tourists (Fig.2) [3].
Most of the accommodation offers a medium or low level of comfort: only 23% are classified to be 4 or 5 stars.
The accommodation capacity in 2010 was 6,960 seats, representing 26.6% of the total accommodation capacity at regional level,

coming on the 2nd position after Bihor County.

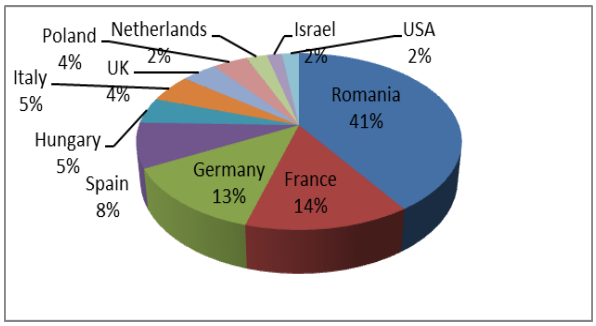

Fig. 2. Countries of origin of visitors in Cluj County
Source: Own determination.

Naturally, most beds incumbent hotels (52.61%) followed by chalets (10.9%) and rural locations (7.19%)[4].

From the territorial perspective, nearly 60% of accommodation are located in urban areas, of which nearly 50% in Cluj-Napoca.

Tourist arrivals in the county was 242,374 in 2010, representing 38% compared to 2007, the decrease is naturally linked to the economic crisis and its effects.

Steep decreases were recorded in all accommodation establishments except hotels, where arrivals increased by 8.9%. The decrease was more pronounced in the rural areas, while the urban area maintained its attractiveness - rather people came for reasons other than leisure [8].

Cluj-Napoca is the main tourist destination in the county of Cluj and one of the main tourist destinations of the North-West region. In the last 5 years, the importance of the city in terms of tourism increased, reaching a concentration varying from 65% in 2008 to 80% in 2012 of total arrivals and overnight stays in the county of Cluj.

With reference to the North-West in the last 5 years, the importance of the city was kept relatively constant both in terms of arrivals (between 25% and 28%) as well as in terms of overnight stays (15% to 19%)(Fig.3, Fig.4, Fig.5, Fig.6) [9].

Transportation and communication routes

Cluj has many roads and rails, which facilitate the movement of tourists to various destinations.

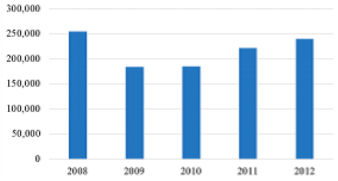

Fig 3. Tourist Arrivals in Cluj-Napoca
Source: Own determination.

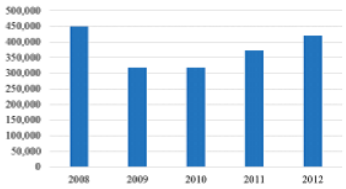

Fig.4. Overnights in Cluj-Napoca
Source: Own determination.

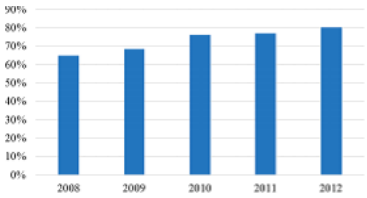

Fig.5. The share of arrivals in the county of Cluj-Napoca
Source: Own determination.

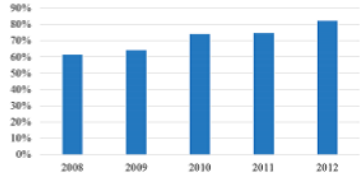

Fig.6. The share of overnight stays in Cluj county

Types and forms of tourism in the county of Cluj

Presence in varying proportions resources attractive natural and man-degree differential accessibility of the road network and the position in the territory of Cluj-Napoca - landmark nodal attract and dispersion of tourist flows in Cluj County and the entire region of North -West - constitute favorable conditions for practicing a wide variety of different types and forms of tourism (with whom they could develop new forms, provided accommodation is in charge of planning and modernization, diversification and functional readjustment necessary) and allow while outlining a profile of the tourist complex and tourist areas with specialized or complex functions, subject to a policy of enhancing the development strategy of Cluj

County during the 2014-2020 period [8].
Adventure park can take two forms of practice (bathing and climatic).

Spa tourism is conditioned by the presence of chlorine and sulfur mineral waters, namely therapeutic mud baths at Someşeni, Băile Turda, Dej, Cojocna, Băile Băiţa, Şic or Leghia. Low level of facilities (except Park spa Toroc - Dej and partly Turda and Cojocna, in full process of modernization) or their lack explained largely still relatively limited degree of operating current of these resources, qualitatively and quantitatively significant ;

Tourism climate favored the existence of a mountain climate attribute curative (ionization and oxygenation strong solar radiation with high relative humidity high) currently in mountainous areas or in cavities underground anthropogenic (Salina Turda, where the climate underground parameters extremely constant and aerosols loaded with microscopic salt particles have a curative major respiratory disorders) or natural (caves with a topoclimat recognized by the change in minimum temperature, humidity and air circulation).

Mountain recreational tourism ranks second in the hierarchy and can be practiced thanks extension Mountain Region ski area holding a potentially valuable (yet non-inventoried in detail) on around 25% of the county. The variety of resources determines the possibility of practicing various forms of tourism, namely: speotourism, climbing, hiking tourism, hunting tourism and recreational fisheries etc. [7].

Leisure tourism winter (winter sports-skiing, bobsled, luge, skating) have opportunities for development and diversification in mountainous areas, especially in the massive Gilău-Muntele Mare and Vlădeasa where at altitudes above 1700 m, length of snow exceeds 5 months annually. The arrangements in this regard are but few, poorly diversified and modest quality, the only location that has ski slopes with a grade of fitting environment is one in Băişoara (plus the Feleac and Dângău, whose lifetime is, climate reasons, minimum). Fitting other ski slopes (including cross country), bob and sledges, with varying degrees of difficulty, ice rinks stringency is required.

Extreme tourism (paragliding or hang gliding, motocross, cycling, river rafting etc.) can find places to practice positive slope in the mountain where slopes, sometimes appreciable differences in level or land fragmentation, combined with the favorable contribution of dynamic component (drafts) or hydrographic nature are conducive to practice such activities[9].

For the enhancement of tourism in the county of Cluj, it had considered various European programs.

One of the projects developed for tourism in the county of Cluj, is entitled integration of tourism in the county of Cluj in the tourism system regional, national and European level.

Cluj County tourism integration in regional tourism system, national and European level by creating a complex tourism offer complementary and competitive, able to motivate and generate tourist flows to satisfy demand converged and diversified.

Increase the attractiveness of the county, reducing seasonality and extend your stay by diversifying the supply of tourism to provide viable alternatives for leisure, development of various kinds of leisure practiced both outdoors (outdoor) and the interior (indoor), activities such as sports, cultural and leisure-recreation, attracting new segments interested in practicing these forms of tourism.

CONCLUSIONS

Through varied relief and geographical position privileged Cluj offers many tourist options and Cluj-Napoca is located on the route of two important tourist routes: E60, crossing the southwestern county of Cluj, thoroughfare for transit tourism, and on the way to the Maramureş region.

Cluj County is the only country where every city has, in town or nearby, a seaside resort [8].

Cluj has a varied and rich potential anthropic composed of cultural-historical elements, ethnographic and religious towns and villages and reception structures.

Cluj county is characterized by a great variety of landscapes and landforms, which are

adding to a series of natural monuments. Geographical location gives it a privileged position at the center, whose importance is magnified by its impressive tourist recreational resources.

County tourist potential benefits from impressive, but it is barely exploited mainly mountaineering-the Apuseni Mountains. Gilău Mountains, Vlădeasa and Trascău peaks are characterized by their extended, gorges and canyons (Turzii, Turului, Stanciului, Arieșului), steeps and their caves (Vârfurașul). Lakes Fântanele, Tarniţa and Floroiu (accumulation), Turda salt lakes and Cojocna, ponds Transylvanian Plain, mineral waters, however, are points of tourist interest.

Tourism resources anthropogenic Cluj county, as well as variety and value, binds directly to the long evolution of human civilization and the interference between the mosaic of ethnic specific Transylvania and implicitly of Cluj County and cultures of their particular whose fingerprint specific developments resulting from centuries, is found in the material and spiritual culture (from architecture and organization of villages and households to traditions, customs, costumes, music, gastronomy, mentality etc.)

Presence in varying proportions resources attractive natural and man-degree differential accessibility of the road network and the position in the territory of Cluj-Napoca - landmark nodal attract and dispersion of tourist flows in Cluj County and the entire region of North -West - have favorable conditions for practicing a wide variety of different types and forms of tourism (with whom they could develop new forms, provided accommodation is in charge of planning and modernization, diversification and functional readjustment necessary) and allow while drawing a tourism profile.

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CONSIDERATIONS ON BEEF PRODUCTION, CONSUMPTION AND TRADE BALANCE IN ROMANIA (2007-2015)

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Abstract

The paper analyzed the dynamics of bovine meat live stock, production, live weight at slaughter, carcass weight, beef and veal consumption, beef supply, export and import and trade balance of Romania in the period 2007-2015 using the empirical data provided by the National Institute of Statistics. The analysis led to important conclusions. Beef comes on the 3rd position after poultry meat an pork in Romania. Beef production declined and so that imports were needed to cover the gap between production and consumption. The decline of the bovine live stock is the main cause as farmers are facing with high farm inputs prices and receive a low farm gate price per kg live weight. In the structure of the slaughtered bovines cows represent over 50 %, fattened steers 25 % and other categories (bulls, heifers, calves etc). The average live weight and quality at slaughter is lower compared to other EU countries. The slaughter rate is less than 50 %. Only 26 % of bovines are slaughtered in industrial specialized units, where the fattened steers of high quality and over 400-430 kg live weight per head are usually slaughtered. Beef consumption is low as pork and poultry meat are preferred by consumers and beef price is too high. Romania is a net exporter of bovine meat, but the highest share in the export structure belongs to bovine live weight (84.4%). In 2020, it is expected as bovine live weight at slaughter to reach 235 thousand tons for an annual growth of 7 thousand tons. To develop meat production it is needed to create farmers associations, to raise meat breeds and apply modern fattening technologies.

Key words**:** *consumption, forecast, meat, production, foreign trade, Romania*

INTRODUCTION

Human health can be assured by a balanced diet in which meat plays an important role. At world level there are discrepancies regarding meat consumption from 72.2 kg/inhabitant in the developed countries to 33.5 kg/inhabitant in the developing ones, and the world average is only 42.9 kg meat/capita. According to FAO, to eliminate malnutrition and under-nourishment, a person must consume 33 kg lean meat or 45 kg fish or 60 kg eggs or 230 kg milk per year. The continuous growth of world population leads to a higher meat demand [5].

In human diet, beef plays an important role grace to the nutritional value determined by its chemical composition: water 66 %, proteins 18.6 %, fats 2.5 %, 7,137 mg essential amino-acids for 100 g, non-essential amino-acids 11,292 mg per 100 g, vitamins per 100 g (niacin 4.7 mg, biotin 3.04 mg, B12 2.6 mg, B6 0.37 mg, E vitamin 0.57 mg/100g, traces of A and C vitamins, pantothenic acid 0.5 mg, riboflavin 0.5 mg, thiamine 0.06 mg), minerals 1 %[2].

Bovine meat production accounted for 67 million tons in 2012 at world level, representing 22.02 % of the world meat output, 304.2 million tones, of which 112.4 pork (36.9%) and 105.4 million tones poultry meat (34.6%). The world trade with bovine meat accounted for 8 million tons, representing 26.93 % of the total meat trade, 29.7 million tons[17].

In 2015, the main beef and beef products exporters were USA, Australia, Brazil, India and New Zealand, Canada and EU. In the same year, the main beef and beef products importers were USA, China, Russia, Japan, Mexico, South Korea and EU [7].

According to USDA, in 2015, the world beef and veal (carcass live weight equivalent) accounted in for 60,022 metric tons and beef and veal consumption was 58,164 metric tons.

The main exporters were represented by Brazil, India, Australia, New Zealand, Canada, Paraguay, Uruguay and EU, while the main importers of beef/veal were China, Japan, Russia, South Korea and EU [16].

Beef production will continue to develop in the next decades by an annual growth rate of 1.7 %, the main exporting countries being Brazil, China and the USA [14].

In 2015, the EU-28 beef production accounted for 7,591 thousand tons (carcass weight), of which 32.4 % from bulls, 30.2 % from cows, 14.9 % from young cattle, 14.8 % from heifers, 9.4 % from bullocks, and 8.1 % from calves [9].

For this reason, it comes on the 3rd position in the world for beef/veal production with a market share of 12 %, after the USA (17%) and Brazil (13%). Also, its market share in the world beef/veal trade accounts for 2 % for export and 9 % for import value. About 72 % of beef/veal production is carried out by France, Germany, Italy, the United Kingdom, Spain and Ireland, which are the main producers in the EU [1].

The EU-28 beef trade has been continuously developing. In 2015, the EU-28 exported 448,223 tons beef products (bovine carcass weight) accounting for Euro thousand 1,399,899. The exported products were live animals, fresh, frozen, prepared meat and other products. The EU-28 imports accounted for 322,753 tons bovine carcass weight whose value was Euro thousand 2,060,481. The main beef products suppliers for the EU are Brazil, Uruguay, Argentina, Australia, USA and other countries.

In 2015, the EU-28 beef trade balance is a positive one, with +811 million Euro, because the export value accounted for 1,898 Million Euro (+12.17% compared to 2012) and the import value was 1,087 Million Euro (+26.24 % compared to 2012) [10].

The rigorous strategy for meat production development according to the CAP policy assures a constant production, consumption and trade. In 2023, it is expected as the EU beef production to reach 7.6 million tons and beef consumption to account for 10 kg/capita [4].

In 2014, Romania came on the 19th position in the EU-28 with 29 thousand tons slaughtered bovine live weight and 136 thousand heads, representing 0.39 % and respectively 0.53 % of the total slaughtering at the EU level. The main positions regarding bovine slaughtering live weight are occupied by France (19.3 %), Germany (15.4%), United Kingdom (11.9%) , Italy (9.6%) and Ireland (7.9%) [7].

In this context, the paper aimed to analyze the evolution of beef production, consumption and trade in Romania in the period 2007-2015 based on the data provided by the National Institute of Statistics.

MATERIALS AND METHODS

The paper imposed the collection of empirical data from the National Institute Data base for the period 2007-2015 [11]. The main indicators taken into consideration to set up this analysis have been the following ones: cattle live stock, live weight of slaughtered bovines at national level and in the industrial specialized units, average live weight at slaughter, carcass weight, slaughter rate, the position of beef among other meat sorts, the degree of consumption covering by bovine meat production, bovine meat supply, export/import ratio, export/production ratio, foreign trade with bovine meat, farm gate price per kilogram of bovine live weight.

The data were processed using the analysis in dynamics based on the fixed basis indices, the comparison method and the forecast for the period 2016-2020 in three scenarios based on the results in the analyzed period. The V1 scenario was based on the average gain in live weight of slaughtered animals in the whole period 2007-2015, the V2 scenario is based on the average gain in live weight of slaughtered animals in the period 2013-2015, and the V3 scenario was based on the gain recorded in 2015 compared to 2014.

The result were presented in tables and graphics and were interpreted.

RESULTS AND DISCUSSIONS

Cattle stock. In Romania, cattle farming is a traditional activity of the population in the

rural space especially in the hilly and mountain areas. In this way, it contributes to the stability of labor force in the rural areas, assuring an important income to rural households. Among other advantages, cattle growing is a sustainable activity based on the use of: (i)the local dual purpose breeds supplying a large variety of products but mainly milk and meat; (ii) cheap forage resources like pastures and meadows and cereals and secondary products resulted from cereals and technical plants cropping; (iii) low energy consumption [6].

Romania has a good potential for producing beef and veal due to its cattle livestock accounting for 2,092 thousand heads in 2015. From this point of view, in the EU-28, Romania comes on the 10th position regarding cattle livestock after France, Germany, United Kingdom, Ireland, Spain, Poland, the Netherlands and Belgium [7].

However, the cattle livestock recorded a continuous decline in the analyzed period so that in 2015, it was by 25 % less numerous than in 2007 when it accounted for 2,818 thousand heads. The minimum cattle livestock was recorded in 2011, 1,988 thousand heads, but since the year 2012. it started a slight recover, as confirmed by the annual growth rates (Table 1).

Table 1. The dynamics of cattle livestock and the annual growth rate in Romania in the period 2007-2015 (Thousand heads)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cattle live stock	2,818	2,683	2,512	2,001	1,988	2,009	2,022	2,069	2,092
Growth rate (%)	-	-4.8	-6.4	-20.4	-0.7	+1.0	+0.5	+2.3	+1.1

Source: Own calculation based on NIS Database, 2016

The main causes determining the decline in cattle livestock are the low consumption of beef and veal, as pork is traditional in Romania and poultry meat is a lean, tasty, and cheaper meat, the low milk price at farm gate which does not stimulate farmers to increase the number of dairy cows, the invasion of imported milk and dairy products and also of meat products at lower prices in the market which compete with the more expensive local products and affect Romanian producers, the nonsufficient support offered by Government to farmers and the high price for farm inputs.

There are important differences regarding the distribution of cattle livestock among the development regions in Romania. The highest number of cattle is grown in NE, NW and Central area of Romania, accounting for more than 59 % of the total cattle stock.

Cattle are grown in about 700 thousand farms of small size, over 24 % having less than 1 ha, 59 % having between 1-5 ha, and just 0.6 % have more than 50 ha. The average number of cattle per farm was 2.75 heads in the year 2015.

The weight of slaughtered bovines. The decline of the cattle stock had a deep impact on the weight of slaughtered animals. At national level, the weight of slaughtered animals (all species included) accounted for 1,431 thousand tons, being by 4.8 5 less than in 2007 (1,503 thousand tons).

The weight of slaughtered bovines declined by 40 % from 333 thousand tons in 2007 to 200 thousand tons in 2015 (Fig.1.)

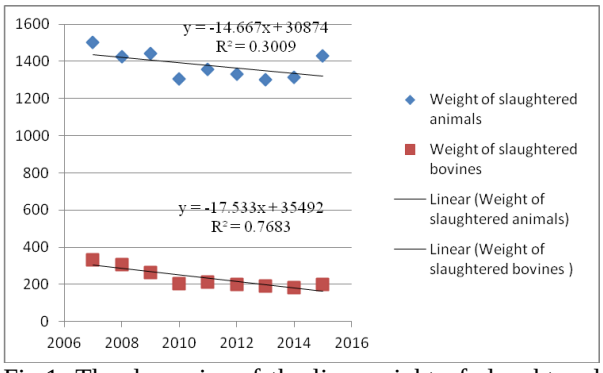

Fig.1. The dynamics of the live weight of slaughtered animals and of slaughtered bovines in Romania in the period 2007-2015 (Thousand tons)

Source: Own design and calculation based on NIS Database, 2016

Therefore, the contribution of bovines to the weight of slaughtered animals registered a continuous decreasing trend from 22.15 % in 2007 to 13.97 % in 2015 (Table 2).

Table 2.The dynamics of the live weight of slaughtered bovines and its contribution to the weight of slaughtered animals in Romania in the period 2007-2015

	MU	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015/2007 %
Weight of slaughtered bovines	Thou. tons	333	306	264	205	212	198	192	183	200	60
Share in the weight of slaughtered animals	%	22.1	21.4	18.2	15.7	15.6	14.8	14.7	13.9	13.9	-

Source: Own calculation based on NIS Database, 2016

The contribution of various development regions to the weight of slaughtered bovines depends on the local growing conditions and the number of bovines. In 2007, the 333 thousand tons bovine live weight at slaughter was achieved by the following contribution of the micro development regions: NE 20.4 %, NW 18.3 %, South Muntenia 19.1 %, Center 14 %, SE 10.5 %, SW Oltenia 10.3 %, W 6.6. % and Bucharest Ilfov 0.80 %. In 2015, the contribution of the micro development regions was the following one: NW 13.1 %, Center 18.3 %, NE 26.3 %, SE 10.7 %, S Muntenia 15.3 %, Bucharest Ilfov 0.4 %, SW Oltenia 8.6 % and WW 7.3 % [13].

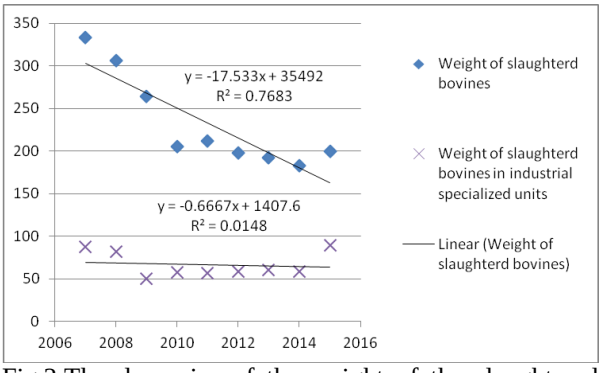

Fig.2.The dynamics of the weight of the slaughtered bovines at the national level and in the industrial specialized units in Romania in the period 2007-2015 (Thousand tons)
Source: Own design and calculation based on NIS Database, 2016.

More than this, in the industrial specialized units, the live weight of slaughtered bovines is 2.2 times smaller compared to the total live weight of the slaughtered bovines in the country. However, in 2007, the live weight of slaughtered bovines in the industrial specialized units accounted for 87.9 thousand tons, representing 26.4 % of the total weight of bovines slaughtered at national level, while in 2015, the weight of the bovines slaughtered in the industrial specialized units recorded a slight increase (+1.7%), accounting for 89.5 thousand tons, representing 44.7 % of the weight of slaughtered animals at the national level (Fig.2).

Regarding the distribution of slaughtered bovine live weight across the year, it was noticed that more cattle are slaughtered in the second half of the year, the most numerous are slaughtered In December and the fewest number in January [12].

The average live weight of bovines at slaughter. Besides the lower number of slaughtered cattle, a second cause of the decline in the live weight of slaughtered bovines is the low average weight at slaughter. However, in the analyzed period, the average bovine live weight at slaughter recorded an increase of 17 %, from 280 kg/head in 2007 to 328 kg/head in 2015.

In the industrial specialized units, the average weight at slaughter is much higher ranging between 415.9 kg/head in 2007 to 430.3 kg/head in 2015 with a peak of 442 kg/head in the year 2010 (Fig.3).

These discrepancies are determined by the structure of the slaughtered bovines: over 50 % cows, 25 % fattened steers, and the remaining being represented by bulls, heifers and young bovines [3].

In the EU, the cattle slaughtering includes 46 % males, 44 % females and 10 % young cattle

[15].

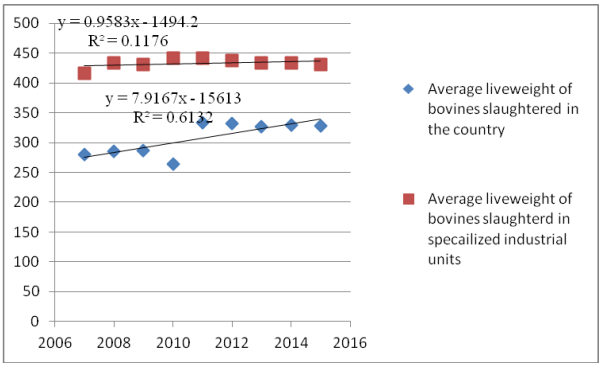

Fig.3.The dynamics of the average live weight of bovines at slaughter at the national level and in the industrial specialized units in Romania in the period 2007-2015 (kg/head)
Source: Own design and calculation based on NIS Database, 2016.

The average weight of bovine carcass is small ranging between 205.5 kg/carcass in 2007 and 213.6 kg/carcass in 2015 in the industrial specialized units.
Therefore, just 3.9 % increase was recorded in the analyzed period.
This small carcass is determined by the small live weight of bovines at slaughter, the structure of the slaughtered bovines, where fattened steers have a low percentage, and the low quality of bovines at slaughter (Table 3).

Table 3.The dynamics of average carcass weight of slaughtered bovines in the industrial specialized units in Romania in the period 2007-2015 (kg/carcass)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015/2007 %
Average carcass weight	205.5	211.3	212.2	218.2	217.4	213.0	210.0	214.1	213.6	103.9

Source: Own calculation based on NIS Database, 2016

The average slaughter rate (%) reflects the share of the carcass weight in the bovine live weight at slaughter. Its level is less than 50 %, varying between 49.4 % in 2007 to 49.6% in 2015 (Table 4).

Table 4.The dynamics of slaughter rate for bovines slaughtered in the industrial specialized units in Romania in the period 2007-2015 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015/2007 %
Slaughter rate (%)	49.4	48.7	49.3	49.3	49.3	48.7	48.3	49.3	49.6	100.4

Source: Own calculation based on NIS Database, 2016

The slaughter rate reflects the small average live weight at slaughter, the low animal quality and the high share of culled cows.
The dynamics of the bovine carcass weight achieved in the industrial specialized units ranged between 43,477 tons in 2007 and 44,71 tons in 2015, reflecting an increase of 2.2 % (Fig.4).
The position of beef and veal among other sorts of meat. The results in meat sector reflect that bovine meat, of which beef and veal has the highest share (over 95%), as in the country there are grown some buffaloes, is situated on the 3rd position among the meat sorts after poultry and pork.

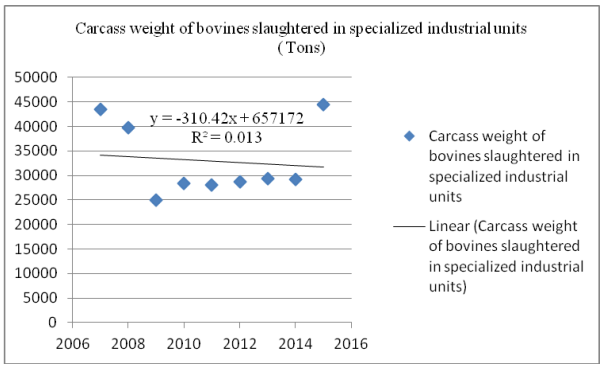

Fig.4.The dynamics of carcass weight of the bovines slaughtered in industrial specialized units in Romania in the period 2007-2015 (Tons)
Source: Own design and calculation based on NIS Database, 2016.

This situation is justified by the industrial poultry farming well developed in Romania as poultry is able to assure a high fattening gain in a very short period of time (33-42 days) and more and many consumers are oriented to poultry meat considered a healthier compared to pork and its price is more convenient in comparison with pork price and mainly with beef and veal price. However, pork remain the traditional meat in the country with an important share among the meat sorts.

If in 2007, the bovine meat contributed by 10.38 % to meat production in Romania, in 2015, its contribution declined to 5.86%. The statistics shows a slight decline in the share of poultry meat from 50.49 % to 49.38 % in favour of pork whose share increased from 38.7% in 2007 to 43.57% in 2015 (Table 5).

Table 5.The structure of meat production by meat sort in industrial specialized units in Romania in the years 2007 and 2015 (%)

Meat sort	2007	2015	2015-2007
Poultry meat	50.49	49.38	-1.11
Pork	38.70	43.54	+4.84
Bovine meat	10.38	5.86	-4.52
Sheep and goat meat	0.44	1.22	+0.78

Source: Own calculation based on NIS Database, 2016

The average beef and veal consumption per inhabitant has recorded a decline of 32.6 % from 8.3 kg/capita in 2007 to 5.6 kg/capita in 2015. The decreasing trend for bovine meat consumption is similar to the general decreasing trend in meat consumption in Romania (Table 6).

Table 6.The average consumption of meat and meat products in fresh meat equivalent in Romania in the Period 2007-2014 (kg/inhabitant)

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2014/2007 %**
Meat consumption	64.7	66	67.3	59.9	56	55.3	54.4	57.8	89.3
Bovine meat consumption	8.3	8	7.3	5.7	5.5	5	5.1	5.6	67.4
Share of bovine in meat consumption (%)	12.8	12.1	10.8	9.5	0.8	9	9.3	9.6	-

Source: Own calculation based on NIS Database, 2016

The average meat consumption declined from 64.7 kg/capita in 2007 to 57.8 kg/capita in 2014, therefore by 10.7 %. The main cause is represented by the high market price of meat, mainly for beef and veal. The share of bovine meat in the general meat consumption decreased from 12.8 % in 2007 to 9.6 % in 2014 (Table 6).

The degree of consumption covering by bovine meat production is below 100%.

Table 7. The degree of coverage of consumption by bovine meat production in Romania in the period 2010-2015

	MU	2010	2011	2012	2013	2014	2015	2015/2010 %
Bovine meat production	Tons	102,674	105,986	99,255	96,103	91,781	99,856	97.2
Bovine meat consumption	Tons	115,679	144,094	100,479	102,102	111,678	111,666	96.5
Coverage degree	%	88.7	73.5	98.7	94.1	82.2	89.4	-

Source: Own calculation based on NIS Database, 2016

This means that domestic production is not able to meet consumption and imports of beef and veal are required to cover market requirements in Romania. Looking at beef/veal production in comparison with consumption, one may easily notice the general decreasing trend of the both indicators in the analyzed period (Table 7).

The bovine meat supply. The offer of beef and veal results from production plus import minus export.

The bovine meat supply increased by 6.34 % from 88.2 thousand tons in 2010 to 93.8 thousand tons in 2015 (Table 8).

Table 8.The dynamics of bovine meat supply in Romania in the period 2010-2015 (Thousand tons)

	2010	2011	2012	2013	2014	2015	2015/2010 %
Production (tons)	102.6	105.9	99.2	96.1	91.7	99.8	97.2
Import (tons)	13.2	11.9	12.0	13.2	20.5	26.8	203.0
Export (tons)	27.6	28.7	37.6	29.8	25.5	32.8	118.84
Bovine meat supply (tons)	88.2	89.1	73.6	79.3	86.7	93.8	106.3

Source: Own calculation based on NIS Database, 2016

This was a consequence of the increased beef and veal import required to cover the difference between production and consumption, and also of the increased export of beef and veal. In the analyzed period, beef and veal production declined by 2.8 % from 102.6 thousand tons in 2010 to 99.8 thousand tons in 2015, beef and veal import increased by 103 % from 13,.2 thousand tons in 2007 to 26.8 thousand tons in 2015 and, beef and veal export increased by 18.8 % from 27.6 thousand tons in 2007 to 32.8 thousand tons in 2015.

Farm gate bovine price per kg live weight is more than double in 2015 (Lei 6.05/kg live weight) compared to 2007 (Lei 2.98/kg live weight) (Fig. 5).

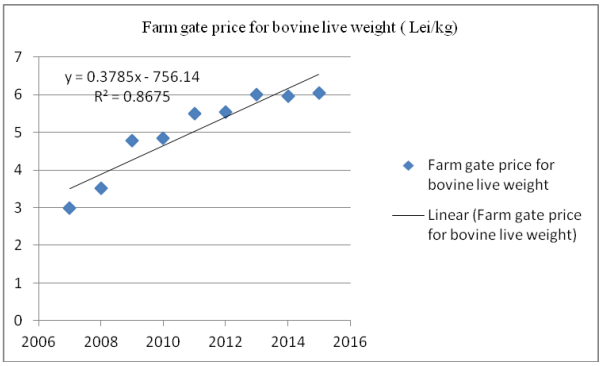

Fig.5.The dynamics of farm gate price for bovine live weight in Romania in the period 2007-2015 (Lei/kg)
Source: Own design and calculation based on NIS Database, 2016.

Despite that the acquisition price increased in the analyzed period, farmers are not satisfied because the price for farm inputs increased more and this affects production cost.

However, according to FAOStat, the price per kg live weight in Romania is among the lowest price in the EU [5]. In 2014, a Romanian farmer received USD 1.76/kg compared to USD 1.8/kg in Hungary, USD 1.89/kg in Poland, USD 1.98/kg in Russian Federation, USD 2.42/kg in Denmark, and USD 2.73/KG in Austria.

Also, the price per kg bovine live weight varies depending on the categories of slaughtered bovines: fattened steers (Lei 5.59/kg, bulls (Lei 5.57), young bovines (Lei 5.40), calves (Lei 5.16), heifers (Lei 4.98), castrated bulls (Lei 4.96) and cows (4.14). Therefore, the lowest price is offered for cows whose share in total bovine live weight is over 50 %. Even for fattened steers, the farm gate price is not enough to cover production cost in some cases,

The export/import ration for bovine meat amount recorded an increasing trend from 2.09 in the year 2010 to 3.13 in the year 2012, and then it registered a deep declining trend from 2.26 in the year 2013 to 1.22 in 2015. This was determined by the high rate of import growth compared to export growth rate.

However, the fact that the exported quantity of bovine meat exceeds the imported amounts reflects that Romania's trade with bovine meat is efficient and the country is a net exporter of bovine meat (Table 9).

The export/production ratio for bovine meat is another indicator reflecting a higher efficiency in Romania's foreign trade with bovine meat.

This ratio recorded an increasing trend from 26.9 % in 2010 to 32.8 % in 2015, showing that more bovine meat produced in the country was exported (Table 10).

Table 9.The dynamics of export/import ratio for bovine meat in Romania in the period 2010-2015

	2010	2011	2012	2013	2014	2015	2015/2010 %
Export/Import ratio	2.09	2.43	2.13	2.26	1.25	1.22	58.37

Source: Own calculation based on NIS Database, 2016

Table 10. The share of bovine exported meat in bovine meat production in Romania in the period 2010-2015 (%)

	2010	2011	2012	2013	2014	2015
Export/Production ratio	26.9	27.1	37.9	31.0	27.8	32.8

Source: Own calculation based on NIS Database, 2016

The export and import value of bovine meat. As a consequence of the exported and imported quantity and of export and import price for various sorts of bovine meat (cattle live weight, fresh and refrigerated beef, frozen beef), both the export and import value recorded an increase by about 50 %. In 2013, Romania's export value of bovine meat was Euro thousand 154,861 compared to Euro thousand 103,026 in 2007. In 2015, the import value of bovine meat accounted for Euro thousand 45,267 compared to Euro thousand 30,304 in 2007 (Fig.6).

As a result the ratio export/import in terms of thousand Euro also reflects that Romania has an efficient foreign trade with bovine meat (Table 11).

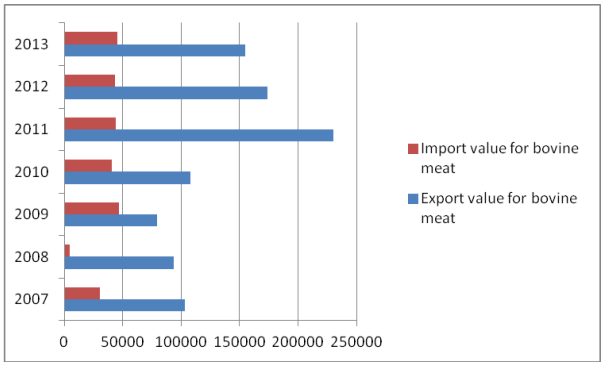

Fig.6.The dynamics of export and import value for bovine meat, Romania, 2007-2013 (Thousand Euro)
Source: Own design and calculation based on NIS Database, 2016.

The structure of export value and import value reflects that Romania exports more live weight and less fresh and refrigerated and frozen beef, and imports more frozen beef than bovine live weight and fresh and refrigerated beef (Table 12).

Table 11. The dynamics of export/import value ratio for bovine meat, Romania, 2007-2013

	2007	2008	2009	2010	2011	2012	2013	2013/2007 %
Export/Import value ratio	3.39	2.15	1.70	2.65	5.19	3.98	3.42	100.88

Source: Own calculation based on NIS Database, 2016

Table 12.The structure of Romania's export and import of bovine meat by sort, 2007 and 2013

	2007		2013		Difference 2013-2007	
	Export	Import	Export	Import	Export	Import
Cattle live weight	90.25	33.24	84.40	26.18	-5.85	7.04
Fresh and refrigerated beef	8.42	17.02	7.78	18.76	-0.64	+1.76
Frozen beef	1.33	49.74	3.82	55.06	+2.49	+5.32

Source: Own calculation based on NIS Database, 2016

A positive aspect of bovine export is that the share of cattle live weight declined from 90.25 5 in 2007 to 84.40 % in 2013, and frozen beef increased from 1.33 % in 2007 to 3.82 % in 2013.

A negative aspect of Romania's trade with bovine meat is that the share of the imported frozen beef increased from 49.74 % in 2007 to 55.6 % in 2013 and the imported fresh and refrigerated beef increased from 17.02 % in

2007 to 18.76 % in 2013.
This means that Romania pays more for processed bovines and receives less money for cattle live weight which does not involve any processing and value added.
The bovine meat trade balance. Taking into account the dynamics of export and import value for bovine meat, the trade balance was positive in every year in the analyzed period, and in 2013 it was recorded a surplus of 50.62 % compared to the 2007 level. Thus, in 2013, the trade balance accounted for Euro thousand 109,534 compared to Euro thousand 72,722 in 2007 (Table 13).

Table 13. The bovine meat trade balance of Romania in the period 2007-2013 (Thousand Euro) Trade balance

	2007	2008	2009	2010	2011	2012	2013	2013/2007 %
Trade balance	72,722	50,236	32,843	67,277	185,984	130,158	109,534	150.62

Source: Own calculation based on NIS Database, 2016

The forecast of live weight of slaughtered bovines for the period 2016-2020.
Based on the evolution of the weight of the slaughtered bovines, and the its growth rate from a year to another, it was established the forecast for the period 2016-2020 in three variants, as follows:
V1-Pessimistic scenario, based on the average gain for the whole period 2007-2015 accounting for -18 thousand tons live weight;
V2-Pessimistic scenario based on the average gain recorded in the last three years of the analysis, 2013-2015, accounting for - 8 thousand tons;
V3-Optimistic scenario, based on the gain recorded in 2015 compared to 2014, that is + 7 thousand tons. The calculations started from the performance registered in 2015 (Table 14).

Table 14. The forecast for live weight of slaughtered bovines for the period 2016-2020 (Thousand tons) Optimistic Scenario

	2016	2017	2018	2019	2020
V1-Pessimistic Scenario	182	164	146	128	110
V2-Pessimistic Scenario	192	184	176	168	160
V3-Optimistic Scenario	207	214	221	228	235

Source: Own calculation.

CONCLUSIONS

Beef and veal production in Romania declined in the analyzed period, affecting the internal market whose requirements had to be covered by imports.
This was due to the decrease of the bovine live stock as farmers are facing with high prices for farm inputs and a low acquisition price offered by intermediaries and meat processors.
The structure of the slaughtered bovines is not a corresponding one because it includes over 50 % cows, 25 % fattened steers and other categories (bulls, heifers, calves etc).
The local breeds are not able to assure a higher performance for bovine live weight at slaughter.
The average bovine live weight and quality at slaughter is lower compared to other EU countries.
The slaughter rate is less than 50 % reflecting the non corresponding structure of the slaughtered bovines.
Only 26 % of bovines are slaughtered in industrial specialized units where the average carcass weight is higher than the average carcass weight at national level.
This is due to the fact that in the industrial specialized units are slaughtered mainly fattened steers of high quality and over 400-430 kg live weight per head.
Beef and veal consumption is low as pork and poultry meat are preferred due to the existing tradition, taste, flavor and a more convenient purchase price per kilogram.
Romania is a net exporter of bovine meat with a positive trade balance.
However, in the structure of its export, bovine

live weight has the highest share (84.4%), while fresh and refrigerated beef and frozen beef have only 7.78 % and, respectively, 3.81 %, involving a low value added and export price.

The forecast for bovine live weight at slaughter showed that in 2020, in the optimistic scenario, this indicator will reach 235 thousand tons for an annual growth of 7 thousand tons.

A few recommendations are imposed in order to improve beef production, consumption and export as follows:

(i)It is needed an increased number of farmers to deal with steer fattening based on the measures and regulations established by the Romanian Government, Ministry of Agriculture and Rural Development and the EU regarding the payment per surface, and for agricultural producers with a minimum number of 3 bovines of at least 16 months age old and for male and female bovines and for stimulating young farmers to raise animals.

(ii)Farmers must join their capital and create associations in order to raise more animals and carry out a higher performance by applying for EU funds.

(iii)A change of the breed structure in meat production requires a cross-breeding between the local breeds and meat breeds like Angus, Charolaise and Limousine.

(iv)The use of pastures and meadows is needed for the sustainable extensive technologies of bovine fattening, which are friendly with the environment.

Also, bovine growing for meat production must be done in specialized farms for steer fattening, the only ones able to provide high quality animals and with a high live weight at slaughter.

(v)A better promotion of beef is also needed to make consumers to be aware that beef is a healthy food which must be included in a higher proportion in their diet.

(vi)A higher orientation to beef/veal export and mainly to meat bovine products including a higher value added (refrigerated and frozen beef) is also needed. In this way, export could become more effective than at present.

(vii)A better orientation of bovine meat export to the external partners where meat market is deficient, where meat price is higher and where pork is not a traditional food.

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RESEARCH ON THE DYNAMICS AND TERITORIAL DISPERSION OF THE OCCUPIED POPULATION IN ROMANIA'S TOURISM IN THE PERIOD 2007-2015

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Abstract

The paper aimed to analyze the evolution of the population occupied in tourism compared to the population occupied in the national economy in the period 2007-2015 using the empirical data provided by National Institute of Statistics. Index method, comparison method, descriptive statistics, Pearson correlation coefficient, linear regression function, and Herfindhal-Hirschman and Gini-Struck indices were used as methodological framework. The population occupied in tourism activities increased by 12.02 % from 155.5 thousand persons in 2007 to 174.2 thousand persons in 2015. Tourism contributes by 2.07 % to the population occupied in the economy. The Bucharest-Ilfov, Centre and SE micro-regions have the highest number of population working in tourism: 21.19%, 16.07%, and respectively 12.45%. The South West Oltenia and West micro-regions have the lowest shares of population employed in tourism. The persons working in tourism are relatively uniform distributed in the territory as confirmed by Herfindhal-Hirschman and Gini-Struck indices. The tourism structure by professional status is: 90.8 % employees, 3.8 % employers and 5.4 % self employed people, higher figures than in the national economy. Tourism absorbed more younger persons than in the national economy. About 13.5 % of the employed persons in tourism belong to the 15-24 years category and 34.5 % belong to the 25-34 years category. The correlation coefficient r=0.588 between the number of people employed in tourism and the number of units for tourists' accommodation reflects that a higher number of tourists will require a larger accommodation capacity and more employment in tourism activities. The correlation coefficient r=0.355 between the number of places (beds) and the number of persons occupied in tourism is a weak. As a final conclusion, tourism is a dynamic branch of Romania's economy with a high potential to create jobs, employ young people and also women.

Key words**:** *analysis, dynamics, labor force, Romania, tourism, territorial dispersion*

INTRODUCTION

Tourism is the most dynamic sector of the world economy. In 2015, tourism represented 7 % of the world exports in goods and services. For this reason, it is situated on the 3rd position after fuels and chemicals and ahead of food and automotive products [15].
Tourism has an important contribution to the economic and social development of any country in terms of creating GDP, jobs and employment and also it contributes to the balance of payments [4,10,11].
Tourism industry includes a large variety of subsectors such as: accommodation, food service, transportation, retail, attractions, entertainment events (cultural, sport, scientific etc) and facilities. The most important component of tourism industry is "hospitality" consisting of accommodation and food services.
The engine of tourism development is tourism workforce and employment [3].
The status of work and human resource management in tourism is characterized and must be focused on the following key aspects: work and careers, ICT's impact on work and employment, training level and skills [2, 8].
Despite that tourism is criticized many times as it creates part-time, seasonal, low quality and informal jobs where migrants and women are employed, tourism it is unanimously considered the world largest employer [1, 12].
It requires a large variety of job skills and assures the fast absorption of young people, women and migrants into the workforce.

The hotel, catering and tourism industry (HCT) accounts for more than 30 % of the global services trade and also, it generates more than 1.5 million additional jobs in the related economic branches [6].

One job in tourism generates 1.5 jobs elsewhere [14].

"Employment in the tourism industry refers to all the jobs (or persons engaged) in both tourism-characteristic activities and non-tourism-characteristic activities in all establishments in tourism industry" as defined by IRTS, 2008 [7].

In 2014, the global employed workforce accounted for 3.25 billion people. In tourism there are employed 204 million people (6.27 %), and it is expected as in 2019 to reach 296 million people.

All the relationships determined by the diversity, complexity and inter-linkage in tourism employment have a deep impact on the HRD sector by means of the types of workplace contracts referring to fulltime, part-time, temporary, casual and seasonal employment [6].

In the EU-28, over 12 million people is employed in the economic activities related to tourism. Of this, 7 million people (58.3%) work in the food and beverage industry, 2 million people is in transport (16.6 %), 2.4 million persons work in accommodation sector (20 %), 0.5 million people (4.2 %) work in travel agencies/tour operators. About 3.3 million people work in tourism accommodation, travel agencies/tour operators and air transport.

The EU tourism contributes by 22 % to the employment in the services sectors. When economic crisis started in 2008, the EU tourism sector has not been affected, on the contrary, the average annual growth rate in accommodation was 0.9 % in the following years

In the EU tourism there are employed 58% women, of which 60 % work in accommodation and 64 % in travel agencies/tour operators. About 40 % women are full time employed.

In the EU, about 13 % of workers employed in tourism belong to the 15-24 years age category, and in the accommodation sector the young people employed represent 15 % of the tourism employment.

In the EU, about 20 % of the employees in tourism have a low education level and in the accommodation sector it is a higher weight, 25 %.

In the EU, jobs are less stable than in the other branches of the economy, but the seasonality in tourists' flows only partially is reflected in tourism employment, and the regions with the high tourist activity have a lower unemployment rate compared to the national average rate [13].

The efficiency of work in a tourism company depends mainly of human resources' features in terms of quality, education and competence, motivation, wage, work management, and work cost [5].

The quality of tourism services depends not only by the technical endowment in accommodation, transportation etc, the amount and quality of food, and the number of employed people in HRD, but also of the specific qualities, capabilities, skills and talent of the employees: kindness, receptivity, correct attitude, communication skills, thoughtfulness etc in the contact with clients. For this reason, the strategy in tourism employment must be focused on personnel recruitment, training, motivation, wage, and work conditions [12].

For the development of tourism, good quality jobs are crucial as affirmed by International Labour Organization, ILO, 2010 [6].

Tourism is an economic activity which could contribute to the reduction of unemployment in the world, as it has done so far, but the quality of its employees is the driver of its development.

In this context, the paper aimed to analyze the status of workforce in Romania's tourism pointing out the dynamics of the occupied population in tourism industry, its share in the occupied population in the national economy, its regional dispersion in the territory, its structure by professional status, age group and education level, its relationship with the number of units and places for tourists' accommodation in the period 2007-2015.

MATERIALS AND METHODS

The research claimed the collection of the empirical data from the National Institute of Statistics Data base for the period 2007-2015.
The main indicators taken into consideration have been the following ones: the dynamics of the occupied population in the national economy, the dynamics of the occupied population in tourism industry (Hotels and Restaurants), the share of the occupied population in tourism in the total occupied population in the national economy, the distribution of the occupied population in the national economy by micro-region, the distribution of the occupied population in tourism by micro-region, the structure of the occupied population in the national economy by professional status, the structure of the occupied population in tourism by professional status, the structure of the occupied population in the national economy by age group, the structure of the occupied population in tourism by age group, the number of units for tourists' accommodation, the correlation between the occupied population in tourism and the number of units with touristic accommodation function, the regression between the occupied persons in tourism depending on the number of the units for tourists' accommodation, the number of places (beds) in units for tourists' accommodation, the correlation between the occupied population in tourism and the number of places in units with touristic accommodation function, the regression between the occupied persons in tourism depending on the number of places in units for tourists' accommodation.
The methods used in this research have been the following ones:
-***Index method,*** using the index with fixed basis I_{FB}(%), according to the formula: $I_{FB}= X_n/X_0*100$;
-***Descriptive statistics*** regarding**:** mean, standard error, median, sample variance, kurtosis, skewness, minimum and maximum value;
-***Variation Coefficient***, $V_{\%}$, using the formula: $V_{\%} = \frac{S}{\overline{X}} * 100$
-***Contribution of tourism to the occupied population in the economy,*** according to the formula: $OP_{Ti}(\%)= OP_{Ti}/OP_{NEi}*100$, where OP_{Ti}= occupied population in tourism in the year i, OP_{NEi} = occupied population in the national economy, and i= 2007, 2008, and ...2015;
-***The share of the occupied population in tourism in the occupied population in the national economy by micro-region***, according to the formula: $OP_{Tj}(\%)= OP_{Tj}/OP_{NEj}*100$, where OP_{Tj}= occupied population in tourism in the micro-region i, OP_{NEi} = occupied population in the national economy, and i=1,2...8 micro-regions.
-***The Pearson correlation coefficient*** based on the formula:

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[\,n\Sigma x^2 - (\Sigma x)^2\,]\,[\,n\Sigma y^2 - (\Sigma y)^2\,]}}$$

The regression function based on the formula: y = ax+b where y = the dependent variable and x= the independent variable, a and b = the regression parameters;
ANOVA, including df, SS, MS, F and significance F, for regression, and also the values for X variable 1 and intercept and their standard error, T stat, P-value, for lower and upper 95%.
The Herfindhal-Hirschman Index was calculated according to the formula: H-H= $\sum_{i=1}^{n} g_i^2$ where n is the number of micro-regions of development, in Romania i=1,...8, and g_i^2 is the square of the share of each micro region in the total value of the analyzed indicator
The Gini-Struck coefficient was determined using the formula: GS= $\sqrt{\frac{n\sum_{i=1}^{n} g_i^2 - 1}{n-1}}$

RESULTS AND DISCUSSIONS

The occupied population in the national economy accounted for 8,725.9 thousand persons in 2007 and registered a slight increase of 0.24 % in 2008. The beginning of

economic crisis in 2008 has deeply affected employment, so that the occupied population in the national economy declined year by year reaching the lowest level in 2011, 8,365.5 thousand persons, by 4.14 % less than in 2007.

Since 2012, the situation has changed so that the number of persons involved in economic activities started to recover, but the peak was recorded only in 2012, accounting for 8,569.6 thousand persons, but then, in the next years, the number of persons occupied in the economy declined reaching the lowest level more exactly 8,340.6 thousand persons in the analyzed period, 2007-2015.(Fig.1)

The descending trend in the occupied population in the national economy was the result of many causes. Among them, the most important ones were: the economic crisis with a negative impact on employment, the lack of jobs in the economy, mainly for young people, the decline of the number of young people graduating high schools and universities.

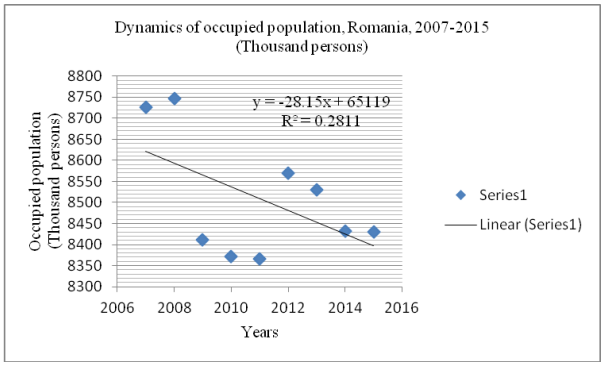

Fig.1.Dynamics of occupied population, Romania, 2007-2015 (Thousand persons)
Source: Own design based on NIS Data base, 2016 [9].

This structure was confirmed by the growth/decline indices presented in Table 1, the 2007 level being equal to 100.

Table 1. Fixed basis indices for the occupied population in the national economy, Romania, 2007-2015 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fixed basis indices	100	100.2	96.3	95.9	95.8	98.2	97.7	96.9	95.6

Source: Own calculation based on NIS Data base, 2016 [9].

Descriptive statistics for the occupied population in the national economy is presented in Table 2.

Table 2. Descriptive statistics for occupied population at national level, Romania, 2007-2015

Descriptive statistics	**Values**
Mean	8509,11111
Standard error	48.47198631
Median	8431.7
Standard deviation	145.4159589
Sample variance	21145.80111
Kurtosis	-0.754287485
Skewness	0.854617641
Minimum	8365.5
Maximum	8747
Confidence level (95%)	111.7766008
Coefficient of variation (%)	1.70

Source: Own calculations based on NIS Database, 2016 [9]

The coefficient of variation of 1.70 % shows a low variation of this indicator in the analyzed period.

The territorial dispersion of the occupied population in the economy. Analyzing the situation among the 8 micro-regions of development, it is easily to notice that in the studied period some changes as mentioned below.

In 2007, the highest number of the population was occupied in the NE micro-region representing 14.4 %. On the 2nd position came Bucharest-Ilfov micro-region with 13.9 %, being followed by South Muntenia micro-region with 13.8 % and NW region with 13.5 %.

In 2015, Bucharest-Ilfov region concentrated 15.2 5 of the population occupied in the economy, being followed by NW micro-region with 14.1 %, NE micro-region with 13.8 % and S Muntenia with 13.4 %. SW Oltenia and West micro-regions are on the last positions with the lowest shares in the occupied population in the economic activities.

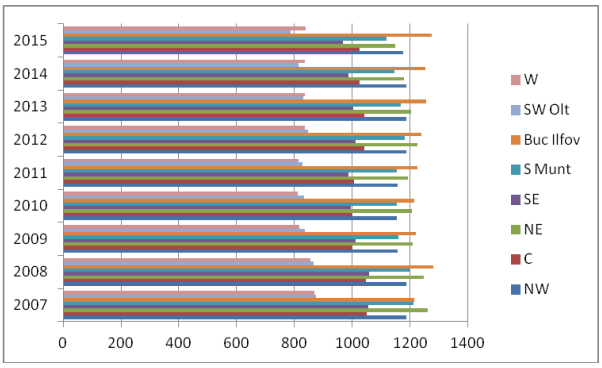

Fig. 2. Occupied population by micro-regions of development in Romania, 2007-2015
Source: Own design based on NIS Data base, 2016 [9].

The HHI and GS indices for the population occupied in the national economy. HHI was equal to 0.1262 in 2007 and 0.1275 in 2015, reflecting a slight increase of 1.03 %. However, the HHI has a low value varying between 0.10 and 0.15 reflecting a lack of concentration or, in other words, a relatively uniform distribution of the occupied population among micro-regions.
The GS also registered low values, 0.037 in 2007 and 0.053 in 2015, reflecting an relatively uniform dispersion in the territory regarding the population occupied in the national economy (Table 3).

Table 3. HHI and GS indices for the population employed in the national economy, Romania, 2007 and 2015

Micro-region	2007		2015	
	G_I	G_I^2	G_I	G_I^2
NW	0.135	0.0182	0.141	0.0198
C	0.120	0.0144	0.123	0.0151
NE	0.144	0.1207	0.138	0.0190
SE	0.121	0.0146	0.116	0.0134
S Muntenia	0.138	0.0190	0.134	0.0179
Bucharest-Ilfov	0.139	0.0193	0.152	0.0231
SW Oltenia	0.103	0.0100	0.094	0.0088
W	0.100	0.0100	0.102	0.0104
HHI		**=0.1262**		**=0.1275**
GS		**= 0.037**		**=0.053**

Source: Own calculations based on NIS Database, 2016, [9].

The occupied population in tourism increased from 155.5 thousand persons in 2007 to 174.2 thousand persons in 2015, reflecting a +12.02 % growth rate. The economic crisis affected the work force working in tourism so that in 2009, it was registered a decline of 22.6 % compared to 2008 and by 19.5 % less compared to 2007. But starting from 2010, the tourism started to recover and it was noticed a growth of 6.22 % in 2010 compared to 2009, and in the coming years, the occupied population in this sector has continuously grown till 2015, a positive aspect reflecting an increased demand in tourism labor grace to the growth in the tourists' number.(Fig.3).

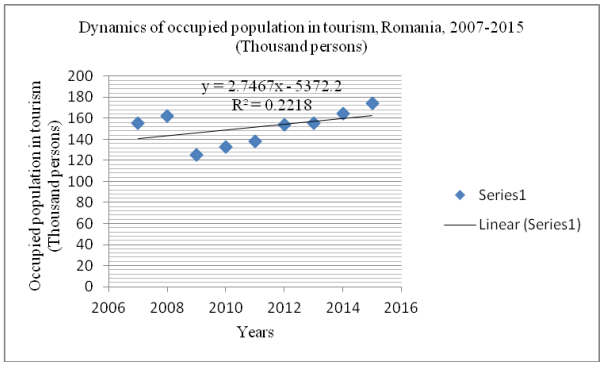

Fig. 3. Evolution of occupied population in Tourism, Romania, 2007-2015 [9].
Source: Own design based on NIS data base, 2016

The descriptive statistics for the occupied population in tourism is presented in Table 4. The coefficient of variation of 10.55 % shows a low variation of this indicator in the analyzed period.

Table 4. Descriptive statistics for occupied population in tourism, Romania, 2007-2015

Descriptive statistics	**Values**
Mean	151.3555556
Standard error	5.324318191
Median	155.5
Standard deviation	15.97295457
Sample variance	255.1352778
Kurtosis	-0.787526082
Skewness	-0.421994981
Minimum	125.3
Maximum	174.2
Confidence level (95%)	12.27789976
Coefficient of variation (%)	10.55

Source: Own calculations based on NIS Database, 2016 [9]

This structure was confirmed by the growth/decline indices presented in Table 5, the 2007 level being equal to 100. It showed the recover starting from 2010 till the end of the analyzed period.

Table 5. Fixed basis indices for the occupied population in the national economy, Romania, 2007-2015 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fixed basis indices	100	104.1	80.5	85.5	88.6	99.1	100.1	105.7	112.0

Source: Own calculation based on NIS Data base, 2016 [9].

The contribution of tourism to the occupied population in the national economy is small but with an ascending trend in the analyzed period, after a few inflexions in 2009, after the beginning of the economic crisis and then in 2011. Since 2012, a continuous growth characterized this indicator. (Table 6.)

Table 6. The contribution of tourism to the occupied population in the national economy, Romania, 2007-2015 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tourism contribution to the occupied population in the national economy (%)	1.78	1.84	1.49	2.09	1.65	1.80	1.83	1.95	2.09

Source: Own calculation based on NIS Data base, 2016

The dispersion of the occupied population by micro-region reflects that the highest number of persons are concentrated in Bucharest-Ilfov micro-region 18.65 % in 2007 and 21.19 % in 2015. On the 2nd position is the Central region with 16.07 % of the occupied population both in 2007 and in 2015, reflecting a constant situation. On the 3rd position it is placed SE micro region with 12.74 % in 2007 and, respectively 12.45 % in 2015.

The lowest shares were recorded in SW Oltenia and West micro-regions. Also, the share of S Muntenia region declined from 11.71 % in 2007 to 8.84 % in 2015, while the share of NV micro-region increased from 11.89 % in 2007 to 13.60 % in 2015 (Fig.4).

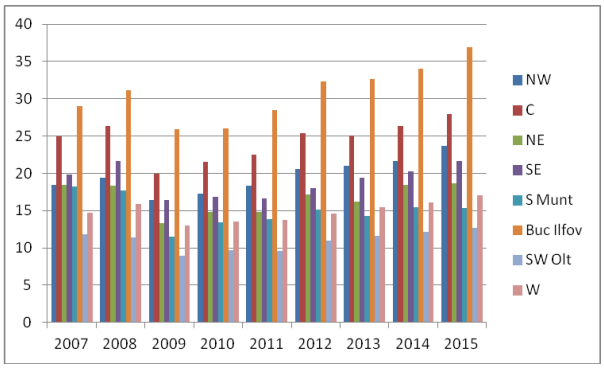

Fig.4.Occupied population in tourism by micro-region of development, Romania, 2007-2015 [9].
Source: Own design based on NIS Database, 2016

The share of the population occupied in tourism in the occupied population in the national economy in presented in Table 7.

Table 7. The share of the population occupied in tourism in the occupied population in the national economy by micro-region, Romania, 2007-2015 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
NW	1.5	1.6	1.4	1.5	1.6	1.7	1.8	1.8	2.0
C	2.5	2.5	2.0	2.1	2.2	2.4	2.4	2.6	2.7
NE	1.4	1.5	1.1	1.2	1.2	1.4	1.4	1.6	1.6
SE	1.9	2.0	1.6	1.7	1.7	1.8	1.9	2.0	2.2
S Muntenia	1.5	1.5	1.0	1.2	1.2	1.3	1.2	1.3	1.4
Bucharest-Ilfov	2.4	2.4	2.1	2.1	2.3	2.6	2.6	2.7	2.9
SW Oltenia	1.3	1.3	1.0	1.2	1.2	1.3	1.4	1.5	1.6
W	1.7	1.9	1.6	1.7	1.7	1.7	1.9	1.9	2.0

Source: Own calculations based on NIS Data base, 2016 [9].

The data reflect that in 2009 it was recorded a decline of the share of population occupied in tourism in the total population occupied in the national economy in all the micro-regions of Romania. Since 2010, it was noticed a slight recover in 7 micro-regions, except Bucharest Ilfov, where the share remained at 2.1 % like in 2009. In 2011, It was recorded an increase

of the share of population occupied in tourism only in NW, Central region, and Bucharest Ilfov, and in the other micro-regions, this share remained constant at the level of 2010. Since 2012, a number of 7 the micro-regions registered a higher share, except the West micro-region, but the last recorded a slight recover in the coming years.

However, the highest shares were noticed in the year 2008 for almost all the micro-regions.

The HHI and GS indices for the population occupied in tourism. HHI has a low value 0.1322 in 2007 and a little bit higher 0.1388 in 2015 (+4.99%), reflecting that we may affirm that there is a relatively uniform distribution of the occupied population in tourism activities in the territory of Romania by micro-region.

The GS index also recorded low values, accounting for 0.0968 in 2007 and 0.1255 in 2015, confirming the uniform dispersion of the population dealing with tourism in micro-region (Table 8).

Table 8. HHI and GS indices for the population employed in tourism, Romania, 2007 and 2015

Micro-region	2007		2015	
	G_I	G_I^2	G_I	G_I^2
NW	0.1189	0.0141	0.1360	0.0184
C	0.1607	0.0258	0.1607	0.0258
NE	0.1189	0.0141	0.1073	0.0115
SE	0.1274	0.0162	0.1245	0.0155
S Muntenia	0.1171	0.0137	0.0884	0.0078
Bucharest-Ilfov	0.1875	0.0347	0.2119	0.0449
SW Oltenia	0.0759	0.0057	0.0730	0.0053
W	0.0946	0.0089	0.0982	0.0096
HHI		**=0.1332**		**=0.1388**
GS		**=0.0968**		**=0.1255**

Source: Own calculations based on NIS Database, 2016, [9].

The occupied population at national level and in tourism by professional status. In 2015, in tourism it was found a higher share of employees, 90.8 %, compared to 60.4 % in the national economy, a higher share of the employers, 3.8 % compared to 1.7 % in the economy, a lower share for self employed persons 5.4 % compared to 9 % in the national economy, and there were no contributing family workers. This reflects that tourism absorb much better employed population and has a more balanced structure regarding the professional status than in the national economy (Table 9).

Table 9. Occupied population at national level and in tourism by professional status, Romania, 2007-2015

Professional status	Occupied population at national level	Occupied in tourism	Share of tourism (%)
Year 2007			
Total (Thousand persons)	9,353	156	1.66
Employees (%)	66.2	82.7	1.97
Employers (%)	1.5	5.8	8.10
Self employed (%)	19.7	9.0	1.39
Contributing family workers (%)	12.6	2.5	0.23
YEAR 2015			
Total (Thousand persons)	8,340.6	174.2	2.08
Employees (%)	60.4	90.8	3.14
Employers (%)	1.7	3.8	4.55
Self employed (%)	25.3	5.4	0.43
Contributing family workers (%)	12.4	-	-

Source: Own calculations based on NIS Data base, 2016 [9].

Taking into consideration the results found by Snak et al. (2003) [12], who found in 1999, that the share of the occupied population in tourism (hotels and restaurants) was 1.09 5 and by professional status: 93.2 5 employees, 2.6 employers, 4.2 % self employed, we may say that the population occupied in tourism declined by 43.9 % from 186 thousand persons in 1990 to 123.2 thousand persons in 1999.

In 2015, the occupied population in tourism was 174.1 thousand persons by 41.46 % higher than in 1999, but still lower by 6.5 % compared to 1990.

The population occupied in the national economy and in tourism by age group. Tourism has a good absorption of young

people, offering jobs in hotels and restaurants and in the connected areas than in the national economy.

In 2015, of 174.2 thousand persons employed in tourism, 13.5 % were young people of 15-24 years old compared to 17.9 % in the national economy. Also, 34.5 % of the employed people in tourism were of 25-34 age group, more than 32.5 % in the national economy.

Also, in tourism, the occupied population older than 35 years has lower shares compared to the national economy, more exactly: 27.1 % for the 35-44 age group, 17.8 % for the 45-54 age group, and 7.1 % for the 55-64 age group and zero % for over 65 years (Table 10).

Table 10. Occupied population at national level and in tourism by age group, Romania, 2007-2015

Specification	2007		2015	
	OP_{NE}	OP_T	OP_{NE}	OP_T
Total (Thousand persons)	9,353	137	8,340.6	174.2
Of which by age group (%)				
15-24	8.3	17.9	7.0	13.5
25-34	27.1	32.1	26.2	34.5
35-44	26.4	25.2	30.6	27.1
45-54	22.4	20.0	19.9	17.8
55-64	10.3	4.5	12.2	7.1
OVER 65	5.5	0.3	4.1	-

Source: Own calculations based on NIS Data base, 2016 [9].

Snak et al., (2003) [12] found that in 1997, in tourism, 20 % of the occupied population belonged to the 15-24 age group and 31.6 % belonged to the 25-34 age group. In 2015, As mentioned above, in tourism, only 13 % represents the youngest category, 15-24 years old, but 34.5 % the category 25-34 years old.

The correlation between occupied population in tourism and number of units for tourists' accommodation was r= 0.588, reflecting a positive and good relationship between this two indicators. It is normal as increasing the number of units with tourist accommodation function to correspondingly increase the number of occupied population in tourism. However, the R squared value, R^2 = 0.346 reflects that only 34.60 % of the Y variation (labour force) depends on X variation (number of units for tourists accommodation), the difference in variation being determined by other factors.

The regression statistics of the occupied population in tourism depending on the number of units for tourists' accommodation is presented in Table 11.

Table 11. Regression statistics of the occupied population in tourism depending on the number of units for tourists' accommodation

Regression statistics	Values
Multiple R	0.588380471
R square	0.346191579
Adjusted R square	0.252790376
Standard error	13807.22764
Observations	9

Source: Own calculations based on NIS Data base, 2016 [9].

The regression function of the occupied persons in tourism depending on the number of units for tourists' accommodation has the following aspect: Y = 13.167 X +78738, as presented in Fig.5.

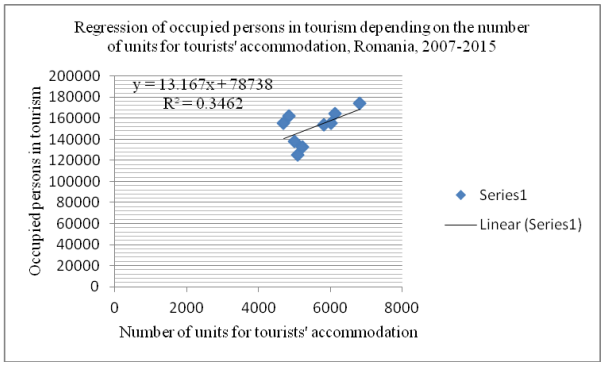

Fig.5. Regression of occupied persons in tourism depending on the number of units for tourists' accommodation, Romania , 2007-2015

Source: Own design based on NIS Data base, 2016 [9].

The ANOVA regarding the relationship between the occupied population in tourism and the number of units for tourists' accommodation is presented in Table 12.

Table 12. ANOVA reflecting the relationship between the occupied population in tourism and the number of units for tourists' accommodation

Specification	DF	SS	MS	F	*Significance F*	
Regression	1	706605476.9	7.07E+08	3.706500211	0.095591525	
Residual	7	1334476745	1.91E+08			
Total	8	2041082222				
Regression parameters	*Coefficients*	*Standard error*	*T Stat*	*P-Value*	*Lower 95%*	*Upper 95%*
Intercept	78738.49489	37998.44833	2.07215	0.07697202	-11113.55754	168590.5473
X Variable 1	13.16719142	6.839291818	1.925227	0.095591525	-3.005163875	29.33954671

Source: Own calculations based on NIS Database, 2016 [9].

The correlation between occupied population in tourism and number of places (beds) for tourists' accommodation registered the value r = 0.355, reflecting that between these two indicators it is a weak and positive relationship. This affirmation is supported by the value of R squared, R^2 = 0.1233 reflecting that only 12.33 % of the Y variation (labour force) depends on X variation (number of places in units for tourists accommodation).(Table 13).

The regression statistics of the occupied population in tourism depending on the number of places (beds) units for tourists' accommodation is presented in Table 13.

Table 13. Regression statistics of the occupied population in tourism depending on the number of places (beds) units for tourists' accommodation

Regression statistics	Values
Multiple R	0.3551140316
R square	0.123305842
Adjusted R square	-0.001936181
Standard error	15988.41036
Observations	9

Source: Own calculations based on NIS Data base, 2016 [9].

The regression function for the occupied persons in tourism depending on the number of places (beds) in units for tourists' accommodation has the following aspect: Y = 0.3701 X +39575, as presented in Fig.6.

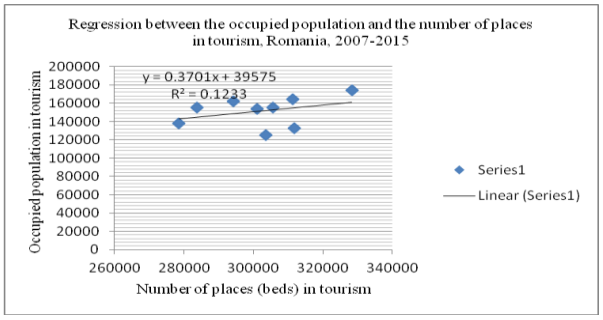

Fig. 6. Regression between the occupied population and the number of places in tourism, Romania, 2007-2015

Source: Own design based on NIS Data base, 2016 [9].

The ANOVA reflecting the relationship between the occupied population in tourism and the number of places for tourists' accommodation is presented in Table 14.

Table 14. ANOVA reflecting the relationship between the occupied population in tourism and the number of places for tourists' accommodation

Specification	DF	SS	MS	F	*Significance F*	
Regression	1	251677361.7	251677361.7	0.984540487	0.354132674	
Residual	7	1789404861	255629265.8			
Total	8	2041082222				
Regression parameters	*Coefficients*	*Standard error*	*T Stat*	*P-Value*	*Lower 95%*	*Upper 95%*
Intercept	39574.78922	112780.9461	0.350899603	0.735987017	-227109.771	306259.3494
X Variable 1	0.370132945	0.373027589	0.992240136	0.354132674	-0.51193714	1.252203028

Source: Own calculations based on NIS Database, 2016 [9].

CONCLUSIONS

The population occupied in tourism increased by 12.02 % from 155.5 thousand persons in 2007 to 174.2 thousand persons in 2015.

The contribution of tourism to the population occupied in the national economy increased from 1.78 % to 2.07 % in the analyzed period.

The micro-regions where the share of population occupied with tourism activities are Bucharest-Ilfov (21.19%), Central micro-region (16.07%), SE micro-region (12.45%). The micro regions with the lowest employment in tourism are S West Oltenia and West.

HHI and GS indices proved a relatively uniform dispersion of the occupied population in tourism in the territory.

By professional status, the people employed in tourism have higher shares than in the national economy: 90.8 % employees, 3.8 % employers and 5.4 % self employed people.

By age group, tourism employs more younger persons than in the national economy. About 13.5 % of the employed persons in tourism belong to the 15-24 years category and 34.5 % belong to the 25-34 years category.

The correlation between the number of people employed in tourism and the number of units for tourists' accommodation is r=0.588, reflecting that if the number of units will grow, more people will be employed in tourism activities.

The correlation between the number of persons occupied in tourism and the number of places in units with touristic accommodation function is a weak and positive one, r =0.355.

As a final conclusion, this research proved that in the period 2007-2015 tourism is a dynamic branch of Romania's economy with a high potential to create jobs, employ young people and also women.

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THE CORRELATION BETWEEN TOURISM ACCOMMODATION CAPACITY AND TOURIST INFLOW BY MICRO REGION OF DEVELOPMENT IN ROMANIA

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Abstract

The paper aimed to analyze the relationship between the tourism accommodation capacity in terms of the number of units, and the number of tourist flows in terms of arrivals in Romania and by its 8 micro regions in the period 2007-2015. In this purpose, the data provided by the National Institute of Statistics were processed using the indices with fixed and variable basis, comparison method, statistical parameters, Pearson coefficient of correlation, and linear regression function. In Romania, the number of units with accommodation function increased by 65.3 % from 4,694 units in the year 2007 to 6,821 units in the year 2015, and the number of tourists' arrivals increased by 63 % from 6,091.9 thousands in 2007 to 9,930.4 thousands in 2015. While the highest number of accommodation units is in the Central, SE and NE Romania, the highest number of tourists' arrivals was recorded in the Central Romania, Bucharest Ilfov and SE region. Even thou at the national level, the average number of tourists' arrivals per unit for tourists' accommodation was 1,456 arrivals/unit, by 12.18 % higher in 2015 compared to 2007, there is still a gap between the territorial dispersion of the accommodation capacity and the tourists flow. The high correlation coefficient r = 0.909 and the high determination degree 82.76 % at the national level, reflect that tourists flow has a major influence on the tourism accommodation capacity. Using the linear regression functions, there were estimates the units for tourists' accommodation depending on the tourists' arrivals for the period 2016-2020. In conclusion, the development of tourism accommodation capacity must be a priority in order to assure a better correlation with the tourist arrivals in the territory of Romania.

Key words**:** *accommodation units, tourists' arrivals, correlation, regression, forecast, micro regions, Romania*

INTRODUCTION

The development of tourism is determined, among other factors, by accommodation capacity and service quality.
The creation of units with accommodation function in various regions is a way to better use the local material and human resources, to create jobs and diversify services, to increase income and living standard of the local population and communities.
Among various tourism indicators there are interconnections. The link between the accommodation capacity and the number of tourists in terms of arrivals and overnight stays must be not ignored, on the contrary, it could be successfully used in tourism planning and development programmes in order to grow turnover in travel and tourism industry [6].
As a component of tourism infrastructure, the number of units with accommodation function must be adapted to the tourism market demand in order to generate direct tourist flows and strengthen tourism industry in terms of investments, vacancies, employment, wage, receipts and contribution to GDP [8].
Tourist flows are close related to the dynamics of the number of tourists arrivals and the number of nights spent in a hotel or any other unit with tourist reception, having a deep impact on the economic efficiency [1].
The higher the number of units for tourists' accommodation, the higher the number of tourists arrivals [2].
In Romania, the number of tourist accommodation structure increased in general since the year 2000, and maily after Romania's entry into the EU. At the same

time, the number of tourists' arrivals has also increased. Most of the people visiting Romania come from Europe (more than 90 %) and more than 60 % come from the EU. Most visitors are from the neighboring countries: Hungary, Rep. of Moldova, Bulgaria, Ukraine, Germany, Italy, Turkey, Yugoslavia and Poland [3].

In this context, the purpose of the paper was to identify and characterize the relationship between the number of tourists' arrivals, as an independent variable, and the number of units for tourists' accommodation, as a dependent variable. The two indicators were studied in dynamics at the national level and by the eight micro regions of development of Romania. Also, there were studied: their dispersion by micro region, their correlation and regression, and also there were forecasted the estimates for the both indicators for the period 2016-2020.

MATERIALS AND METHODS

In order to set up this research paper, the following indicators were taken into consideration: (I) the number of units for tourists' accommodation in Romania by the 8 micro regions of development (NW, Central, NE, SE, Bucharest Ilfov, S Muntenia, SW Oltenia and W, and (ii) the number of tourists' arrivals in Romania by the 8 micro regions of development (NW, Central, NE, SE, Bucharest Ilfov, S Muntenia, SW Oltenia and W.

The empirical data were collected from the Data base of the National Institute of Statistics for the period 2007-2015.

The following aspects were approached in this study: the dynamics of number of units for tourists' accommodation in Romania by the 8 micro regions of development, the indices reflecting the growth rate of the number of units for tourists' accommodation, the description statistics for number of units for tourists' accommodation in Romania by the 8 micro regions: mean, standard error of mean, median, standard deviation, sample variance, kurtosis, skewness, minimum value, maximum value, confidence level and coefficient of variation, the dispersion by micro region of the number of units for tourists' accommodation, the dynamics of number tourists' arrivals in Romania by the 8 micro regions of development, the indices reflecting the growth rate of the number of the dynamics of number of units for tourists' accommodation in Romania by the 8 micro regions of development, the indices reflecting the growth rate of the number of tourists' arrivals, the description statistics for number of tourists' arrivals in Romania by the 8 micro regions: mean, standard error of mean, median, standard deviation, sample variance, kurtosis, skewness, minimum value, maximum value, confidence level and coefficient of variation, the dispersion by micro region of the number of tourists' arrivals, the average number of tourists' arrivals per unit for tourists' accommodation, the correlation between the tourists' arrivals and the number of units for tourists' accommodation, the determination degree of the number of units for tourists' accommodation by tourists' arrivals, the linear regression function for the number of units for tourists' accommodation, the comparison between the average growth rate for the number of tourists' arrivals and the average growth rate for the number of units for tourists' accommodation, and the forecast of the number of units for tourists' accommodation depending on the tourists' arrivals in the period 2016-2020.

The data were processed using the following methods: indices with fixed and variable basis, growth rate, descriptive statistics, Pearson correlation, linear regression function $Y = ax + b$, using Excel facilities.

The results were tabled and illustrated in graphics and also interpreted.

RESULTS AND DISCUSSIONS

Evolution of the number of units for tourists' accommodation. The number of units with accommodation function in Romania increased by 65.3 % from 4,694 units in the year 2007 to 6,821 units in the year 2015. However, after a continuous growth from 4,694 units in 2007 to the peak of 5,222 units in 2010, it the year 2011 it was

recorded an important decline to 5,003 units (-4.2 %). But, starting from 2012, the number of units recovered, accounting for 5,821 in that year. Since 2012, it has continuously increased because of the demand growth in close relationship with the number of tourists (Fig.1).

The indices reflecting the growth rate of the number of units for tourists' accommodation were calculated and their results are shown in Table 1.

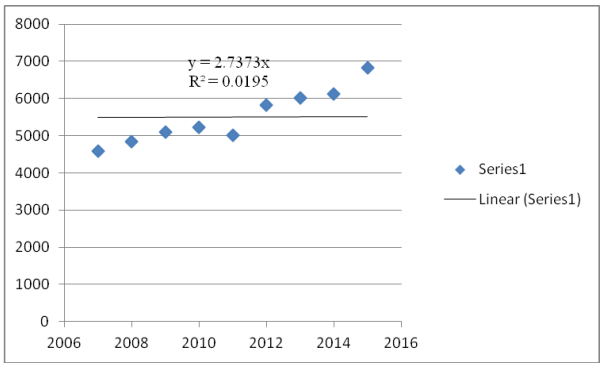

Fig.1. Units for tourists' accommodation in Romania, 2007-2015

Source: Own design based on NIS Database, 2016 [4].

Table 1. The growth rate for the number of units with accommodation function, Romania, 2007-2015 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Growth rate (%)	100	103.1	108.5	111.2	106.5	124.0	128.0	130.5	145.3

Source: Own calculation based on NIS Database, 2016, [4].

The description statistics regarding: mean, standard error of mean, median, standard deviation, sample variance, kurtosis, skewness, minimum value, maximum value, confidence level and coefficient of variation is presented in Table 2.

Table 2. Descriptive statistics for units for tourists' accommodation in Romania by micro-region, 2007-2015

	Romania	NW	C	NE	SE	Bucharest Ilfov	S Muntenia	SW Oltenia	W
Mean	5503.88	664.22	1454.33	624.22	1172.88	164.66	550.22	358.66	525.77
St. Error	242.91	22.64	108.27	43.43	44.25	3.41	36.63	26.38	31.76
Median	5222	658	1268	604	1111	164	533	377	513
St. Dev.	728.75	67.92	324.81	130.31	132.77	10.25	109.90	79.14	95.28
Sample variance	531085.11	4613.44	105506.5	16981.94	17630.36	105.25	12079.94	6263.75	9078.44
Kurtosis	-0.568	-0.293	0.429	-1.221	-0.950	-0.786	-1.012	-2.025	-1.358
Skewness	0.593	-0.129	1.112	0.165	0.228	0.253	0.541	-0.231	-0.259
Minimum	4594	554	1188	459	974	151	426	255	389
Maximum	6821	771	2107	830	1385	182	740	448	652
Confidence level	560.17	52.20	249.67	100.16	102.06	7.88	84.48	60.83	73.23
Coefficient of variation (%)	13.2	10.2	22.3	20.8	11.3	6.2	19.9	22.0	18.1

Source: Own calculation based on NIS Database, 2016, [4].

The coefficient of variation accounted for 13.2 % at the national level, reflecting that this variable is relatively homogenous and the mean is relatively a representative one.

In case of the Center micro region, the coefficient of variation accounted for 22.3 %, the highest level among micro regions, and 6.2 %, the lowest coefficient of variation in case of Bucharest-Ilfov micro area.

Only Bucharest-Ilfov micro region registered this low of 6.2 % reflecting that this variable is a homogenous one and the average is a representative one.

The highest values of 22.3 % in the Central micro region, of 22 % in SW Oltenia micro region and 20.8 % in NE micro region reflects that the number of units for tourists' accommodation is a heterogenous variable, and the average is less representative.

The micro regions NW, SE, S Muntenia and W recorded a coefficient of variation ranging between 10 % and 20 %, respectively: 10.2 %, 11.3 %, 10.9 % and 18.1 %. This shows that the number of units with accommodation

function is a relative homogenous variable and the average is a relative representative one.

The number of units for tourists' accommodation by micro region recorded a large range of values in the territory of Romania (Fig.2.).

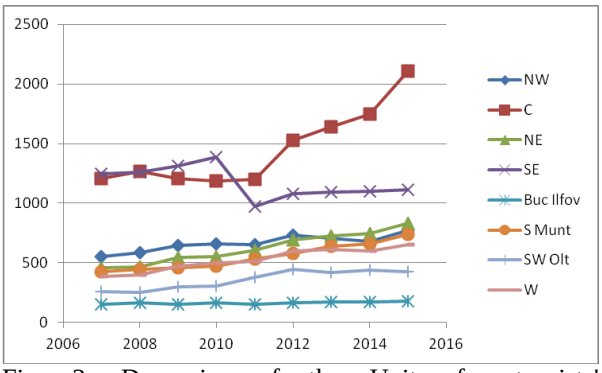

Fig. 2. Dynamics of the Units for tourists' accommodation in Romania by micro region, 2007-2015

Source: Own design based on NIS Database, 2016, [4].

In the NW micro region, it ranged between 554 units in 2007 and 771 units in 2015, the growth rate being 30.1 % for the whole analyzed period 2007-2015. In the Central micro region, it varied between 1,209 units in 2007 and 2,107 units in 2015 (+74.2 %). In the NE micro region, the number of units for tourists' accommodation increased by 80.8 % from 459 units in 2007 to 830 units in 2015. in the SE micro region, this indicator varied between 1,247 units in 2007 and 1,111 units in 2015 (+89%). In Bucharest-Ilfov area it varied between 151 units in 2007 and 182 units in 2015 (+20.5 %). In the S muntenia area, this indicator ranged between 426 units in 2007 and 740 units in 2015 (+73.7 %). In the SW Oltenia region, it varied between 259 units in 2007 and 428 units in 2015 (+65.2 %), and in the W region, it ranged between 389 units in 2007 and 652 units in 2015 (+67.6%) (Fig.2.).

The structure of the units for tourists' accommodation by micro-region has recorded the following time changes:

In 2007, the highest share of units was recorded in the SE micro region, 26.57 %, in the Central micro region 25.75 % and in the NW area 11.80 %. The lowest share was 3.2 % belonging to Bucharest-Ilfov micro region.

In 2015, the Central region of Romania was situated on the top position with the largest share 30.88 %, being followed by the SE micro region 16.28 %, and the NE micro region with 12.1 %. The lowest weight was recorded by Bucharest-Ilfov micro-region (Table 3).

Table 3. The dispersion of the number of units for tourists' accommodation by micro region, Romania, 2007-2015 (%)

	National level	NW	C	NE	SE	Bucharest Ilfov	S Muntenia	SW Oltenia	W
2007	100	11.8	25.8	0.9	26.5	3.2	9.1	5.5	8.3
2015	100	11.2	30.8	12.1	16.3	2.6	10.8	6.7	9.5

Source: Own calculation based on NIS Database, 2016, [4].

The number of tourists (foreigners plus Romanians) in Romania increased by 63 % from 6,091.9 thousands in 2007 to 9,930.4 thousands in 2015 (Fig.3.).

The number of tourists' arrivals recorded a decline in 2009 and mainly in 2010, accounting for 6,072.5 thousands tourists. This situation was created by the economic crisis which determined an increase in unemployment and affected the income per household.

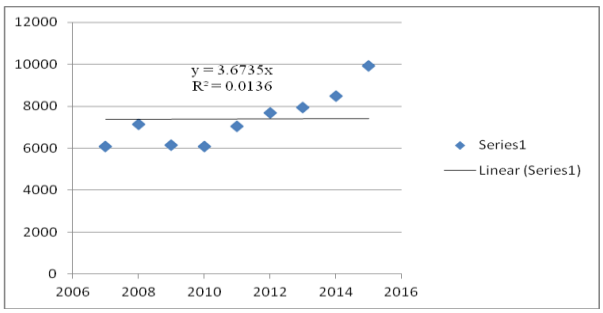

Fig.3.Tourists' arrivals in Romania, 2007-2015 (Thousands)

Source: Own design based on NIS Database, 2016, [4].

The growth rate for the number of tourists' arrivals in the analyzed period is presented in

Table 4. This also attests the decline of tourists' arrivals in the years 2009 and 2010, and the continuous increase starting since 2011.

Table 4. The growth rate for tourists' arrivals, Romania, 2007-2015 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Growth rate (%)	100	16.9	0.6	-0.1	15.4	26.1	30.3	38.9	63.0

Source: Own calculation based on NIS Database, 2016, [4].

The descriptive statistics for tourists' arrivals in Romania presents: mean, standard error of mean, median, standard deviation, sample variance, kurtosis, skewness, minimum value, maximum value, confidence level and coefficient of variation in Table 5.

The coefficient of variation varied between 27.3 5 in the Central micro region and 7.8 % in the SE micro region. The SE micro region is the only region where the coefficient of variation was below 10 % reflecting a uniform distribution of the number of tourists, and that the average is a representative one.

In case of NW, NE, S Muntenia, SW Oltenia and W micro regions, the coefficient of variation varied between 10 % and 20 %, reflecting that the variables were relatively homogenous and that the average is relatively representative.

In case of the Central and Bucharest-Ilfov micro regions, the coefficient of variation was higher than 20 % reflecting that the variables were relatively heterogenous and the average is less representative.

Table 5. Descriptive statistics for tourists arrivals in Romania by micro-region, 2007-2015

	Romania	NW	C	NE	SE	Bucharest Ilfov	S Muntenia	SW Oltenia	W
Mean	7386.12	877.44	1562.81	740.60	1203.44	1300.42	687.85	430.97	674.25
St. Error	428.38	42.82	140.85	30.98	31.30	100.12	29.06	20.10	31.58
Median	7124.9	889.7	1435.70	725.60	1178.1	1282.6	692.8	429.3	674.5
St. Dev.	1285.16	131.47	422.57	92.94	93.90	300.37	87.19	60.31	94.76
Sample variance	1651648.42	17286.07	178571.25	8538.32	8818.24	90226.74	7602.70	3637.91	8980.05
Kurtosis	0.501	1.071	-0.371	2.064	-0.279	-0.378	0.260	-0.324	2.242
Skewness	0.866	0.723	0.686	1.165	-0.026	0.734	0.485	-0.129	0.951
Minimum	6072.5	702.8	1072.70	620.9	1044	989.8	572.9	337.1	542.8
Maximum	9930.4	1140.6	2340.9	939.4	1347.9	1850.8	852.6	528.1	875.5
Confidence level	987.86	101.06	324.82	71.44	72.18	230.89	67.02	46.36	72.84
Coefficient of variation (%)	17.39	14.98	27.03	12.54	7.80	23/09	12.67	13.99	14.05

Source: Own calculation based on NIS Database, 2016, [4].

The number of tourists' arrivals by micro region recorded different values from a region to another depending on the purpose of the visit and mainly by the tourist attractions.

In the NW, this indicator varied between 889.7 thousand arrivals in 2007 and 1,140.6 thousands in 2015 (+28.2 %). In the Central micro region, it varied between 1,330.1 thousand arrivals in 2007 and 2,340.9 thousand arrivals in 2015 (+75.9%). In the NE micro region, the indicator ranged between 717.6 thousand arrivals in 2007 and 939.4 thousand arrivals in 2015 (+30.9 %). In the SE micro region, it varied between 1,231.1 thousand arrivals in 2007 and 1,347.9 thousand in 2015 (+9.48 %). In Bucharest-Ilfov area, the indicator ranged between 996.7 thousand arrivals in 2007 and 1,850.8 thousand tourist arrivals in 2015 (+85.6%). In the S Muntenia micro region, it varied between 729.2 thousand arrivals in 2007 and 852.6 thousand arrivals in 2015 (+16.9%). In the SW Oltenia micro region, the indicator varied between 403 thousand arrivals in 2007 and 528.1 arrivals in 2015 (+31 %). Finally, in the W micro region, the indicator ranged between 674.5 thousand arrivals in 2007 and 875.7 thousand arrivals in 2015 (+29.6%).

Therefore, the highest increase, +85.6 %, was noticed in Bucharest-Ilfov micro region, where the highest number of tourists' arrivals was recorded, 1,850.8 thousands in 2015, representing 18.6 % of the total number of 9,930.4 thousands arrivals (Fig.4).

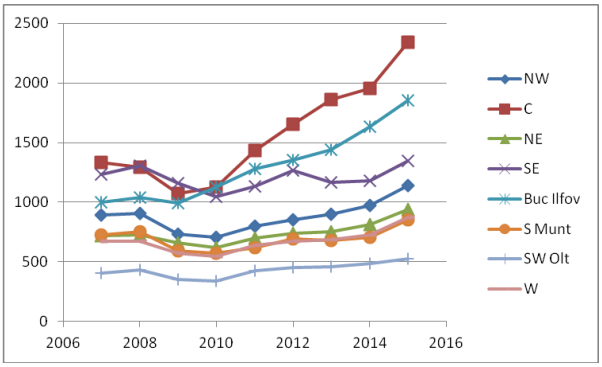

Fig. 4. Dynamics of Tourists' arrivals in Romania by micro-region in the period 2007-2015 (Thousands)
Source: Own design based on NIS Database, 2016, [4].

The average number of tourists' arrivals per unit for tourists' accommodation depends on the dynamics of the number of tourists and the number of units with accommodation function. At the national level it was recorded an increase by 12.1 % regarding the number of tourists per accommodation unit.

Also, an important growth was noticed in Bucharest-Ilfov micro region of 54 %, followed by the SE micro region with 22.87 % and the Central micro region with only 1 %, In fact, the highest number of tourists/unit of accommodation was recorded in 2015, more exactly 10,169 arrivals/unit in Bucharest-Ilfov area (Table 6).

Table 6.The average number of arrivals/unit for tourists' accommodation at the national level and by micro region, Romania, 2007-2015 (arrivals/unit)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Romania	1,297.8	1,472	1,203	1,162	1,405	1,320	1,322	1,381	1,456
NW	1,605	1,552	1,134	1,068	1,229	1,167	1,268	1,439	1,479
C	1,100	1,018	888.7	948.4	1,199	1,0984	1,132	1,119	1,111
NE	1,563	1,567	1,197	1,120	1,152	1,073	1,042	1,091	1,131
SE	987.2	1,040	882	753	1,165	1,170	1,070	1,070	1,213
Bucharest Ilfov	6,600	6,329	6,427	6,903	8,274	8,100	8,310	9,423	10,169
S Muntenia	1,711	1,670	1,293	1,213	1,156	1,192	1,064	1,076	1,152
SW Oltenia	1,556	1,683	1,187	1,105	1,132	1,014	1,092	1,112	1,234
W	1,733	1,692	1,213	1,092	1,247	1,124	1,119	1,216	1,343

Source: Own calculation based on NIS Database, 2016, [4].

The lowest number of arrivals per unit of accommodation was 753 registered in 2010 in the SE micro region.

Important decreases were recorded in NW (-8 %), NE (-27.7%), S Muntenia (-32.7%0, S W Oltenia (-20.7%), and W (-32.6 %).(Table 6).

The correlation between the tourists' arrivals and the number of units for tourists' accommodation. At the national level, the correlation coefficient between these two indicators was r = 0.909 reflecting a strong positive relationship. The coefficient of correlation varied between r = 0.253 in SE micro region and r = 0.966 in the Central micro region.

Also, a relative moderate relationship between these two indicators was found in NE (r = 0.754), SW Oltenia (r = 0.714), S Muntenia (r = 0.526) and W (r =0.547).

A weak positive relationship was found in NW (r = 0.416), SE (r = 0.253), and Bucharest Ilfov (r = 0.277).

Table 7. The correlation between arrivals and accommodation units by micro region, Romania, 2007-2015

	Romania	NW	C	NE	SE	Bucharest Ilfov	S Muntenia	SW Oltenia	W
Correlation coefficient (%)	0.909***	0.416	0.966***	0.754**	0.253	0.277	0.526	0.714**	0.547

Source: Own calculation based on NIS Database, 2016, [4].

Similar correlation, r = 0.8446 were found between the accommodation capacity and the number of foreign tourists' arrivals in the period 199802008 and R square= 0.7134, reflecting that 71.34 % of the variation in touristic accommodation capacity is determined by the number of tourists [5].

In another study, for the period 1991-2014, the correlation between the accommodation capacity and the number of arrivals was r = 0.767 [6].

Also, a r = 0.95 was found between foreign tourists arrivals and accommodation capacity in Romania's sea shore resorts at the Black Sea [7].

In Suceava County, in the period 2000-2006, the relationship between the existing accommodation capacity and the number of tourists' arrivals was concretized in r = 0.92 [8].

The determination degree of the number of units for tourists' accommodation by tourists' arrivals varied between 6.41 % in SE micro region and 93.41 % in the Central micro region. At the national level, it accounted for 82.76 %, reflecting that the number of tourists' arrivals is a major factor influencing the number of units for tourists' accommodation.

The results obtained by micro region were the following ones: in SE micro region it was founded 6.41 %, in NW 17.38 %, in S Muntenia 27.77 % and in W 30.01 %. These values reflect that the number of accommodation units was mainly determined by other factors than the number of tourists' arrivals (Table 8).

Table 8. The determination degree of the number of units for tourists accommodation (Y, dependent variable) by tourists' arrivals (X, the independent variable), Romania, 2007-2015 (%)

	Romania	NW	C	NE	SE	Bucharest Ilfov	S Muntenia	SW Oltenia	W
Determination degree (%)	82.76	17.38	93.41	56.93	6.41	77.17	27.77	50.98	30.01

Source: Own calculation based on NIS Database, 2016, [4].

The linear regression function for the number of units for tourists' accommodation (Y= dependent variable) depending on the tourists' arrivals (X= independent variable) is presented in Fig. 5-13 both at the national level and by each micro region.

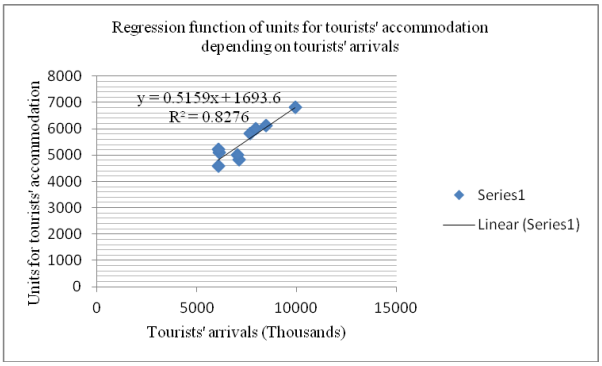

Fig.5. Regression function of units for tourists' accommodation depending on tourists' arrivals in Romania

Source: Own design based on NIS Database, 2016, [4].

At the national level, in this study it was found a regression function: y = 0.5159x + 1693.6 for the period 2007-2015. In another study, for the period 2000-2008, it was found a regression function y = 310.02 x +4164.4 between the number of arrivals and the accommodation capacity, and a coefficient of correlation r= 0.952 and R square equal to 0.9067, reflecting that 90.67 % of the variation in tourists' accommodation capacity is determined by the number of tourists' arrivals [9].

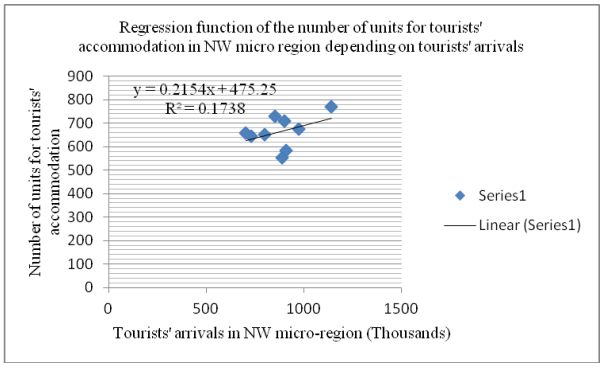

Fig.6. Regression function of the number of units for tourists' accommodation depending on tourists' arrivals in NW micro-region

Source: Own design based on NIS Database, 2016, [4].

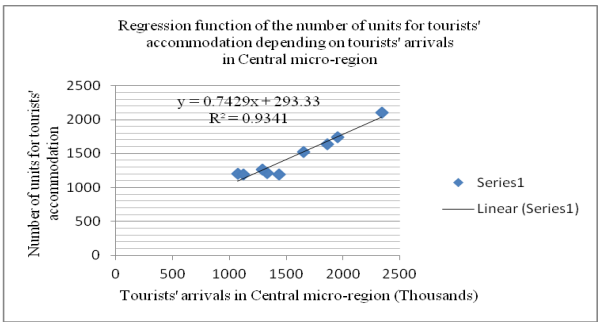

Fig.7. Regression function of the number of units for tourists' accommodation depending on tourists' arrivals in the Central micro-region
Source: Own design based on NIS Database, 2016, [4].

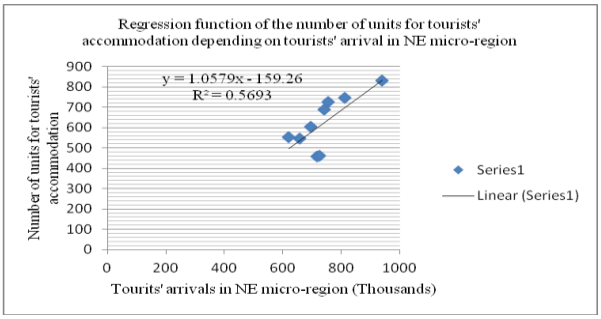

Fig.8. Regression function of the number of units for tourists' accommodation depending on tourists' arrivals in the NE micro-region
Source: Own design based on NIS Database, 2016, [4].

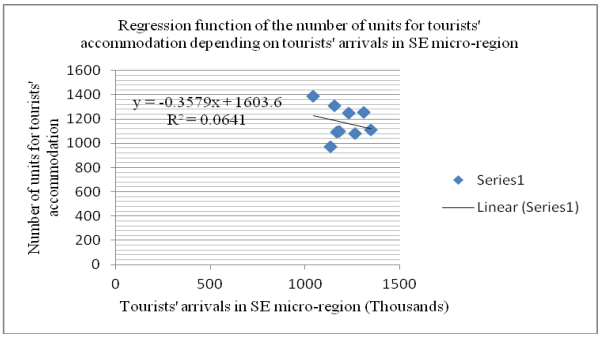

Fig.9. Regression function of the number of units for tourists' accommodation depending on tourists' arrivals in the SE micro-region
Source: Own design based on NIS Database, 2016, [4].

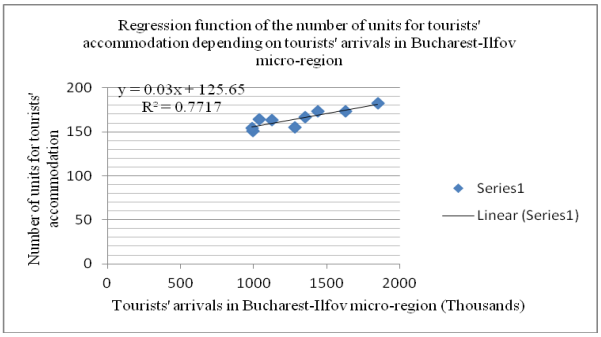

Fig.10. Regression function of the number of units for tourists' accommodation depending on tourists' arrivals in Bucharest-Ilfov micro-region
Source: Own design based on NIS Database, 2016, [4].

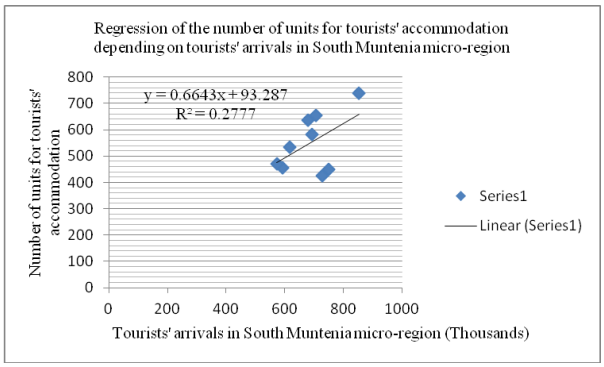

Fig.11. Regression function of the number of units for tourists' accommodation depending on tourists' arrivals in South Muntenia micro-region
Source: Own design based on NIS Database, 2016, [4].

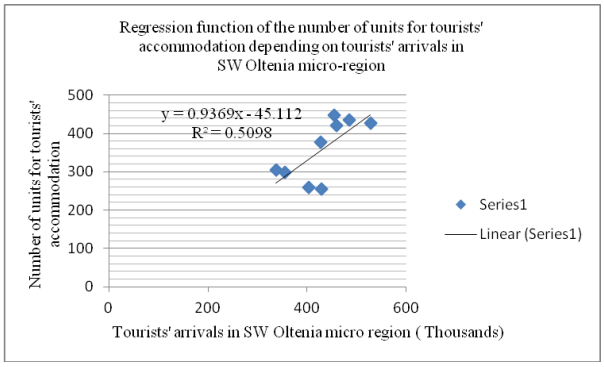

Fig.12. Regression function of the number of units for tourists' accommodation depending on tourists' arrivals in SW Oltenia Muntenia micro-region
Source: Own design based on NIS Database, 2016, [4].

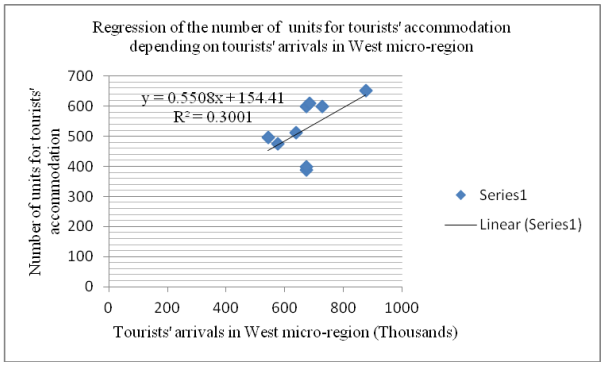

Fig.13. Regression function of the number of units for tourists' accommodation depending on tourists' arrivals in West micro-region
Source: Own design based on NIS Database, 2016, [4].

The comparison between the average growth rate for the number of tourists' arrivals and the average growth rate for the number of units for tourists' accommodation pointed out the aspects mentioned in Table 9.

Table 9. Compariosn regarding the growth rate for the number of tourists' arrivals and the growth rate for the number of units with accommodation function, Romania, 2007-2015 (%)

	Romania	NW	C	NE	SE	Bucharest Ilfov	S Muntenia	SW Oltenia	W
Arrivals' growth rate (%)	5.98	5.86	9.34	4.32	5.26	7.77	4.99	6.08	5.66
Units' growth rate (%)	4.81	4.88	7.48	6.93	2.65	3.40	6.38	7.22	6.33

Source: Own calculation based on NIS Database, 2016, [4].

-At the national level, the average growth rate for the number of tourists' arrivals was 5.98 %, higher than the average growth rate for the number of units with accommodation function, 4.81 %.
-In some micro regions such as: Central, SE and Bucharest Ilfov, the average growth rate was higher than the average growth rate of the number of units for tourists' accommodation.
-In the other micro regions: NE, S Muntenia, SW Oltenia and W, the average growth rate of tourists' arrivals was lower compared to the average growth rate of the units for tourists' accommodation.

The forecast of the number of units for tourists' accommodation depending on the tourists' arrivals in the period 2016-2020 was determined taking into account the following aspects: the number of tourists' arrivals in the year 2015, the last year of the analysis, the average growth rate of tourists' arrivals in the period 2007-2015 (Table 9) and the regression functions for the number of units for tourists' accommodation depending on the number of arrivals in each micro region (Fig.5-13).
The calculus was made both at the national level and by micro region. The results are shown in Table 10.

Table 10. Forecast for the number of units for tourists' accommodation (Y, Thousands) depending on the number of tourists' arrivals (X) in Romania for the period 2016-2020

	2016		2017		2018		2019		2020	
	X	Y	X	Y	X	Y	X	Y	X	Y
Romania	10,524	7,123	11,153	7,447	11,819	7,791	12,525	8,155	13,274	8,541
NW	1.207	735	1,278	750	1,352	766	1,431	783	1,514	801
C	2,559.5	2,195	2,598.5	2,372	3,059.8	2,566	3,345.5	2,779	3,657.9	3,011
NE	979.9	877	1,022.2	922	1,066.3	969	1,112.3	1,017	1,160.3	1,068
SE	1,418.7	1,096	1,493.3	1,069	1571.8	1,041	1.654.4	1,011	1.741.4	980
Bucharest Ilfov	1,994.6	185	2,149.5	190	2,316.5	195	2,496.4	201	2,690.3	206
S Muntenia	895.1	688	939.7	718	986.5	749	1,035.7	781	1,087.3	816
SW Oltenia	560.2	480	594.2	512	630.3	545	668.6	581	709.2	619
W	925.2	664	977.5	693	1,032.8	723	1,091.2	755	1,152	789

Source: Own calculation.

CONCLUSIONS

The increased demand for visiting Romania' attractions determined a continuous growth of the accommodation capacity in tourism. So, the number of units with accommodation function increased by 65.3 % from 4,694 units in the year 2007 to 6,821 units in the year 2015. Among regions there are different growth rates, depending both on the growth rate of the number of tourists, but also of other factors.
The highest number of units for tourists' accommodation have been developed mainly in the Central, SE and NE Romania, and the lowest number was noticed in the West part of the country.
The number of tourists increased by 63 % from 6,091.9 thousands in 2007 to 9,930.4 thousands in 2015. The highest growth rate

was noticed in the Central Romania, Bucharest Ilfov and SE region.

At the national level, the average number of tourists' arrivals per unit for tourists' accommodation accounts for 1,456 arrivals /unit in 2015, being by 12.18 % higher than in 2007. The highest number of arrivals per unit of accommodation was 10,169 recorded in Bucharest Ilfov area and the lowest one, 1,111 arrivals was found in the Central region in the year 2015.

The correlation coefficient between the two indicators was r = 0.909 reflecting a strong positive relationship at the national level. The lowest correlation coefficient was 0.253 registered in SE micro region, and the highest one was 0.966 in the Central micro region.

About 82.76 % of the variation of the number of accommodation units at the national level is determined by the number of tourists' arrivals. However, the lowest determination degree was 6.41 % in SE micro region and the highest one, 93.41 %, in the Central micro region.

The average growth rate for the number of tourists' arrivals was 5.98 %, higher than the average growth rate for the number of units with accommodation function, 4.81 % at the national level.

The linear regression functions for each pair of indicators allowed to forecast the estimated values for the number of units for tourists' accommodation depending on the number of tourists' arrivals for the period 2016-2020.

In conclusion, the increased interest both of the foreign tourists and Romanian ones has a deep impact on the accommodation capacity in Romania's tourism. For this reason, the managers developing business in the field of tourism must pay attention, among other aspects, to the growth of the number of units with accommodation function and the number of places, as well as to the quality of services.

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THE CORRELATION BETWEEN INTERNATIONAL TOURIST ARRIVALS AND TOURISM RECEIPTS - A KEY FACTOR OF TOURISM EFFICIENCY

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Abstract

The paper analyzed the relationship between international tourist arrivals and tourism receipts in the world, in the EU and in Romania in the period 2009-2015. Also, it was analyzed the situation in the CEECs in 2014. The relationship between these two indicators was studied in its dynamics and also as a ratio reflecting tourism efficiency in term of receipt per tourist. The Bravais-Pearson and Spearman correlation coefficients confirmed the existence of a strong link between these indicators: r= 0.925 at the world level, r = 0.967 in the EU, r = 0.877 in Romania and r = 0.896 in the CEECs. The average receipt/tourist in the whole analyzed period accounted for 1,040.3 USD at the world level, 916.95 USD in the EU and 900.04 USD in Romania. In the CEECs, the average receipt/tourist was 1,205.5 USD in 2014. The EU contributes by 40.4 % to the number of international tourist arrivals, and by 37.39 % to the world receipts from tourism, reflecting its power of attraction for the tourists coming from all over the world due to its cultural heritage and large variety of landscapes, historical places, museums, art galleries, traditions. The CEECs contributes by 10.40 % of the EU tourist inflow and by 11.86 % of the EU receipts. Romania contributes by 0.47 % to the EU international tourists and by 0.38 % to the EU receipts. The increased number of international tourists has a benefic effect on tourism receipts, and together represents the key factors of tourism development and the world trade and global economy.

Key words**:** *international arrivals, receipts, correlation, regression, world tourism, the EU, the CEECs, Romania*

INTRODUCTION

Tourism is one of the most efficient form of the international trade, among other services like financial, banking etc. It is considered an important engine of economic and social development as it creates investments, employment, income, and exports and also contributes to the development of the local communities, infrastructure, and to the preservation of the cultural values [3].

There is a positive relationship between tourism earnings and the economic growth of a country. [1, 2, 5, 6, 9].

Tourism plays an important role in the payment balance supplying foreign exchange receipts for the destination countries. Europe attracts million of international tourists every year, representing 51.3% of the world international flow. Europe will continue to be the most visited tourist destination in the world, and also the CEECs will attract more tourists than the Western European countries [10].

The correlations existing between various tourism indicators are important for the further evolution of tourism and for the establishment of the strategies in tourism development. He found a positive and intense correlation (0.805) between tourist arrivals and tourism turnover in Romania [8].

Studying the relationship between tourism earnings, GDP and trade volume, it was proved that tourism development has an impact on economic growth and that earnings per tourist could be considered an indicator of quality in tourism services in each country [4].

Romania is a small "spot" on the world map in terms of the tourists arrivals and receipts. The problems regarding infrastructure, the service quality, and the weak promotion have

still a negative impact on inbound tourism [7]. However, in the last decade, Romania showed a better evolution of tourist arrivals and foreign exchange flow, but its market share is still lower compared to other European countries and even to the CEECs. The tourism receipts increased reflecting a good trend, but the less competitive offers and the lower quality-price ratio compared to other countries still have a negative influence on tourism efficiency. However, foreigners are interested to visit Romania for various purposes such as: business, participation to various events, attending courses, spending holidays, recreation, treatment in various resorts etc. [10].

In this context, the objective of the paper was to identify the relationship between two key indicators characterizing international tourism: the international tourist arrivals and the receipts coming from tourism. This relationship was studied both at the world level, in the EU, in Romania in the period 2009-2015, and in the CEECs in the year 2014.

The Ho (null hypothesis) is that the two indicators have no links between them, they are independent and the compared values do not differ.

The H1 hypothesis (the alternative hypothesis) was that the data are connected among them, they are dependent, and the compared data are different.

MATERIALS AND METHODS

In order to set up this paper, the following indicators have been considered: international tourist arrivals at the world level, the EU level and in Romania, tourism receipts at the world level, the EU level and in Romania. The period of reference was 2009-2015.

For the CEECs, the international tourist arrivals and tourism receipts were used only for the year 2014 for which we found the complete data.

The data were provided by UNWTO, Tourism Highlights, 2016.

For all this indicators, there were calculated: the descriptive statistics including: mean, standard error of mean, standard deviation, kurtosis, skewness, minimum, maximum, coefficient of variation.

The tourism receipt per international tourist was determined by dividing the tourism receipts by the number of international tourist arrivals.

The Bravais - Pearson coefficient of correlation was calculated for the pair of indicators: international tourist arrivals and tourism receipts at the world level, at the EU level and in Romania.

The Bravais-Pearson coefficient of correlation was calculated using the formula:

$$r_{xy} = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

"T" Test for correlation coefficient was determined according to the formula:

$$t = r\frac{\sqrt{n-2}}{\sqrt{1-(r)^2}}$$

For the CEECs countries, it was determined the Spearman correlation using the formula:

$$p = 1 - \frac{6\sum D^2}{N(N^2-1)}$$

The evolution of the indicators for the period 2009-2015 was commented using the fixed basis index.

The results were tabled and graphically illustrated accompanied by their interpretation.

RESULTS AND DISCUSSIONS

The international tourist arrivals at the world level followed an increasing trend in the analyzed period. From 883 million tourists in the 2009, the international tourist arrivals reached 1,184 million in the year 2015. Therefore, the number of international tourist arrivals increased by 34.08 % (Fig.1.)

Regarding the international tourist arrivals in the EU, it was noticed a similar ascending trend from 356.8 million international tourist arrivals in the year 2009 to 478.4 million in the year 2015. Therefore, in 2015, the tourist

inflow in the EU was by 34.08 % higher than in the year 2009, this growth rate being similar with the one at the world level (Fig.1.).

The evolution of the international tourist arrivals reflects that the EU attracts 40.4 % of the world international tourists.

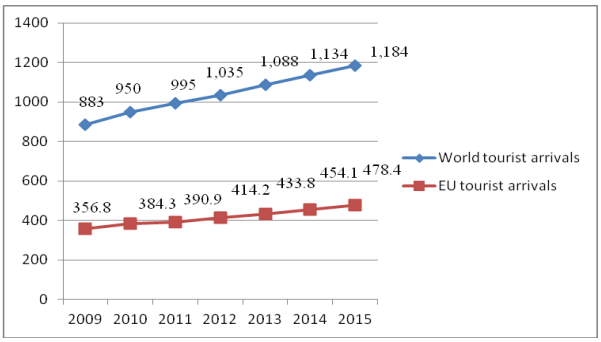

Fig.1. The dynamics of international tourist arrivals at the world level and in the EU , 2009-2015 (Million)
Source: Own design based on UNWTO Tourism Highlights, 2016 [11]

The receipts coming from tourism at the world level increased from 851 USD Billion in the year 2008 to 1,186 USD Billion in the year 2015, that is by 39.36 %. However, in the analyzed period it was noticed a continuous increasing trend from a year to another between 2009 and 2014. In 2014, it was recorded the highest receipt, that is 1,309 USD Billion. However, in 2015, the receipts were by 9.4 % lower than in the year 2014 (Fig.2.)

The tourism receipts registered by the EU recorded a continuous increasing trend from 311 USD Billion in the year 2009 to 443,4 USD Billion in the year 2015.

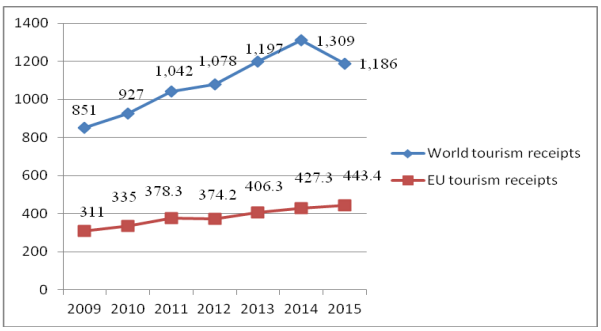

Fig.2. The dynamics of tourism receipts at the world level and in the EU, 2009-2015 (USD Billion)
Source: Own design based on UNWTO Tourism Highlights, 2016

Therefore, in 2015, the EU had by 42.57 % more receipts from international tourism (Fig.2.).

The EU contribution to the world tourism receipts increased from 36.54 % in the year 2009 to 37.39 % in the year 2015.

The receipts per international tourist is the result of the time evolution of the two indicators presented above: international tourist arrivals and tourism receipts.

At the world level, the receipts per international tourist increased by 3.87 % from 963.7 USD in the year 2009 to 1,001 USD in the year 2015.

In the EU, the receipts per international tourist accounted for 926.8 USD in the year 2015, being by 6.33 % higher than in the year 2009.

Comparing the receipts per international tourist in the EU with the world level, it is easily to notice that the receipts per tourist in the EU are a little bit smaller that at the world level. More exactly, in 2009, the receipt per tourist was by about 9.6 % lower than at the world level, while in the year 2015, it was by only 7.5 % lower than at the world level (Fig.3.).

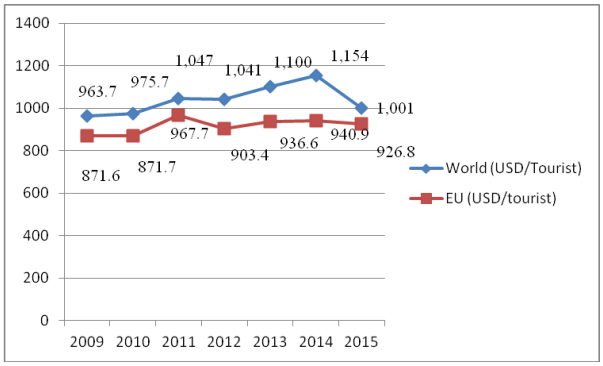

Fig.3. The dynamics of the tourism receipts/ tourist arrival at the world level and in the EU (USD/capita)
Source: Own design based on UNWTO Tourism Highlights, 2016 [11]

The international tourist arrivals in Romania recorded a continuous ascending trend in the analyzed period. In 2015, this indicator accounted for 2.23 Million international tourists, by 75.59 % more than in the year 2009, when Romania received only 1.27 Million international foreign tourists (Fig.4).

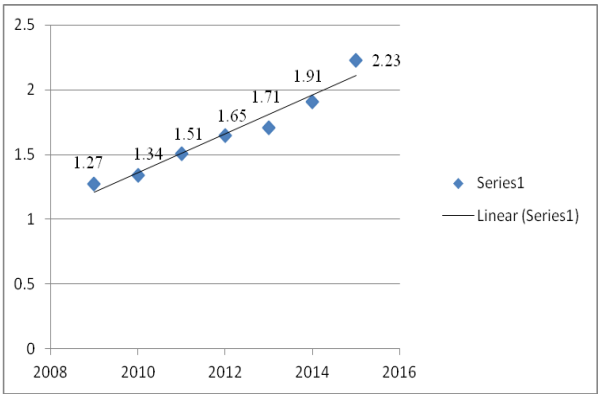

Fig.4. The dynamics of international tourist arrivals in Romania, 2009-2015 (Million)
Source: Own design based on UNWTO Tourism Highlights, 2016 [11]

The number of international tourists in Romania is very small compared to other EU countries. For this reason, its share in the EU international tourist arrivals is just 0.35 % in 2009 and 0.47 % in the year 2015.

The receipts from international tourists obtained by Romania accounted for 1.23 USD Billion in the year 2009 and for 1.7 USD Billion in the year 2015. Therefore, in the analyzed period, Romania registered by 38.21 % more receipts from foreign tourists. However, in 2014, it was recorded the highest receipt, accounting for 1.83 USD Billion, but in 2015, it was found a decline by about 7.2 % compared to the 2014 level (Fig.5.).

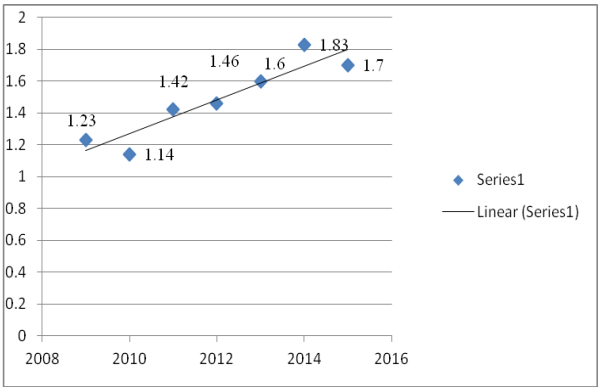

Fig.5. The dynamics of tourism receipts in Romania, 2009-2015 (USD Billion)
Source: Own design based on UNWTO Tourism Highlights, 2016 [11]

The share of tourism receipts recorded by Romania in the EU tourism receipts is very small, just 0.39 % in 2009 and 0.38 % in 2015.

The receipt per foreign tourist declined from 968.5 USD in the year 2009 to 762.3 USD in the year 2015. The decrease rate accounting for 21.3 %. This was caused by the decline in tourism receipts in the year 2015 and the high growth of international tourists in the same year as mentioned in the graphs above (Fig. 6).

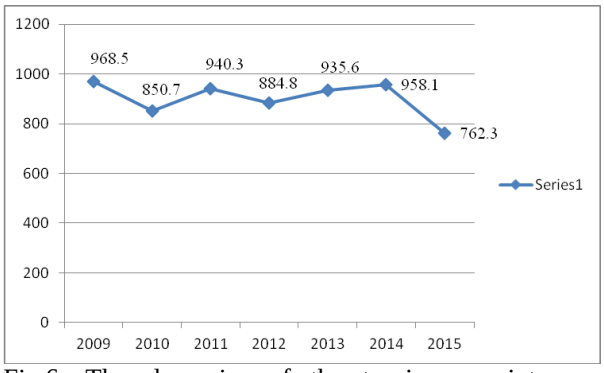

Fig.6. The dynamics of the tourism receipts per international tourist in Romania, 2009-2015 (USD/capita)
Source: Own design based on UNWTO Tourism Highlights, 2016 [11]

In 2015, the receipt per international tourist in Romania was better in the year 2009, being by 0.4 % higher than the world level and by 11.11 % higher than the EU level. In the year 2015, Romania recorded a receipt per international tourist by 24 % smaller compared to the world level and by about 17.25 % less than at the EU level.

The descriptive statistics for international tourist arrivals, tourism receipts, receipts/tourist in the world, EU and Romania in the period 2009-2015, regarding: mean, standard error of the mean, standard deviation, kurtosis, skewness, minimum and maximum values, and the variation coefficient are presented in Table 1.

The coefficient of variation varied between 3.96 %, the lowest value, in case of EU tourism receipts/ tourist and 19.87 %, the highest value, in case of Romania's international tourist arrivals.

This reflect in general a low variation around the mean, and that the average is a representative one for all the studied indicators.

Table 1. Descriptive statistics for international tourist arrivals, tourism receipts, receipts/tourist in the world, EU and Romania, 2009-2015

	Mean	St. Error	St. Dev.	Kurtosis	Skewness	Minimum	Maximum	Variation Coefficient (%)
World international tourist arrivals	1038.42	39.83	105.40	-0.912	-0.089	883	1184	10.15
World tourism receipts	1084.28	60.65	160.48	-0.901	-0.159	851	1309	14.80
World tourism receipts/ Tourist	1040.34	25.87	68.46	-0.431	0.654	963.7	1154	6.58
EU international tourist arrivals	415.07	16.03	42.43	-0.931	0.141	356.8	478.4	10.22
EU tourism receipts	382.21	18.08	47.84	-1.021	-0.281	311	443.4	12.51
EU tourism receipts/ tourist	916.95	13.73	36.33	-1.227	-0.173	871.6	967.7	3.96
Romania's international tourist arrivals	1.66	0.12	0.33	0.022	0.664	1.27	2.23	19.87
Romania's tourism receipts	1.48	0.09	0.24	-1.060	-0.046	1.14	1.83	16.21
Romania's tourism receipts/ tourist	900.04	27.85	73.69	0.985	-1.230	762.3	968.5	8.18

Source: Own calculation based on UNWTO Tourism Highlights, 2016

The Bravais-Pearson coefficient of correlation between the number of international tourist arrivals and tourism receipts accounted for r = 0.925 at the world level, with a "t" calculated value t = 5.443 < t_{tabled} 5.893 for p=0.001 (99.9% confidence), therefore the H_0 hypothesis is rejected, between the number of international tourist arrivals and tourism receipts at the world level being a high significant relationship.

Taking into account the value of the coefficient of determination, R Square = 0.8559, this means that 85.59 % of the variation of tourism receipts is determined by the variation of the international tourist arrivals.

In the EU, it was found a coefficient of correlation r = 0.967, a little higher than at the world level. In this case, also the H_0 hypothesis is not accepted, because the "t" calculated value t = 8.486 < t_{tabled}.

The value of the coefficient of determination accounted for R square = 0.9365, reflecting that 93.65 % of the variation of tourism receipts is determined by the variation of the international tourist arrivals.

In Romania, it was recorded a coefficient of correlation r = 0.877, with a "t" value t = 4.081 smaller than the tabled value 5.893 for p= 0.001 (99.9 % confidence), resulting the rejection of the H_0 hypothesis.

The value of the determination coefficient was R square = 0.7702, meaning that 77.02 % of the variation of tourism receipts is determined by the variation of the international tourist arrivals (Table 2).

Table 2. The coefficients of correlation and the coefficients of determination between the number of international tourist arrivals and tourism receipts

	Coefficient of correlation, r	Coefficient of determination, R^2
World	0.925	0.8559
EU	0.967	0.9365
Romania	0.8525	0.7702

Source: Own calculation based on UNWTO Tourism Highlights, 2016 [11]

Regression of the tourism receipts depending on the international tourist arrivals at the world level is presented in Fig.7.

Regression of the tourism receipts depending on the international tourist arrivals in the EU is presented in Fig.8.

Regression of the tourism receipts depending on the international tourist arrivals in Romania is presented in Fig.9.

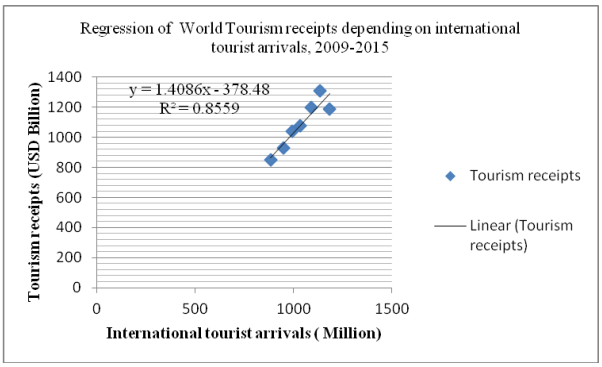

Fig. 7. Regression of World Tourism receipts depending on international tourist arrivals, 2009-2015
Source: Own design based on UNWTO Tourism Highlights, 2016 [11]

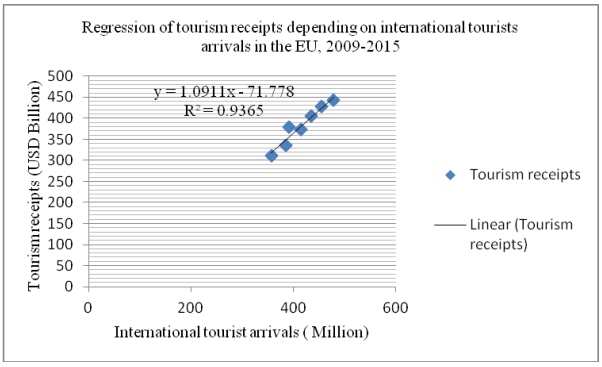

Fig. 8. Regression of Tourism receipts depending on international tourist arrivals in the EU, 2009-2015
Source: Own design based on UNWTO Tourism Highlights, 2016 [11]

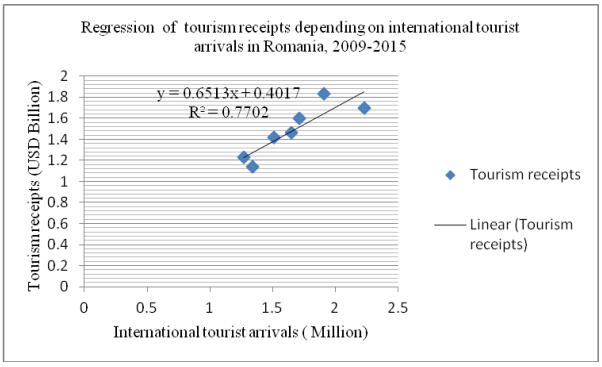

Fig. 9. Regression of Tourism receipts depending on international tourist arrivals in Romania, 2009-2015
Source: Own design based on UNWTO Tourism Highlights, 2016 [11]

The dynamics of international tourist arrivals in the 12 CEECs is shown in Fig. 10. In this group of countries, the number of international tourist arrivals varied in the year 2014 between 9,011 thousand tourists in Poland, the highest value, and 723 thousand tourists in Latvia, the lowest number of foreign tourists. The total number of the CEECs' international tourist arrivals was 44,467 thousands, representing 10.40 % of the EU tourist inflow.
Romania comes on the 9th position among the CEECs countries regarding the number of foreign tourists, being followed by Estonia, Lithuania and Latvia (Fig.10).

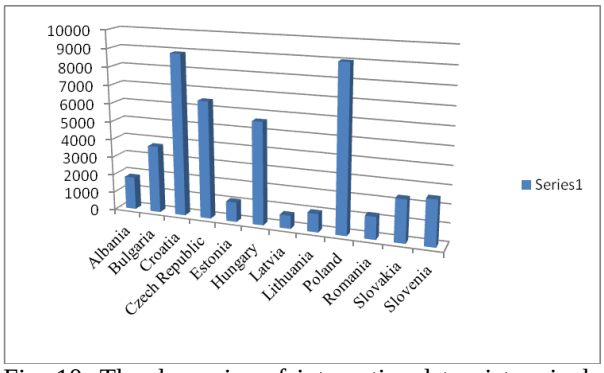

Fig. 10. The dynamics of international tourist arrivals in the CEECs in 2014 (Thousand)
Source: Own design based on UNWTO Tourism Highlights, 2016 [11]

The CEECs achieved various receipts from foreign tourists. The values ranged between 11,234 USD Million in case of Poland, and 956 USD Million in case of Latvia. This group of countries totalized 50,707 USD Million receipts from tourism, representing 11.86 % of the EU receipts.
Romania comes on the 8th position among the CEECs countries regarding the receipts from tourism, being followed by Estonia, Bulgaria, Lithuania and Latvia (Fig.11).

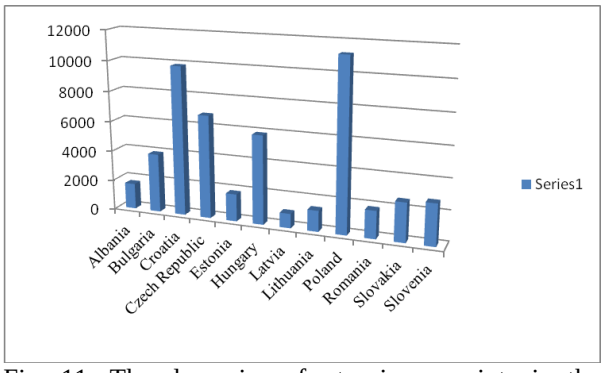

Fig. 11. The dynamics of tourism receipts in the CEECs in 2014 (USD Million)
Source: Own design based on UNWTO Tourism Highlights, 2016

The receipt/international tourist in the CEECs varied between 938 USD in Albania,

the lowest level, and 1,664 USD in Estonia, the highest level. The average per CEECs is 1,205.5 USD/tourist and compared to the world level 1,154 USD in the year 2014, it is by 4.46 % higher. Compared to the EU level in the year 2014, the CEECs average receipt/tourist is by 28.12 % higher.(Fig.12).

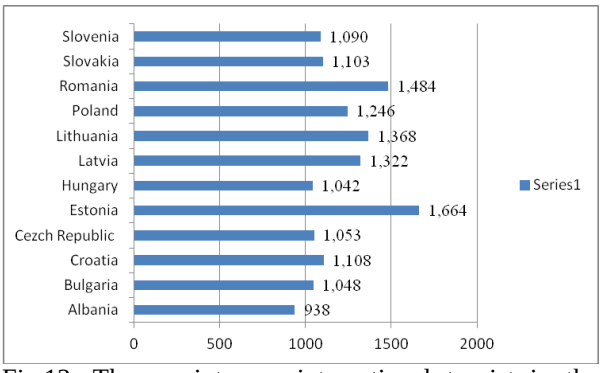

Fig.12. The receipts per international tourist in the CEECs in 2014 (USD/tourist)
Source: Own design based on UNWTO Tourism Highlights, 2016 [11]

The Spearman rank coefficient in the CEECs accounted for r_S = 0.896 in the year 2014 compared to 0.791 recorded in the year 2009.
Comparing the value r_S = 0.896 with the tabled Spearman coefficient for df =10, it was found that the calculated value confirm a highly significant relationship between the international tourist arrivals and receipts from tourism in this group of countries.
Therefore, also in this case, the Ho hypothesis was rejected and the H1 hypothesis was accepted (Table 3).

Table 3. Spearman rank correlation between international tourist arrivals and tourism receipts in the CEECs in 2014

Country	International tourists arrivals (Thousand)	Tourism receipts (USD Million)	Rank 1 International tourists arrivals	Rank 2 Tourism receipts	D= R1-R2	D^2
Albania	1,816	1,705	7	8	-1	1
Bulgaria	3,728	3,908	4	5	-1	1
Croatia	8,898	9,865	2	2	0	0
Czech Republic	6,478	6,822	4	3	+1	1
Estonia	1,090	1,814	5	10	-5	25
Hungary	5,631	5,872	3	4	-1	1
Latvia	723	956	9	12	-3	9
Lithuania	1,011	1,384	8	11	-3	9
Poland	9,011	11,234	1	1	0	0
Romania	1,234	1,832	11	9	+2	4
Slovakia	2,336	2,578	10	7	+3	9
Slovenia	2,511	2,737	6	6	0	0
Total	44,467	50,707				
Spearman coefficient of correlation	p= 0.896					

Source: Own calculation based on UNWTO Tourism Highlights, 2016 [11]

CONCLUSIONS

In the analyzed period, the number of international tourist arrivals has continuously increased at the world level (+34.08%), in the EU (+34.08%), and in Romania (+75.59 %), reflecting that at the world level and in the EU the growth rate is similar while in Romania it was more than 2.5 times higher.
Compared to the year 2009, the receipts coming from tourism have continuously raised, in 2015 being by 39.36 % higher at the world level, by 42.57 % higher in the EU and by 38.21 % higher in Romania.
The EU contributes by 40.4 % to the number of international tourist arrivals, and by 37.39 % to the world receipts from tourism, reflecting its power of attraction for the tourists coming from all over the world due to its cultural heritage and large variety of landscapes, historical places, museums, art galleries, traditions.

Romania contributes by 0.47 % to the EU international tourists and by 0.38 % to the EU receipts.

Regarding the receipt/foreign tourist, the EU average is by 11.86 % lower than the one at the world level. The receipt per foreign tourist in Romania is 900.04 USD per tourist, being by 13.49 % lower compared to the world average (1,040.3 USD/ tourist arrival) and by 1.85 % lower compared to the EU average (916.95 USD per foreign tourist).

The receipt per tourist could be considered an indicator of tourism efficiency and quality allowing the comparison among various countries. The higher the receipt per tourist, the higher tourism efficiency and services quality.

The values of the correlation coefficients between the international tourist arrivals and tourism receipts have been the following ones: r = 0.925 at the world level, r = 0.967 in the EU and r = 0.877, reflecting the very strong positive relationship, statistically significant.

The CEECs contributes by 10.40 % of the EU tourist inflow and by 11.86 % of the EU receipts.

Considering the year 2014, the average international tourist arrivals in the CEECs was 1,205.5 USD/tourist, by 4.46 % higher than the world average (1,154 USD/tourist), by 28.12 % higher than the EU average (940.9 USD/tourist) and by 25.83 % higher than the average in Romania (958.10 USD/tourist).

The Spearman rank correlation in the CEECs between the international tourist arrivals and receipts is 0.896, confirming again that the two indicators are closely related.

Therefore, the international tourist flows have a deep impact on tourism receipts, transforming it into the most dynamic and efficient branch of the international trade and world economy.

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WORK DEMAND PATTERN ANALYSIS FOR MGNREGA: WITH SPECIAL REFERENCE TO 18 INDIAN STATES

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Abstract

MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act) is Indian government's flagship social safety net program. World Bank in year 2015 announced MGNREGA as world's largest public employment guarantee program. According to an India Today (February, 2016) report, around 200 million people were provided with work under MGNREGA. The present study focuses upon 18 select Indian states' work demand pattern under MGNREGA. Each state chosen under study has a specific geographic location, weather pattern, economy and population. Month wise data (secondary in nature) of work demand (in terms of number of persons) for years 2012-13, 2013-14, 2014-15 and 2015-16 for all the selected 18 states have been considered for the analysis. The research hypothesis states that there were no differences between four years' work demand pattern for each state. The result varied significantly: twelve states had no significant differences between four years' work demand pattern, while six states had significant differences between four years' work demand pattern. The research outcome explains that every state has a unique work demand pattern and the work demand pattern varies depending upon factors such as weather system of the state, other available employment opportunities, poor implementation at Panchayat (village governing body) level and low awareness amongst rural people. The research outcome could help government to understand the varying nature of work demand in each state in each month. The research revelations could also assist government to improve its promotion and implementation policies to promote MGNREGA differently in those states facing work demand inconsistencies.

Key words**:** *MGNREGA, employment, unemployment, poverty, work demand pattern*

INTRODUCTION

Providing employment to the rural people has always been a challenge for any Indian government at central or at state level. Since independence India has been suffering from chronic poverty and unemployment problems, especially in the rural areas. As per Lakdawala methodology for financial year 1999 - 2000, 26.10% population of India (260.25 million people) was considered as below the poverty line. As per Tendulkar methodology for financial year 2011-12, 21.9% population of India (269.78 million people) was considered as below the poverty line. Out of 269.78 million people living below the poverty line (as per Tendulkar method, 2011-12) a staggering 216.7 million people were from rural India (Planning Commission). India has been growing at rapid pace since the mid-1980s, but despite the growth the government has not been able to curb the chronic poverty problem [16]. Unemployment, in long term, not only elevates poverty but it also creates a tough situation for an individual. Unemployment can increase a person's debt, stress level, dissatisfaction and frustration, which in long term can affect the individual, his family and society at large. In the year 2013; 11,772 farmers committed suicide in India (The Economic Times, 8 July, 2014), major reason for farmers' suicide was quoted as debt and bankruptcy. However, here we are not attempting to establish any conclusion between MGNREGA and farmers' suicide rate. According to an NCAER (2015) report, farmers holding small farms were the major participants in MGNREGA, around 42% of MGNREGA participants owned farms that

contained 1 hectare land or less. In this context MGNREGA can be a wage generating option for such farmers and for those millions of people living in rural areas looking for employment. Every state in India has a different economy, weather pattern, their own welfare schemes, agriculture produce and governance pattern, at the same time these states also differ in terms of unemployment rate, Table 1 gives information about the state wise rural unemployment scenario.

Table 1. Rural Unemployment Rate (per 1000) for persons aged 15 years & above. Numbers in the column besides 'States and Union Territory' is unemployment rate (per 1000)

States and Union Territory	Nos.	States and Union Territory	Nos.
Gujarat	10	Chhattisgarh	38
Karnataka	17	Dadra and Nagar Haveli	40
Telangana	17	Mizoram	42
Maharashtra	24	West Bengal	46
Madhya Pradesh	25	Haryana	51
Andhra Pradesh	26	Odisha	56
Meghalaya	26	Uttar Pradesh	59
Chandigarh	28	Rajasthan	64
Tamil Nadu	30	Assam	67
Bihar	67	Kerala	118
Punjab	67	Tripura	120
Manipur	71	A & N Islands	121
Himachal Pradesh	75	Goa	138
Jharkhand	77	Sikkim	138
Daman and Diu	82	Puducherry	138
Uttarakhand	84	Delhi	142
Nagaland	89	Arunachal Pradesh	150
Jammu and Kashmir	115	Lakshwadeep	238

Source: Labour Bureau Survey, 2013-14 http://labourbureau.nic.in/Report%20%20Vol%201%20final.pdf

As we can see from Table 1, industrial and economically stronger states like Gujarat, Karnataka and Maharashtra had the lowest rural unemployment rates. At the same time economically backward states such as Bihar, Uttar Pradesh, Odisha (formerly Orissa) and Assam had higher rural unemployment rates. With objectives to provide rural people with guaranteed employment, to reduce rural to urban migration and to make villages sustainable by creating useful assets, government of India launched MGNREGA in 2006. The major goals of MGNREGA include: a) a fall back employment source for vulnerable rural groups b) providing basic wage security and boosting the inclusive growth c) providing villagers with work in the village or nearby their villages (within 5 Km radius of village). As per MGNREGA guidelines, a worker can demand for work at any given time during a year. The Gram Panchayat (village governing body) plays a vital role in implementing MGNREGA in the village. The village head (Sarpanch) acts as a manager who is responsible for disseminating information to the villagers, accepting the work applications, providing workers with job card, deciding what works to carry out in the village and providing solution to any problems or conflicts. As per MGNREGA guidelines only those who have completed 18 years can participate, moreover, caste wise reservation is also not permitted, these two unique features of MGNREGA makes it a people's act. To the workers benefit, MGNREGA also offers the unemployment allowances. If the workers do not get employment after 15 days of applying for work, they become eligible for unemployment allowance, for which they need to contact the Gram Panchayat. Workers get their wages in their bank account or post office account. Under MGNREGA various types of works are allowed to be carried out, however, it should be noted that in any type of work, workers are not allowed to use machinery. Majority of the permissible works under MGNREGA are targeted toward the betterment of village from the context of connectivity, irrigation, underground water level, cleanliness and agriculture to name a few. Some of the major permissible works as per MGNREGA guidelines are: land development, water conservation and harvesting, irrigation canals, drought proofing, protection walls for flood control, check dams, roads and tree plantation. A United Nation Report (2011) mentioned

about the participatory nature of MGNREGA, the report described a situation in the state of Uttarakhand where workers joined hands for constructing an irrigation canal which was expected to benefit 10 villages and irrigate 4,000 hectares of land. This exemplary project with participation of villagers for the benefits of villages is the best example for those villages not being able to create useful assets through MGNREGA.

In recent years most of the emerging economies have been putting their best efforts to strengthen their unemployment protection policies to protect workers from slipping into informal economy and to safeguard country's human capital [3]. World over only 33.9% of the labour force is covered by mandatory unemployment insurance (International Labour Organization, 2014/15). The International Labour Organization report further states that 80 to 90% of the labour force in North America and Europe was covered by law by an unemployment benefit scheme, only 37.6% of the labour force in Latin America was so protected, 20.6% of the labour force in the Middle East, 16.6% in the Asia and Pacific region and just 8.4% of the labour force in Africa was protected under law. Many developing and developed countries have extended their social security coverage during recent years and have stepped up their efforts to ensure that all in need benefit from at least basic protection. In countries such as Brazil, China, Ghana, India, Mexico, Mozambique, South Africa and Thailand, the social security program's extension has had gradual and significant impact on people's well-being, it also left significant impact on economy, labour market, inclusive growth and employment policies of aforesaid countries (International Labour Organization, 2014/15). In the low income countries, Public Work Programs (PWPs) with focus on the labor force often become costly tools of social protection [13], this is evident from Indian government's allocation of Rs 385 billion for MGNREGA for financial year 2016-17. PWPs can be rapidly rolled out, and that is why PWPs have been used by many countries to protect the poor from the agro climatic or macro-economic shocks [20]. In Brazil, due to the Bolsa Familia program's conditional cash feature, households' income increased and subsequently it reduced the crime rate [6]. Bangladesh launched Food for Works (FFW) program in 1975, which provided beneficiaries with food for work during the lean patch of the year, the beneficiaries worked for construction and maintenance of rural roads, irrigation channels and river embankments [27]. Administrators during the British Rule in India often implemented public works program to help famine affected people [11].

One of MGNREGA's unique features is no gender and caste based discrimination. Under MGNREGA the family members can work together and this feature draws ample of women to participate in MGNREGA, women's participation across India stood highest at 51% during financial year 2012-13 (http://mnregaweb4.nic.in/).

Women's participation in public work programs has helped them gain more confidence and it has resulted into their increased participation within household. Women's active participation and increased income also played a major role for their children's well-being [2]. In South Africa's Expanded Public Works Program (EPWP) workers can on an average work for four months to over one year in infrastructure sector, this feature of EPWP provided workers with steady income throughout their tenure [27]. The impact of non-MGNREGA income, MGNREGA wages and Public Distribution Systems (PDS) participation on households' food intake revealed that MGNREGA wages had helped the households to consume more protein, calories and micronutrients [14]. The information dissemination of MGNREGA in Andhra Pradesh, Maharashtra and Rajashtan revealed higher level of information amongst villagers [24]. In Uttarakhand's three districts, MGNREGA had helped people generate extra income, but the extent was only 10-20 percent [26].

The effect of rainfall and work demand pattern for four different states of India was analysed and it was found that out of four states, three states had no relationship

between work demand and rainfall, this result revealed that in India millions of people demand for work under MGNREGA irrespective of the season (India mainly has three seasons: winter, summer and monsoon) [15]. MGNREGA had a sizable impact on employment generation [1]. MGNREGA's performance differs from state to state across India, as compared to man days generated by other states in India, Jammu and Kashmir's performance was quite dismal [23], this existing reality of varying work demand has been studied in our research work.

MATERIALS AND METHODS

To understand and analyse the work demand pattern in details, work demand data (secondary in nature) for four years (2012-13, 2013-14, 2014-15 and 2015-16) for selected 18 states have been collected from MGNREGA's official website (nrega.nic.in). Out of 29 Indian states, 18 states have been chosen as work demand data for some of the states were not available on the MGNREGA website.

For the analysis part, one factor ANOVA and Correlation have been applied on each state's data. Detailed charts have also been prepared to understand the work demand pattern of each state over the period of four years; charts help us to understand the trend and consistency of the work demand pattern for each state.

Hypothesis:

H0: There are no significant differences between four years' work demand pattern for each state.

RESULTS AND DISCUSSIONS

Results of those six states where four years' work demand pattern is significantly different are shown below in tables and graphs.

Table 2. Assam: ANOVA and Mean Correlation.

Source of Variation	***F***	***P-value***	***F crit***
Between Groups	7.602684	0.000335	2.816466
Mean Correlation for four years		0.477981	

Source: Own calculation based on the data provided by MGNREGA's official website.

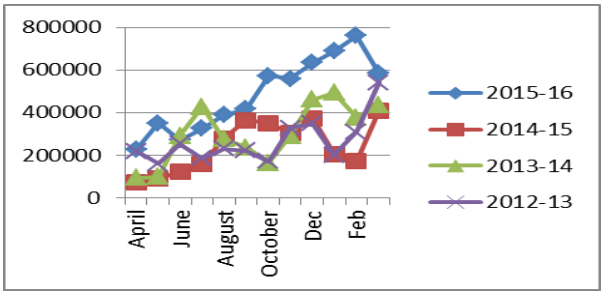

Fig.1. Assam: ANOVA and Mean Correlation.
Source: Own design based on the data provided by MGNREGA's official website

Table 3. Haryana: ANOVA and Correlation.

Source of Variation	*F*	*P-value*	*F crit*
Between Groups	0. 9.541626	5.68498E-05	2.816466
Mean Correlation for four years		0.270758	

Source: Own calculation based on the data provided by MGNREGA's official website.

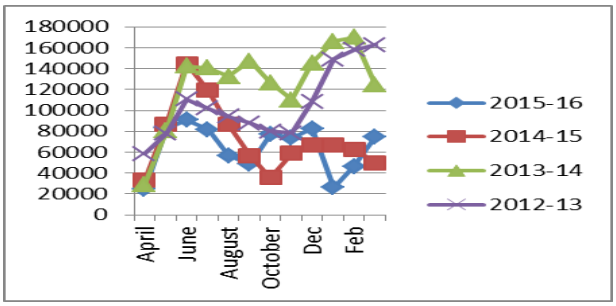

Fig.2. Haryana: ANOVA and Correlation
Source: Own design based on the data provided by MGNREGA's official website.

Table 4.Punjab: ANOVA and Correlation

Source of Variation	*F*	*P-value*	*F crit*
Between Groups	10.61319	2.26E-05	2.816466
Mean Correlation for four years		0.259906	

Source: Own calculation based on the data provided by MGNREGA's official website.

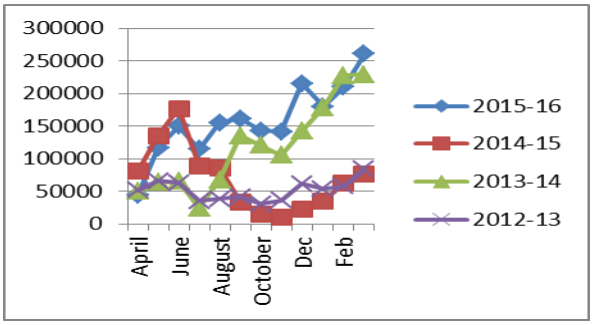

Fig.3. Punjab: ANOVA and Correlation
Source: Own design based on the data provided by MGNREGA's official website.

Table 5. Tamil Nadu: ANOVA and Correlation

Source of Variation	*F*	*P-value*	*F crit*
Between Groups	4.63197	0.016865	3.284918
Mean Correlation for four years		0.304328	

Source: Own calculation based on the data provided by MGNREGA's official website.

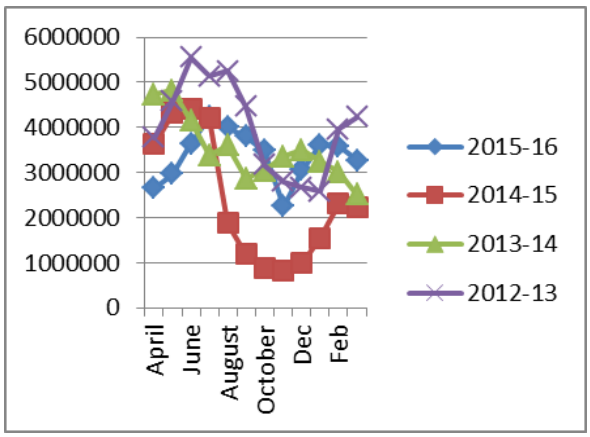

Fig.4.Tamil Nadu: ANOVA and Correlation
Source: Own design based on the data provided by MGNREGA's official website.

Table 6. Goa: ANOVA and Correlation

Source of Variation	*F*	*P-value*	*F crit*
Between Groups	19.24616	5.98E-10	2.539689
Mean Correlation for four years		-0.03883	

Source: Own design based on the data provided by MGNREGA's official website.

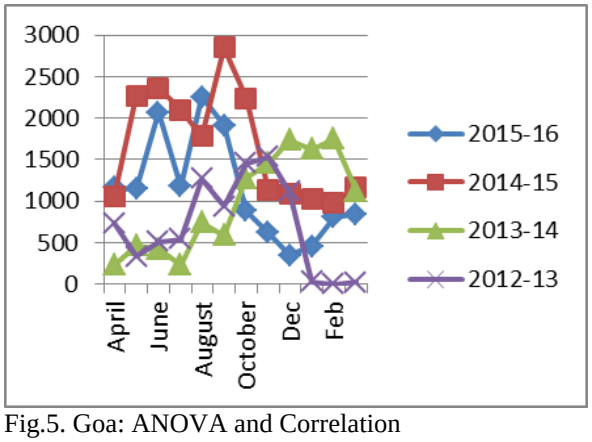

Fig.5. Goa: ANOVA and Correlation
Source: Own design based on the data provided by MGNREGA's official website.

The data analysis revealed that in twelve states the differences between four years' work demand pattern were not significant.

Table 7. Himachal Pradesh: ANOVA and Correlation

Source of Variation	*F*	*P-value*	*F crit*
Between Groups	3.319028	0.028307	2.816466
Mean Correlation for four years		0.067266	

Source: Own calculation based on the data provided by MGNREGA's official website.

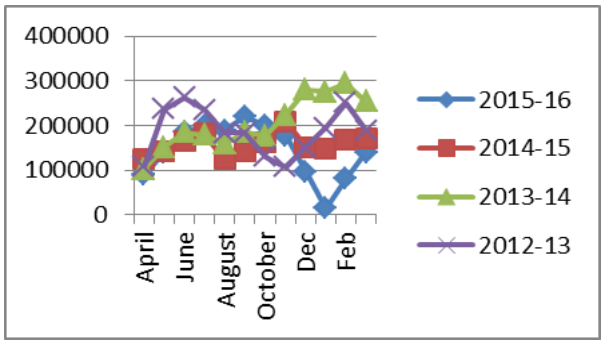

Fig.6. Himachal Pradesh: ANOVA and Correlation
Source: Own design based on the data provided by MGNREGA's official website.

These twelve states were: Bihar, Gujarat, Karnataka, Kerala, Uttar Pradesh, West Bengal, Odisha, Rajasthan, Tripura, Jammu & Kashmir, Maharashtra. For remaining six states differences between four years' demand pattern were significant, these states were: Assam, Haryana, Punjab, Tamil Nadu, Goa, Himachal Pradesh. This result concluded that MGNREGA's demand pattern was not uniform for all the 18 states under study. The variation in work demand can occur due to various factors such as poor or no implementation of MGNREGA by Gram Panchayat, other work opportunities with higher wages, good monsoon, rural to urban migration, launch of new welfare scheme/s. The major learning from the finding is the unique work demand characteristics of all the states. As evident in Fig. 7, MGNREGA work demand was significantly high in the states of Tamil Nadu, West Bengal, Rajasthan, Uttar Pradesh and Madhya Pradesh. In the states of Himachal Pradesh, Jammu and Kashmir, Haryana, Punjab, and Goa the work demand was found not as high as in other states. However, it should also be noted that the work demand had remained relatively similar throughout four years in the states of Madhya Pradesh, Tripura, Gujarat and Himachal

Pradesh.

There were two reasons behind lower participation in MGNREGA. First reason was that in many states other employment opportunities were available to workers which refrained them from participating in MGNREGA (NCAER – 2015). NSS(66th round) Report from Ministry of Statistics and Programme Implementation, Government of India puts Rajasthan, Karnataka, Maharashtra as states with higher employment rate in rural India. The second reason was the poor implementation of MGNREGA. Economically stronger Indian states such as Punjab, Gujarat, and Maharashtra might be able to provide people with better and higher market wages, which in turn would lower MGNREGA demand (NCAER – 2015). Economically backward states such as Bihar and Odisha see lower participation in MGNREGA mostly because of poor implementation at the grass root level. MGNREGA's success also depends on an interested and active Gram Panchayat. Small state like Tripura could be the torch bearer for other states where MGNREGA performance had been poor. Tripura provided work for 94.46 person days per household in fiscal 2015-16. (The Financial Express, 27 April, 2016)

In states of Kerala, Tamil Nadu, Tripura and Gujarat the participation of women was quite high, for Kerala it was 87.03%, for Tamil Nadu it was 79.74%, for Tripura it was 47.42% and for Gujarat it was 44.55% (mnregaweb4.nic.in/netnrega). In the states of Bihar and Gujarat, MGNREGA's success was determined by interaction among local village bodies and political representatives. Employment outcomes were found to be very good in the villages where agricultural labourers had close contacts and rapport with the Sarpanch.

In many villages the villagers preferred MGNREGA works when it did not clash with their farm work, however, the wealthier farmers opposed MGNREGA as many of the labourers opted for MGNREGA works leaving them with few farm labourers.

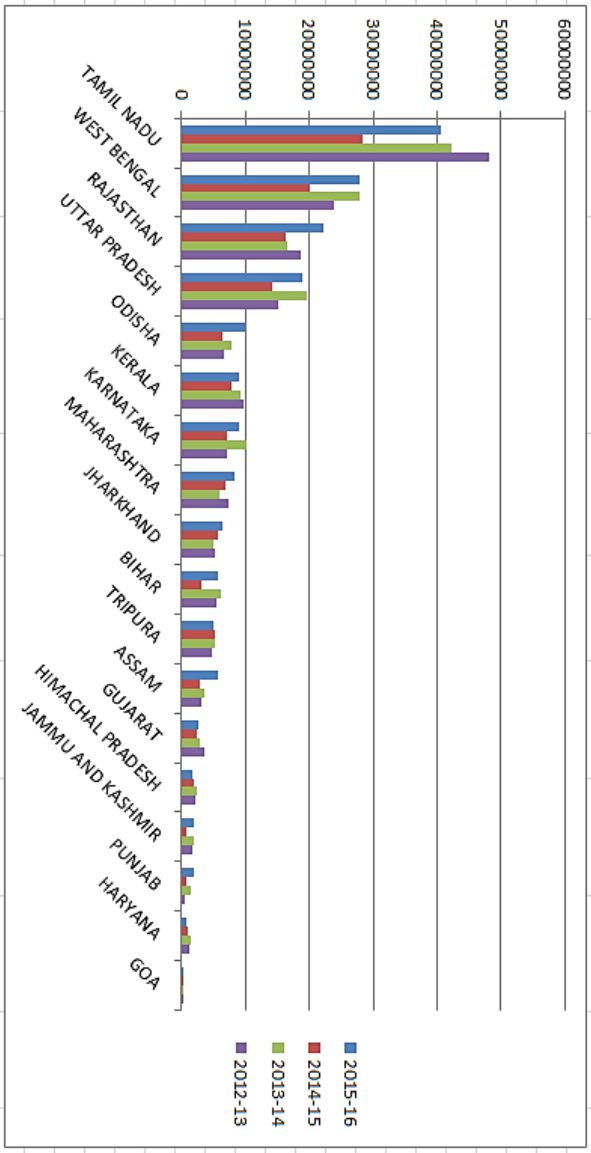

Fig. 7. Work demanded by no of person in all the 18 states for four years (Source: Compiled by authors)

In West Bengal political competition within the village made way to higher MGNREGA expenditure (ESID Briefing no. 1, 2013). For poorer states the existing management structure of MGNREGA was not efficient enough for a successful implementation and therefore, a holistic approach including community participation and decision making should be made mandatory for creating durable assets [7]. Lower participation in economically backward states such as Bihar and Odisha and higher participation in states such as Tamil Nadu and Maharashtra suggested that state level policies and priorities had a big impact on work demand pattern [9]. Further in the discussion, we will talk about MGNREGA's performance in four

Indian zones and discuss important points.

West Zone

In the year 2015-16, 22.10 million people worked in Rajasthan, 2.72 million people worked in Gujarat and 8.2 million people worked in Maharashtra. (http://www.nrega.nic.in/netnrega/home.aspx) In was observed that income, social participation, level of aspiration and level of awareness were found to be medium in Maharashtra, among majority of MGNREGA beneficiaries [8]. In Maharashtra the program was a success in terms of asset creation, watershed development, prevention of drought, large scale administration of rural public works and reduction in large scale migration which could be the reason for no significant difference in the past four years' of work demand pattern in an elephantine state [22]. Despite huge number of people willing to be a part of MGNREGA program in Rajasthan, there were issues of biases by Sarpanch, non-allotment of work even upon demand and political interference as reported in ESID briefing No.1. MGNREGA workers were mostly from the backward class and most of them earned their employment through dairy, farming and construction activities and hence the participation rate was lower in Gujarat [15].

East Zone

In the year 2015-16, 27 million people worked in West Bengal, 9.9 million people worked in Odisha, 5 million people worked in Tripura, 5.7 million people worked in Assam, 6.4 million people worked in Jharkhand and 5.7 million people worked in Bihar in MGNREGA program. (http://www.nrega.nic.in/netnrega/home.aspx) Low awareness created a problem to make MGNREGA demand driven in case of Odisha, further it was also observed that people neither knew about works/projects which were covered under MGNREGA nor did they know as to how they can demand for a work [18]. As suggested in ESID Briefing No.1, in Bihar it was seen that labourers and marginal farmers preferred MGNREGA provided the work was not clashing with their farm work. Fig. 7 suggests that trend of work demand though over the months for the last four years have been almost the same, there hasn't been a high work demand, despite Bihar being third largest state of India population wise. In case of West Bengal, no irregularities were found in Gram Panchayat's functioning; people actually demanded more MGNREGA jobs as other alternative jobs were not available. It was noted that MGNREGA had helped villagers with better purchasing power and with increase in income they were able to send their children to school, which could be the reason for work demand pattern remaining almost same for the past four years, in fact towards increasing side [10]. Successful implementation in the state of West Bengal was noticed by the Government of India and it decided to showcase the state as a model state. As cited in an article 'NREGA Implementation Ranking 2015-16' by Mathur and Bolia in 2016, Tripura was ranked on the top on various parameters like providing 95 days of employment on and average, higher percentage of wages paid and higher work completion rate. These factors may contribute to higher stability in work demand pattern in the past four years as seen in the chart. However, Assam did face problems such as poor implementation, corruption, lack of awareness and poor quality of assets. Assam failed to provide 100 days of employment due to the entry of unscrupulous contractors who would take the most part of benefits and reduce the number of days of employment. [4] Corruption was a major issue and so was implementation in the state of Assam [12].

North Zone

In the year 2015-16, 18 million people worked in Uttar Pradesh, 1.73 million people worked in Himachal Pradesh, 1.85 million people worked in Jammu & Kashmir, 0.76 million people worked in Haryana and 1.89 million people worked in Punjab in MGNREGA program. (http://www.nrega.nic.in/netnrega/home.aspx) In the state of Punjab, rural connectivity, water conservation and water harvesting, drought proofing and cleaning of village ponds were the major employment activities under MGNREGA. It had a significant impact on the economic condition of workers by

providing them work opportunities, regular income and economic independence especially in the case of women workers, which could be the reason for gradual increment in work demand in Punjab. [25] Irregular fluctuations in movement of monthly wage rates in smaller states like Himachal Pradesh and Jammu & Kashmir could be an important issue in MNREGA implementation [28]. While average accruals per household had been quite high in Haryana, the major problem was that only 2.8% of the household were covered [17]. Despite offering very low wages in Uttar Pradesh, work demand was high compared to other states [21].

South Zone

In the year 2015-16, 40 million people worked in Tamil Nadu, 9.1 million people worked in Kerala, 8.9 million people worked in Karnataka and 0.01 million people worked in Goa in MGNREGA program. (http://www.nrega.nic.in/netnrega/home.aspx) University of Sussex's Global Insight (2013) survey in two villages in Tamil Nadu revealed that the average number of person days had increased steadily. Between 2008-09 and 2012-13, the total number of households increased from 3.3 million to 7 million. Further the survey noted that majority of the MGNREGA workers were drawn from those households which depended upon agricultural works as their main source of income. In the state of Tamil Nadu majority of the workers were dalits (backward class) and women [5]. From the total participants in MGNREGA in Tamil Nadu, women's share was as high as 85%(http://www.nrega.nic.in/netnrega/home.aspx). The main beneficiaries of the scheme were thus women, dalits and villagers with little education or assets. The success of Tamil Nadu could be due to skyrocketed annual expenditure, increase in total number of person-days and number of households who benefitted due to the program [5]. Specific measures were put in place in the state to curb corruption. There was a high participation of women which led to success of MGNREGA, there was difference in work demand pattern observed over the years [6]. In the state of Kerala, Panchyats were actively engaged in ensuring that MGNREGA program was implemented effectively. While rich states like Tamil Nadu and Kerala provided employment opportunities under MGNREGA, particularly in the state of Kerala, Panchayat played a very critical role by actively engaging in the development oriented work unwillingness of women to participate, inflexible timing and undue delay in payment were the areas where improvement was required [29]. In case of Karnataka, gender, education and family size of the workers influenced worker's employment under MGNREGA program. In rural areas, the program was complementing rural wage incomes of needy at no cost to agriculture and other sectors. The economic scarcity of labour in agriculture was majorly due to hike in wages in Mining and Construction sector [19].

CONCLUSIONS

The results of Anova and Correlation suggested that six states' work demand pattern was significantly different. These states are located in North, East and South of India, whereas in West Indian states work demand pattern is not observed significantly different. Three states of Tamil Nadu, West Bengal and Rajasthan were found with highest number of persons demanding work under MGNREGA respectively. The varying nature of work demand is evident in the Figure No.7. Future research, with a grass root level opinion of beneficiaries of MGNREGA in all Indian states can lead us to know the on-ground situation of work demand as well as factors affecting work demand in every state.

Looking at the data analysis part and the observations mentioned in discussion, it could be commented that every state has a unique work demand pattern, some states have high percentage of women participation, some states have implementation problem, some states have poorly developed government structure, wherein some states offer other high wage opportunities that attract workers. The outcome of the research opens the door for customized MGNREGA implementation for each state as all the 18 states under study

showcase a different work demand pattern.

A lot of work can be done to analyse and understand the work demand pattern across India using various models and data collection strategies. The entire research work has been carried out using secondary data; primary data collection could add several more factors which could enhance understanding on why work demand pattern varies from state to state and even within the state as well. Since data for only four years were available on MGNREGA official website, this research paper takes into consideration the work demand data of 18 Indian states for the years: 2012-13, 2013-14, 2014-15 and 2015-16.

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CONSCIENTIOUS MANAGEMENT OF SOIL HUMUS AND WATER: A MAJOR CONDITION FOR PURPOSEFUL MECHANISATION OF FIELD CROP HUSBANDRY IN TROPICAL RAIN FOREST OF NIGERIA

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Abstract

Machinery and implements used in agricultural product/on work in media of lives - the soil, livestock and crops. Certain features of these media determine the possibility and extent of mechanization of works relating to them. In the tropical rain forest areas, mechanization remains the greatest obstacle to the expansion of production and therefore constitute great problem to food and primary raw materials supply. This paper highlights the problems, discusses the problems as well as the correlating factors and the possibilities of improving on the level of mechanization in view of the present technological and socio- economic development of the peoples of tropical rain forest areas of Nigeria. The work is an original scholarly research based on review of relevant publications and visit to several locations within the Tropical Rain forest belt. The results reveal inadequacies managerial skills and in appropriate deployment of technical staff as well as poor education as major factors for the insufficient understanding of the soil-machine-crop-climate relationship which is the bedrock for conscientious planning and execution of mechanization. The paper is aimed at drawing the attentions of the relevant authorities charged with ensuring adequate availability and supply of food and raw materials for the populace and the industries to the need to purposeful mechanization. The paper ends by making some practicable recommendations and warning of the dangers of not mechanizing farm production as well as the implications of failure of mechanized farm projects in the tropical rain forest zones.

Key words**:** *husbandry, mechanization, soil, tropical rain forest, water*

INTRODUCTION

It has been observed that ‘‘without soil there can be no agriculture and without agriculture in our present state of knowledge, the world cannot be fed” [7]. The food must be satisfactory both in quantity and quality. It has been evaluated on the basis of studies by FAQ [11] specialists that a great part of the world population is under-nourished considering the fact that the food does not correspond qualitatively, being poor in Protein, especially the protein of animal origin [28].

In view of the above, it became apparently necessary to take series of measures to address the problems. Principally among the measures are:

(i)To increase production per unit surface area (hectare) or per head of animal; and

(ii)To increase the total surface area cultivated.

However, the ever-increasing population of the world and the limit in the size of the land that can be made available for agriculture led to the present basic tendency in agriculture which includes maximum utilization of the production capabilities of both land and the biological materials [26].

The single most important factor that can simultaneously facilitate the expansion of the surface area cultivated as well as the number of animals and the intensification of production per unit surface area (hectare) and per head of reproductive animal, respectively, is high degree of mechanization. However, there are other measures such as genetic improvement, expansion of use of chemicals, improved training or education of agricultural workers, expansion of irrigation and drainage, boosting of soil humus content, etc., which

mostly influence the intensification of production. Irrigation and drainage of large surface area must be sufficiently mechanized for maximum labour and economic efficiency [1]. In the tropical rain forest zone which include part of Nigeria the impression has always been created that it is not feasible to introduce mechanization especially of arable field crops because of the thick forest and excessive rainfall which makes the soil too soft for mechanical aggregates to ply upon. Consequently agricultural production has continually been taught in schools and practiced under peasant subsistence system. As a result food production has been low, raw materials supply to industrial has been inadequate and the whole agricultural production has been of low yield, poor quality and of low returns to farmings. Since mechanization has remained a single most important factor in intensification and expansion of agricultural production, the tropical rain forest area of Nigeria can not afford not mechanizing is agricultural production in view of the increasing draught, desert expansion and religious disturbances in the northern part of the country. The fast expansion of the desert inwards is not unconnected with the global climate change.

Literature review

Too much stress has often been laid on the barriers presented by "Virgin" forest to human activity**.** The tropical forest**s** that cover such vast expanses remain not so much because of their own resistance as because of the feebleness of human attack on them [23]. This means that the existence of the forest is simply a proof of the absence of a population interested in its destruction and thus the forest cannot resist if groups if cultivator wish to take its place. This has been proven to be so because a vast portion of the rain forest has been cut down, howbeit recklessly due to excessive ill-organized logging for timber for wood furnishing materials. With much of the forest gone (over 75 %), the common features of the exposed landmass are heavy sheet and deep, long and large gully erosion posing great threat on continuous trend (Fig.1.)

The cleanings of forests have revealed that sand is rather found instead of deep humus and that the forest may have great difficulty in growing up again once man's exploitation has exposed the underlying sand.

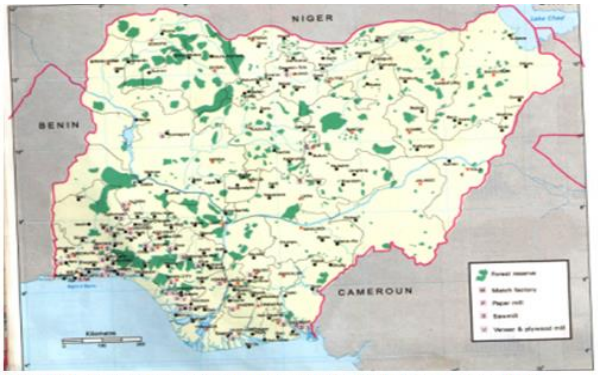

Figure 1: Map of Nigeria showing the Forest Resoureces, 2005
Source: Longman Atlas, Second Edition

Thus Tropical soils are very poor in assimilable bases and phosphorous and ill supplied with humus. The deficiencies are such that soils of similar composition would have been barren in a temperate climate [23]. So great is the poverty of tropical soils in bases that they are acid, a condition unfavourable to good use of humus. However cultivated tropical plants are adapted to acid conditions. These conditions can be found in south west, Benin and south east areas of Nigeria, which falls within the rain forest area.

The tropical rain forest soil is easily leached. The ease of leaching of the soil is due in part to the feeble capacity for adsorption by tropical soils. They can not retain fertilizers because they are poor in humus due to the fact that their clays have unfavourable structure because they have a tendency to accumulate inert lateritie elements [23]. These inert materials contribute nothing to the fertility of the soil and does not help to prevent leaching of the elements that determine the fertility of the soil.

Intensive method can transform poor soils into heavy yielders, as the Flemish peasants have done in the fields of Flanders and the Chinese in Malaya. Even though at the cost of immense labour and the application of abundant manure [23]; [1]. In present day agricultural practice, intensification and reduction in labour can only be guaranteed by **efficient** mechanization.

The single most important factor for the intensification of agricultural production is mechanization backed by irrigation, drainage and good soil study/management. People have seen the heavy and very frequent rain fall as problems to the use of heavy machinery for crops cultivation, thereby shying away from mechanizing agriculture [21].

The non-mechanization of agricultural production means that the needed food and raw materials supply is in the hand or subsistence peasants and thus the food needs has heavily depended on importation [3].

However, the current economic reality and the market behaviours of the sole product heavily relied upon by Nigeria, crude oil, for foreign exchange earning, has shown that the livelihood of the people is seriously threatened and urgent actions need to be taken to savage the population [4].

Unfortunately, mechanization of field agricultural work in the tropical rain forest zones of Nigeria has been in shamble [5]. It has been observed that the fundamental problems of mechanization of the process of crop production in the tropical rain forest zones, are the excessive humidity, high temperatures and the delicate nature of the soil [2]. These make the behaviour of an exposed soil very complex and delicate to manage. The problem of management of excess and shortage of water is not as complex and delicate as the management of the physical properties of tropical rain forest soils, especially in regards to humus content, and the structure of the soils. Enough researches abound in the areas of irrigation and drainage (water use) as means of improving the soil for increased productivity [18].

"Agricultural mechanization is a broad subject requiring very meticulous planning and execution"[2]. It goes beyond merely buying few tractors and implements, machines etc.

The problems of conservation of the soil increases with mechanization. Removal of roots reduces soil stability, and heavy cultivation may breakdown the soil structure due to accelerated fall in humus levels [9]; [2]. In most of the forest zones, the relief is typically steep and dissected and most of the ground sloping. The gradient together with the normal heavy and intense rainfall associated with land line squalls common at the beginning of the rains, could be expected to result in heavy erosion, both sheet and gully [9].

Contrary to the popular view of the peoples of the tropical rain forest zones, the main difficulties and danger of mechanization are fundamentally related to the nature of the soil and the associated climate; because if land is completely cleared for the first time, it can then be regularly ploughed, cultivated (primary and secondary), modelled, seeded, planted, fertilized, weeded and crops harvested mechanically. Hence, the dense vegetation of the rain forest do not really constitute a problem to mechanization, although the removal of the forest cover leaves the soil more exposed to the effect of sun and rain, particularly before the planted crop establishes itself and after it had been harvested [2].

Another salient problem of mechanization, and which requires very serious attention, has been observed to be its encouragement of quick farming of too large areas at the expense of careful farming, hence mechanization does not necessarily increase yield per hectare even if it increases productivity per day's work [2]. In fact large scale mechanization is generally associated with lower yields than are obtained by more intensive methods but the benefits of mechanization results from the economy of large scale associated with mechanization [2].

It has been observed that the behavior of the soil once it has lost its humus depends on its texture and structural stability. Soils which are high in clay and iron are firmly aggregated into silt-size particles, and this gives them considerable stability, they may remain permeable and porous even when low in humus, and percolating water may remove little if any clay from them [13]. This structural stability is said to be one of the favorable properties of some highly weathered latosols. Some soils are known to completely lose their structure under intense cultivation. If finer particles are washed downwards,

cultivation may result in a relatively sandy sterile top soil overlying lower horizons in which soil pores are clogged by silt and clay, or which may even contain a clay pan below normal plough depth [2]; [26].

The high temperatures favour very high rate of evapo-transpiration and of chemical reactions/processes leading to rapid breakdown of soil organic matters and other components.

This high rate of mineralization promotes easy leaching of the resulting simpler products as well as too quick absorption by plants. This explains why tropical rain forest soils have very little and unstable humus content, hence low fertility while at the same time supporting luxuriously growing vegetation [6].

Humus is the store house of soil nutritive substances in complex organic compounds, and it represents part of the soil colloidal system. It is known to form an active part of the soil, and has great influence on the soil's physical properties, therefore playing a great role in structuring of the soil particles. The structure of the soil affects retention capability, stability, mechanical strength, rate of erosion and the aeration of the soil, (all these properties are factors of the porosity of the soil) [19]. The application of lime helps to improve the structuring of the soil particles besides the effect of correcting soil solution reaction. It is known that:

(i)The worse the structure of the soil, the higher the number of tiny spaces, hence the greater the process of capillarity which influences the humidity of the soil [25].

(ii)The bigger the structured aggregate, the greater the mechanical resistance of the soil [20].

(iii)Fine unstructured soil easily gets saturated after rainfall due to lack of deep infiltration, thus causing water to stagnate at the surface unlike well-structured soil [2]; [27].

(iv) Structured soils have greater resistance to the process of erosion than the unstructured and the structured soils are easier worked [27] and

(v)Generally, structured soils have greater fertility than the unstructured soils [2]; [25]; [26];[27].

MATERIALS AND METHODS

Firstly, this work is an original research and a review work based on scholarly inquiry to find out the reasons for the peasant nature of agriculture in the tropical rain forest world, the level of food and raw materials supply for the populace as the result of this peasantry, the challenges to expansive agriculture granted only by efficient mechanization of production and to find out the prospect of mechanized agricultural production (especially arable field crops) that can enhance the livelihood and socio-economic development of the people, the agriculture and their rural community.

The country Nigeria lies between Longitude 3^0 and 15^0 East of the Greenwich Meridian and Latitude 4^0 and 14^0 North of the Equator. The Tropical Rain Forest area is found between Latitude $5\frac{1}{2}^0$ and 7^0 North of the Equator; stretching from Ogun State in the South-West through Benin in the Mid-West to South Eastern State of Cross River (Northern Part). Figures 2, 3, and 4 show the physical features, Soil distribution and Vegetation respectively.

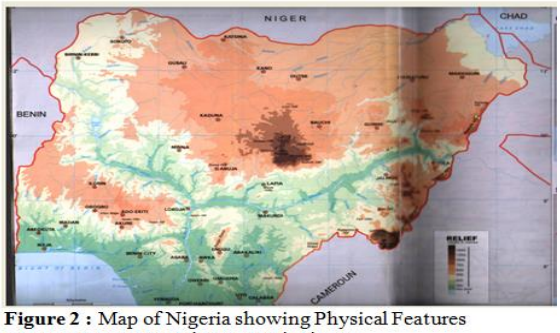

Figure 2 : Map of Nigeria showing Physical Features
Source: Longman Atlas, Second Edition

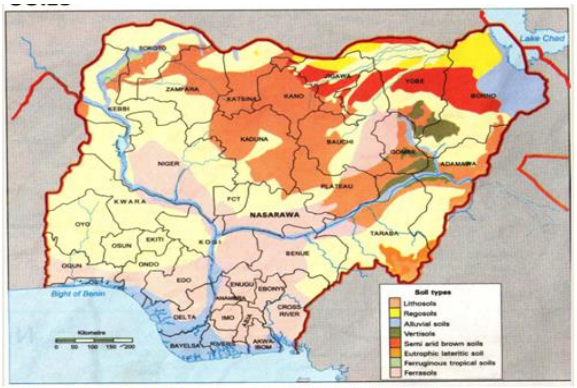

Figure 3 : Map of Nigeria showing Soil Distribution
Source: Longman Atlas, Second Edition

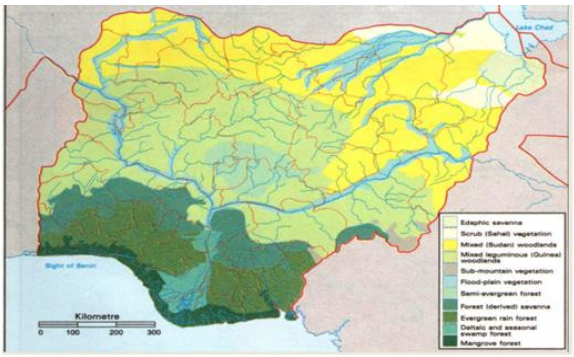

Figure 4 : Map of Nigeria showing the Vegetation
Source: Longman Atlas, Second Edition

Secondly, informal visitations were made to some selected locations for first hand observations, namely:

(i)Benin-Owina River Basin Development Authority (one of the federal government established and managed attempted mechanized agricultural projects scattered all over the country) expanse of farmlands in Edo and Ondo States (for Benin and Owina project respectively). The ambient/environments were carefully observed and willing staff interacted with in each location.

(ii)Two (2) rural farming settlements were visited in each of Ogun, Ondo, Edo, Anambra, Imo, Abia States and central part of Cross River State. The tillage practices of the farmers were observed.

(iii)Teaching and Research Farm of College of Engineering and Engineering Technology Micheal Okpara University of Agriculture, Umudike and National Root Crops Research Institute, Umudike.

RESULTS AND DISCUSSIONS

Observations revealed that there has been attempted mechanization of arable field crop production in the Nigerian Tropical Rain forest belt and that the failure of the attempts left negative ecological and socio-economic impacts in the environments attributable largely to insufficient work on the soil for sustained productivity.

Hence the rapid degeneration of the soil and the uneconomic outputs leading to the ceasation of production activities.

(1)The skill workforce in the River Basin: was in appropriately distributed for reasons of:

(a)Agricultural engineers specializing in mechanization was Nil while agricultural engineers, Technologists and Technicians in Civil work, design and repairs was 100 %

(b)Crop agronomist, irrigation agronomist and competent soil specialist was in proportion of 90 %, 5 % and 5 % respectively.

(c)Application of mulch and organic manure was Nil while application of inorganic fertilizers was 100 %, despite the repeated tillage of the land with ploughs and harrows in the Tropical Rain Forest Climatic conditions.

(d)State of the farm is failure with ill exploited and ill managed machinery littering the storing unit (a huge loss of passive energy).

(2)Visited farm settlements reveal high level of poverty and lack of educational expertise among the rural farmers using manual labour and implements.

Farmers are not aware of the need to incorporate grass mulch and/or organic manure to strengthen the soil physically and chemically. And the effects of gully erosion in exposed deforested areas were visible. Dry season cultivation is absent. These are contrary to literature presentation and some of the observations are shown in the plates below.

Plate 1: Exposed Land in Edo State.

Plate 2: Exposed Land in Ondo State

Plate 3: Gully Erosion in Imo State

Plate 4: Gully in abandoned farmland in Anambra State

Plate 5: sheet erosion in central Cross River State

(3)Some few machines have been invented and produced for seeding/planting arable crops like yam, cocoyam and cassava but the commercialisation of these as well as successfull year-in year-out production on the field is still a mirage.

The rapid degeneration of the soil can be said to be the negative effect of the state of the soil humus/organic, matter and water (both in the soil and frequent heavy rainfalls) which define so many physical and chemical features of the soil that needed conscientious attention and which unfortunately never got anything let alone a conscientious one. Looking at the distribution of the type of specialist and the competency level of the so-to-say specialist deployed in service in these attempted mechanized projects, the result of failure could not have been otherwise except there had been miracles.

With the level of mechanisation infrastructures provided in the government owned and managed projects, it is obvious that management skill was a huge problem creating inadequate understanding of soil machine – crop – climate relationship and the related dynamics.

Generally it takes an agricultural engineer to mechanise agricultural production but only such engineers with added specialisation in mechanisation (expolitation and management of engineering facilities) can have the adequate competency to manage field production works.

The activities of mechanisation go beyond inventing machines and repairs of broken down machines. It attracts high quality soil specialists, irrigation and drainage experts and facilities, genetical engineering of the crop species, application of chemicals, organic matter (in form of animal manure, grass mulch and dead plants and animals) etc. which must all be efficiently syncronised in optima level in one complex system of production activities.

The result statistics reveal clearly the inadequacies of the managerial skill that contributed immensely to the failures of the attempted mechanization of arable farming in Nigerias Tropical Rain Forest Belt.

In view of the Prevailing Technological and Socio- Economic Development of Nigeria, Crop production can be successfully mechanized to a high degree in the tropical rain forest zone, though it will require reasonable investment and good knowledge of soil-machine-plants relationship. Possibilities exist for this investment to be amortised and profit made if high yielding varieties of crops, high water consuming crops (e.g Yam, Cassava, etc) and all year round cropping (2 - 3 harvests) are implored. The question that readily comes to mind is, how? The answer is

founded on good water management through irrigation and drainage and on meticulous study and management of the soil, which will include slope adjustment, high level of administration of fertilizers, vegetal remains and grasses on regular basis (2 - 3 yearly) via deep mould board plough tillage (sub soiling). Although these are temperate region measures, it is practicable to adapt these measures in the tropical rain forest zone to economically mechanize production, [17]; [2]; [25].

However, the above' measures must be backed up with the use of biological materials with high productive capability and high degree of consumption and utilization of nutritive elements, that is, they should be able to withstand high degree of use of chemicals [16]. Also, the loose tropical soil ploughed to bury vegetal materials, must be mechanically compressed to guide against erosion and excessive leaching. All these measures represent improvement on the soil.

The use of heavy grass mulch, chemical fertilizers and animal manures can form the basis of development of new systems adapted to the rain forest zones. Grass mulches moderate the effect of the high temperatures; chemical fertilizers substitute the leached substances while the structuring of the soil is greatly improved by the application of lime and organic materials [15]. They have shown to be effective in holding stable aggregates together. Consequently the maintenance of the soil in good physical conditions is enhanced by periodic additions of organic materials [26] while the presence of binding agents or aggregating forces such as oxides of iron and manganese, soil compression under the weight of machines and some types of tillage help to improve the structure of the soil. The good structuring of the soil favourably influences the soil factors that determine its mechanized management.

Installation of overhead (Sprinkler and drip/trickle) Irrigation facilities in combination with sub-surface (tile drain) drainage facilities. This should be backed up by sub-soiling to incorporate vegetal materials once in 2-3 years using heavy mould board plough to a depth up to 60 cm [26]; [2]. The use of tile drains will ensure that percolating water is absorbed, collected, transported and emptied into designated basin or course. The irrigation and drainage will facilitate all year round cultivation thus providing for full exploitation of the machineries and quick recovery of the huge investments [8]. Studies have shown that the optimum soil humidity level for quality work of cultivation and safety of the mechanical implements or working organs is about 18- 21 % for loam soil but with a possibility range of 14 – 26 %. This is lower for sandy soils (10 – 20 % of the total capacity of the soil) [10].

Breeding and introduction of high yielding crops of shorter maturity period, of moderate height (possibly below 1.5 m) and possessing high water and nutrients consumption capacity [3].

Full mechanization of land preparation in the tropical rain forest zone with presently available temperate zone equipment. However, landscaping that will give the land the minimum gradient is very necessary and fundamental. A slope of 1 % and below would drastically minimize the velocity of run-off, thus facilitating adequate percolation, sub-surface draining and reduction in the erosive ability of the water [27]; [24]; [2].

Division of the farms into plots of optima dimensions that ensure economic efficiency for the movement of the machinery while preventing prolonged run-off. This will disfavour the erosion of the topsoil [26]. The light compression of the soil by the movement of the heavy farm machinery (being aggregating force) would also be advantageous to the structuring of the loose tropical rain forest soil.

The present engines, machines and implements available for farm works in advanced countries can be successfully adapted and implored to mechanize the planting/seeding of cassava stems (e.g. MPR-5(8), yam seeds (e.g. 4SaBp-62.5), all grains, legumes and fibrous crops on modelled (ridges or beds) and on flat soil surface, the application of manure and chemicals, the transplanting of seedlings and the processing of farm produce [14]. The harvesting of many of these crops can be semi-mechanized e.g.

the digging out of cocoyam tubers can be done with the use machine such as MRS-34, BM-6 and KS-6 while the picking can be done manually [22].

The loading and off- loading of transport vehicles with farm produce can be fully mechanized in the tropical rain forest zone.

The authors of this write up do not see the poor (so to say) economy of most tropical rain forest countries as fundamental issue that can hinder the introduction of mechanization at a greater level. In the present state of the world, manpower can be acquired through exchange programmes [20]. What is lacking is determination and will. Therefore, skilled manpower is not a fundamental problem that can hinder the development of mechanization in tropical rain forest countries. However, the state of technological advancement of the society exercises great influence on the expansion of mechanization of farm/field operations because mechanization must be strongly supported by high level of use of chemicals and genetic engineering amongst others.

The development of varieties of yam that can produce many yam tubers of reduced sizes just like cocoyam and similitude of mini-set yam) will guarantee the mechanization of the harvesting of yam, and of course, available machines for the harvesting of sugar beets, e.g. MRS-3T, KS-6, BM-6, CRS-2, E-684 can be adapted to harvest cocoyam and similar tropical crops. The production of cocoyam can be fully mechanized with minimum difficulties (seeding to harvesting and transporting) at the level of the economic and technical development in the tropical rain forest zones including parts of Nigeria.

The government should put the specialist together (no matter how few the numbers) and fund research into the mechanization of tropical rain forest soil and crops by establishing functional Agricultural Mechanization Research Centers.

The agricultural mechanization research center should be funded through an agricultural mechanization development bank. The bank should be legislated to operate on strict economic profit oriented basis with the capability of amortizing the initial fixed and working capitals and sustaining itself fully.

The lateritic or podsolic soil usually associated with rain forest is characterized (in its natural state) by very low base, an organic layer of raw humus and a loose structure in the mineral A-horizon. The application of lime and chalk will correct the lime deficiency, enhance decomposition of raw humus and promote the development of crumb/structure [12].

A good rotation between arable and grass crops will facilitate a fairly high level of productivity of rain forest soil under permanent cultivation otherwise there would be a rapid degeneration of the soil [7].

CONCLUSIONS

Agricultural mechanization is a very broad and complex subject which goes far beyond just buying tractors with few implements and machines. It requires strict economic and technical planning with due respect to ecological potentials because losses associated with failure of attempted mechanized farm projects are often enormous and of long time effects, financially and ecologically.

With conscientious planning/management based on more meticulous study and management of the soil (including its humidity) field agricultural works can be economically mechanized.

Application of irrigation for dry season cultivation and drainage for wet season cultivation will generate all year round use of the machinery and implement as well as result in multiple harvest. This will facilitate increased surface area cultivated and greater intensification of production. In consequence, more hands would be employed, there would be a higher level of agro-industrialization and there would be more, better and cheaper food items for the populace. Finally, there would emerge a better society.

It is our view, therefore, that only efficient mechanization can guarantee expansive and intensive crop production needed to cope with the demands of the ever-increasing world population. It represent the cheapest way the tropical rain forest people can hope to

improve their standards of living compared to the alternatives which are the importation of food items and the use of traditional subsistence method.

With all practical intents, good will and determination field work can be successfully mechanized to a higher degree at the present level of education and economic development of the Nigeria in its tropical rain forest areas.

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STUDY ON THE PRODUCTION AND COMMERCIALIZATION OF SUGAR BEET AT NATIONAL LEVEL AND BY REGION OF DEVELOPMENT IN ROMANIA

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Abstract

This paper examines the evolution of the production and marketing sector of sugar beet in Romania, since 2007 until now. The main indicators analyzed are: the area cultivated with sugar beet; sugar beet production; average production per hectare of sugar beet; the average acquisition price for sugar beet and sugar beet imports. The statistics which were the basis of the survey were taken from the National Institute of Statistics and FAOSTAT. This study highlights especially the quantitative changes recorded in the production and marketing of sugar beet. This sector has a particular importance, as it provides the raw material for sugar production for human consumption. Romania has favorable conditions for sugar beet production and is foreseen an increase in acreage starting with 2017, when the quota will be removed and the sugar market will be liberalized.

Key words**:** *sugar beet, sugar beet production, average acquisition price, development regions*

INTRODUCTION

Sugar beet is mainly grown for the roots which through processing generate two product categories: sugar (main product); the pulp and molasses (by-products). Romania has three agro-ecological zones for the cultivation of sugar beet: Central Zone, West and South Plains and Moldavia. Unlike other crops, sugar beet cultivation requires certain conditions, especially on soils, such as: soils with high fertility; soils with increased water retention capacity; well-structured soils; soils rich in humus. Industry experts recommend the following types of soils for sugar beet: chernozem soils; alluvial sandy loam; red brown soil of woods. Regarding groundwater, it is recommended a depth of 2-4 m. An important element is the ph, which is indicated to be between 6.5-8.0. Sugar beet culture is important because, it ensures favorable conditions in order to: keeping water in the soil; practicing crop rotation; improving natural soil fertility, etc. [11]
Before 1990, in Romania were cultivated large areas of sugar beet (100,000 ha). Sugar beet production achieved before 1990 was 6.7 million tons. The sugar beet production achieved nationwide, provides the raw material for more than 30 sugar production factories. The sugar obtained provides the necessary for domestic consumption. After 1990, we witnessed a decrease of cultivated agricultural areas, of productions achieved and quality. [1]
Currently, sugar beet acreage decreased considerably compared to 1989 but a surface increase is predicted after 2017 [15].
In this context, the paper aimed to analyze the dynamics of the production and marketing sector of sugar beet in Romania in the period 2007-2015 using the following indicators: the area cultivated with sugar beet, sugar beet production, average production per hectare of sugar beet, the average acquisition price for sugar beet and sugar beet imports.

MATERIALS AND METHODS

For the study were taken and processed statistics from the National Institute of Statistics and FAOSTAT. The analysis of the production and marketing sector of sugar beet was based on a range of specific indicators,

such as area cultivated with sugar beet; total production of sugar beet; average production per hectare of sugar beet; the average acquisition price for sugar beet and quantitative and valuable imports of sugar beet. In order to achieve a more realistic analysis of the production and marketing sector of sugar beet nationally and by region of development were consulted numerous specialty materials.

RESULTS AND DISCUSSIONS

In Romania, the vegetable sector in the period 2007-2015, was marked by a series of major changes that have made their mark directly on the evolution of agriculture in our country. [4]
In Table 1 is evidenced the area cultivated with sugar beet nationally and by region of development in 2007-2015. Currently, in Romania sugar beet crops occupy 9.17% of the surface registered in 1989. [7]
Nationally, in 2015, the area cultivated with sugar beet dropped by 7.5% compared to 2007. From the data presented, we can easily observe that in 2014 in Romania was the largest area cultivated with sugar beet (31,280 ha),from the analyzed period. In the European Union, in 2014 were planted with sugar beet 1,550,000 ha and Romania held a share of 2.01% of the area cultivated. [8]
At the level of development regions, the largest surfaces planted with sugar beet can be found in the Central Region and in the North-East Region. The largest acreage in the Central Region was 12,003 ha (2014), and for the North-East Region was 10,253 ha (2012). In the South-East Region were cultivated the lowest sugar beet areas. They ranged between 147 ha - 801 ha. In 2008, in the South East Region was registered the smallest acreage of sugar beet (147 ha). In 2015 sugar beet acreage in this region fell by 42.2%. In the Western Region is observed a substantial increase from 461 ha (2007) to 2,965 ha (2015).

Table 1. Surface with sugar beet in the main development regions in Romania (ha)

Specification	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015/2007 (%)
Romania	28,730	20,445	21,329	22,029	18,816	27,303	28,144	31,280	26,591	92.5
NORTH-WEST Region	7,069	5,332	5,668	4,922	3,029	4,492	4,212	5,637	5,282	74.7
CENTRAL Region	9,477	6,857	7,696	9,384	8,833	9,316	11,697	12,003	9,139	96.4
NORTH-EAST Region	11,154	7,463	7319	7156	5909	10253	9143	10009	9057	81.1
SOUTH-EAST Region	256	147	-	-	228	796	801	493	148	57.8
WEST Region	461	643	641	562	790	2436	2291	3084	2965	643.1

Source: [6] ; own calculations

According to official data, currently in Neamt county the area cultivated with sugar beet has a share of 40.0% of the area cultivated with beet in Romania. Currently, in Romania, the average area operated in a sugar beet farm reached 24 hectares, more than twice the average recorded in the European Union, which is 10 ha.
Since 2016, in Romania, 250 hectares were cultivated with ecological beets by Agrana Romania. For 2017, it is foreseen a doubling of the area planted with ecological sugar beet [2, 12].

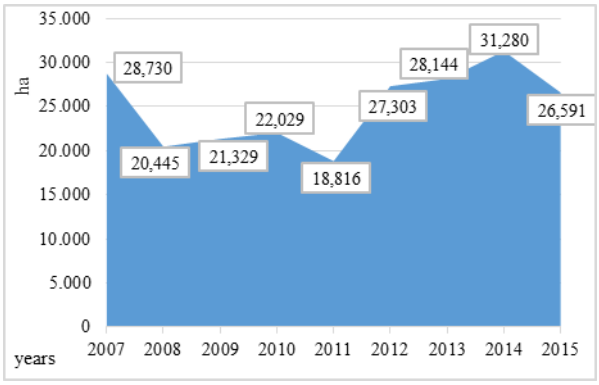

Fig.1.The dynamics of the surface with sugar beet in Romania
Source: [6]

The achieved production of sugar beet is important because it influences the production of sugar made nationwide. The evolution of sugar beet production nationally and in the main producing regions is presented in Table 2. Nationally, in 2007-2015, it is revealed an oscillation of the sugar beet production (fig. 2). Nationwide the production of sugar beet grew in 2015 by 38.9% compared to 2007. This increase is mainly due to the average yield per hectare. However, in 2015, were achieved lower productions compared with 2014, due to drought which negatively impacted the agricultural production. In 2014, it was achieved the highest production of sugar beet (1,398.5 thousand tons) during the analyzed period. The production achieved in 2014 is 35.8% higher than the production in 2013. In 2014, some counties have contributed substantially to the achievement of sugar beet production, such as: Covasna (14.0%); Neamţ (12.2%); Mureş (11.9%); Braşov (11.5%) and Satu Mare (10.2%). [9, 14]

Table 2. Production of sugar beet achieved in the main producing regions of Romania (thousand tons)

Specification	2007	2008	2009	2010	2011	2012	2013	2014	2015
Romania	748.8	706.6	816.8	837.8	660.4	719.7	1,029.2	1,398.5	1,040.6
NORTH-WEST Region	234.6	221.5	249.3	255.3	121.5	130.0	150.0	238.3	204.5
CENTRAL Region	275.5	232.1	318.3	313.7	304.6	253.8	459.8	587.1	385.9
NORTH-EAST Region	226.9	221.7	225.5	243.5	183.3	237.3	310.3	384.1	318.1
SOUTH-EAST Region	1.3	6.6	-	-	11.3	24.4	30.8	21.6	5.9
WEST Region	6.1	24.4	23.3	25.2	39.3	73.9	78.0	166.8	126.0

Source: [6]

The Central Region ranks first in terms of achieved production of sugar beet. This was determined by the large areas attracted in culture and by the high average production per hectare. In the Central Region the highest production was registered in 2014 (587,100 tons). The smallest production of sugar beet production in this region was 232,100 tons (2008). In 2015, sugar beet production in the Central Region recorded an increase of 40% compared to 2007. In the North West Region, in 2015, was encountered a decrease in production of sugar beet by 12.9%. This was mainly due to reduction of sugar beet acreage. As expected, very small productions were recorded in the West Region and in South-East Region.

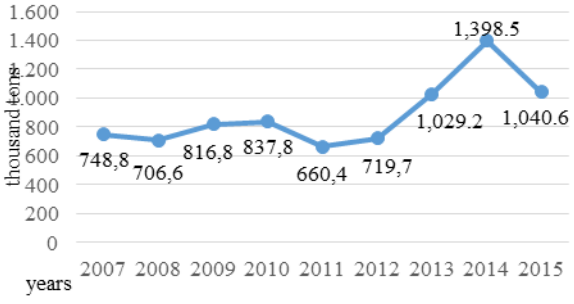

Fig. 2. The dynamics of sugar beet production in Romania
Source: [6]

In 2015, the sugar beet production in the Central Region recorded an increase of 40% compared to 2007. In the North West Region, in 2015, was recorded a decrease in production of sugar beet by 12.9%. This was mainly due to the reduction of sugar beet acreage. As expected, very small productions were recorded in the West Region and in the South-East Region. The sugar beet production achieved nationwide, is taken up and processed by the four sugar factories, namely: Roman, Ludus, Oradea and Bod. [14]

The average production per hectare of sugar beet has a major importance, in terms of total production achieved nationwide. In the data presented, we see that, the average production per hectare has fluctuated from year to year (Table 3 and Fig. 3). In Romania, in 2015, the average production per hectare of sugar beet, has registered an increase of 50.1% compared to 2007. The highest yield per hectare in Romania, was registered in 2014 (44,711 kg/ha). This average of sugar beet production achieved in 2014 is below the average in the European Union (74 tons per hectare). In 2014, England has achieved the highest average production of 96 tons per hectare. [8]

According to official data published in 2014, has been registered the highest production per

hectare of sugar beet in our country's history. It must be specified that, in 2014, some counties in Romania have achieved higher average production of sugar beet compared with the average achieved nationwide. Most representative of these counties are: Arad (+36.1%); Mureş (+22.1%); Galaţi (+20.8%); Sibiu (+11.1%) and Neamţ (+7.2%). [9]
At the level of development regions, in 2015, were recorded increases compared with 2007. The highest average production per hectare of sugar beet has been recorded in 2015 in the West Region (42,510 kg/ha). The smallest average production per hectare in 2015, was achieved in North-East Region (35,130 kg/ha).

Table 3. Average production per hectare of sugar beet achieved in the main producing regions of Romania (kg/ha)

Specification	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015/2007 (%)
Romania	26,065	34,564	38,296	38,036	35,103	26,363	36,569	44,711	39,135	150.1
NORTH-WEST Region	33,196	41,559	43,995	51,871	40,131	28,961	35,631	42,276	38,727	116.6
CENTRAL Region	29,077	33,854	41,372	33,434	34,495	27,254	39,316	48,921	42,232	145.2
NORTH-EAST Region	20,345	29,714	30,819	34,038	31,026	23,153	33,940	38,378	35,130	172.6
SOUTH-EAST Region	5,379	44,898	-	-	49,706	30,661	38,527	43,982	39,953	742.7
WEST Region	13,241	38,087	36,476	44,859	49,829	30,337	34,085	54,093	42,510	321.0

Source: [6]; own calculations

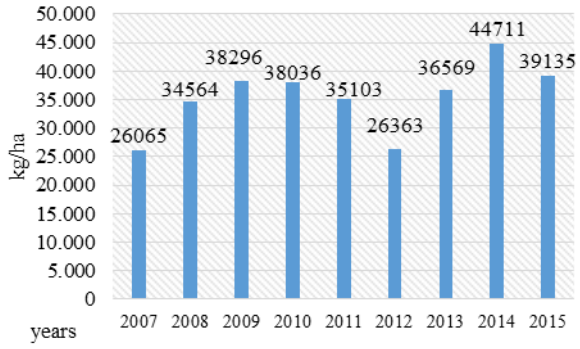

Fig. 3. The dynamics of average production of sugar beet per hectare nationally and by region of development (kg/ha)
Source: [6]

Production costs per hectare for the sugar beet depend on a number of factors:

- Production technology used;
- The cost of production factors;
- The cost of labor;
- Average productivity level. [5]

The average acquisition price for the sugar beet nationally and by region of development is presented in Table 4 and Fig. 4. In Romania, the average acquisition price for the sugar beet, in 2007-2009, has been framed on an uptrend. In 2010, we are witnessing a price decrease compared to 2009, by 7.7%. In 2011, there was an increase, compared to 2010, with 41.6%. Between 2011-2017, the average acquisition price for the sugar beet remained constant (0.17 Euro/kg). In 2014, it is registered a price decrease compared to 2013 (- 5.9%). In the interval, 2014-2015, the price remained stable at 0.16 Lei/kg. Nationally, in 2015, there was an increase in the average price of acquisition, with 77.7% compared to 2007. At the level of development regions in 2015 compared to 2007, there were increases in the average purchase price for the sugar beet between 33.3%-150%. The largest increase has been registered in the North-East Region, from 0.08 Lei/kg (2007) to 0.2 Lei/kg (2015).

Table 4. The average acquisition price for the sugar beet by development regions in Romania (RON/kg)

Specification	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015/2007 (%)
Romania	0.09	0.11	0.13	0.12	0.17	0.17	0.17	0.16	0.16	177.7
NORTH-WEST Region	0.09	0.11	0.12	0.12	0.16	0.15	0.16	0.13	0.12	133.3
CENTRAL Region	0.09	0.11	0.13	0.12	0.18	0.18	0.17	0.15	0.13	144.4
NORTH-EAST Region	0.08	0.08	0.13	0.1	0.17	0.17	0.18	0.19	0.2	250.0

Source: [6]; own calculations

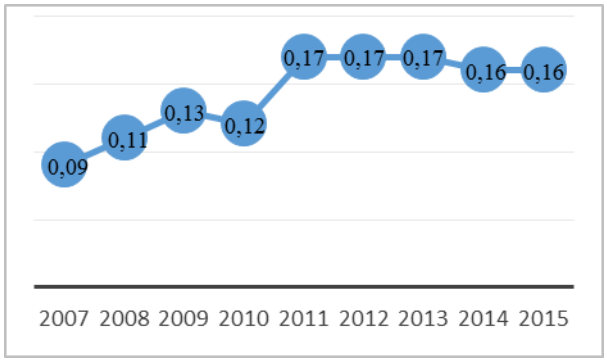

Fig. 4. Dynamics of average purchase prices for the sugar beet in Romania (RON/kg)
Source: [6]

Quantitative and valuable imports of sugar beet, in the 2007-2013 period had dealt with different developments from one year to another (Figure 5 and 6). The largest imported amount was 2,670 tons (2007). In 2008, according to official data, there were no imports of sugar beet. In 2013, the quantitative imports of sugar beet decreased heavily, reaching 111 tons. This situation demonstrates that, Romania produces enough sugar beet, in order to obtain sugar for consumption.

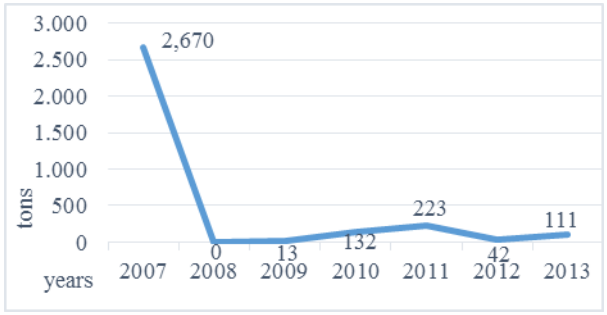

Fig. 5. Dynamics of quantitative imports of sugar beet in Romania
Source:[10]

Regarding the imports value of sugar beet in Romania for the period 2007-2013, it emerges, fluctuated from time to time. The most substantial imports value were recorded in 2007 (1,118 thousand $). The lowest imports value was recorded in 2009 and 2012 (8.0 thousand). In 2013, imports were very low value (41.0 thousand $), compared to 2007.

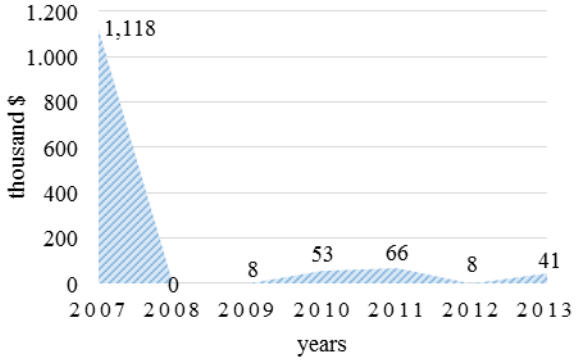

Fig. 6. Dynamics of valuable imports of sugar beet in Romania
Source: [10]

In Romania, the cultivation of sugar beet is supported through various forms of assistance, such as: the single area payment scheme, payment for young farmers, payment for agricultural practices beneficial for the climate and to the environment "greening payment", redistributive payment, simplified scheme for small farmers, coupled support scheme, transitional national aids, within the budgetary provisions allocated to MARD. [13].
In order to increase competitiveness of the productive and marketing sector of sugar beet, specialists in the field recommend the following:
- Use of monogerm varieties;
- Use of treated and pelleted seed;
- Reducing the use of pesticides according to EU regulations;
- The concentration of cultivated areas around the sugar factories, etc. [15]

CONCLUSIONS

After analyzing the production and marketing sector of sugar beet in Romania resulted the following:
-The area cultivated with sugar beet nationwide has decreased in 2015 (- 7.5%) compared to 2007 and at the regional development level has progressed differentiated from one year to another;
-Total production of sugar beet increased from 748 800 tons (2007) to 1040.6 thousand tons (2015). 2014 has been marked by the achievement of the largest production of sugar beet (1,398.5 thousand tons) in the analyzed

period;
-The average production per hectare of sugar beet has registered an increase in 2015 (+50.1%) compared to 2007. In 2014, it recorded the highest average production per hectare of sugar beet, of 44,711 kg / Ha. This average production achieved per hectare is below the average achieved at EU level. In terms of average production per hectare of sugar beet, at the level of development regions, in 2015, we had: the most significant production (42,510 kg/ha) in the Western Region and the lowest production (35,130 kg/ha) in North-East Region;
-Average acquisition price for the sugar beet increased in 2015 (+77.7%) compared with 2007;
-Quantitative and valuable imports have evolved differently from one period to another.

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ECONOMIC ANALYSIS IN VEGETABLE SECTOR OF ROMANIA

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Abstract

This paper emphasizes the main tendency in the vegetables field of Romania by examining economic indicators. The aim is to find the ability of the Romanian market to provide the necessary with vegetables. In order to answer to the question was analyzed total area, total production, average production, average prices, average consumption, import and export. The analysis was made for the period 2011-2015. The obtained results show a diminishing of indicators.

Key words**:** *analysis, vegetables, production, consumption, Romania*

INTRODUCTION

Development of Romanian vegetable sector is closely related to their economic importance and food for the population. To that vegetable sector is supported financially by the state. It provides financial support from European funds as follows: direct payment schemes (the Single Area Payment Scheme, payment for agricultural practices good for the climate and the environment, coupled support scheme; redistributive payment; simplified scheme for small farmers pay for young farmers); financial support for producer groups and producer organizations. Also, in order to support vegetable sector is given support from Romanian funds. These funds refer to transitional national aids, but also state aid for diesel used in agriculture [5, 11, 17, 22].

Furthermore, vegetable sector is sustained by Romanian geographic conditions remarkable for development of this field. [1, 21]

However, in the period 2011-2015 for which was made study Romanian vegetables sector declined. Only 60% of registered vegetable consumption nationwide is provided by domestic production. This means that 40% of consumption of vegetables is provided by imports. [22]

Vegetables from imports are more varied than those derived from domestic production. According to analyzes conducted at the vegetable market in Romania, it was found that diversification of vegetables do not contribute significantly to the growth in domestic consumption. [3, 18]

At the national level consumption of vegetables is lower than the recommendations of specialists in nutrition, although, their consumption brings many health benefits. [4, 18]

According to a study conducted at EU level, for 2014, it was found that Romania ranks last in the ranking on the consumption of fruit and vegetables. The first places in the ranking are: Greece, Croatia and Slovenia. [8].

The objective of the paper was to analyze the trends in the vegetables sector of Romania by means of the following indicators: total cultivated area, total vegetable production, average production, average prices, average consumption, import and export. The analysis was made for the period 2011-2015.

MATERIALS AND METHODS

The economic analysis in the vegetable field was made taking into consideration the

currently statistical data. At the nationwide were consulted statistical data provided by National Institute of Statistics of Romania. Also, in order to highlight in a more realistic main trends of Romanian vegetables market was analyzed imports and exports using data from Food and Agriculture Organization of the United Nations. In this paper used a range of indicators such as vegetable area on main of categories, vegetable production and purchase prices for certain categories of vegetables; the average monthly consumption of vegetables per person; the average monthly expenditure for buying vegetables; imports and exports of vegetables.

RESULTS AND DISCUSSIONS

The analysis of data in the vegetables field provides the status of this sector. At nationwide vegetables area declined with 10.5% in 2015 compared to 2011. The area cultivated with vegetables was had in downtrend, registering the smallest area in the year 2015 (Table 1). Largest vegetable area increasing was recorded in 2011 (263,359 ha). Unlike other European countries, in 2011, Romania presents an advantageous structure of the total area, according to the use land. In 2011, agricultural land accounted for 61.6% of the total. This year, the largest area was owned by vegetables. [12]

Table 1. Vegetables area in Romania, 2011-2015 (ha)

Specification	2011	2012	2013	2014	2015	2015/ 2011 (%)
Total vegetables	263,359	258,910	259,029	239,474	235,731	89.5
Tomatoes	51,754	49,655	48,369	43,857	43,738	84.5
Eggplants	10,020	9,577	9,359	9,209	9,058	90.3
Dry onion	33,125	33,050	32,245	30,305	30,642	92.5
Dry garlic	12,128	11,367	10,616	10,703	10,519	86.7
Cabbage and cauliflower	47,016	49,089	54,907	47,837	47,894	101.8
Peppers	20,002	19,947	19,491	18,241	18,154	90.7

Source: [20]; Own calculation

Also, in 2015 decreased areas cultivated with tomatoes (-15.5%); eggplants (-9.7%); dry onions (-7.5%); garlic (-13.3%) and pepper (-9.3%). The biggest decrease has been for the tomatoes due to lack of the processing of these. [5]

Therefore, the area cultivated with cabbage increased in 2015 compared 2011 from 47,016 ha to 47,894 ha in 2015. Anyway, can be observed that the area decreased for each of vegetable (Table 1). As a ranking in the top of vegetable areas cultivated are cabbage (47,894 ha); tomatoes (43,738 ha), dry onion (30,642 ha), dry garlic (10,519 ha) and eggplants (9,058 ha).

As respect the vegetables production registered oscillation of it. Achieved production nationwide with the main categories of vegetables is shown in Table 2.

Note that the total production of vegetables in 2015 decreased by 13.1% compared to 2011. This decrease in production is due, on the one hand because of diminishing of vegetables areas and on the other hand because of unfavorable climate conditions. In 2011, it was made the largest vegetable production (4,176,298 tons). According to official data published in 2011, the global resources of vegetables and vegetable products were increased compared with those in 2010. This was possible due to increasing production of vegetables. In 2011, production of vegetables conducted nationwide provided 73.5% of total resources. The smallest vegetable production was achieved in 2012 (3,535,316 tons) [11, 13].

The lowest productions were for tomatoes (-27.3%); eggplants (-20.8%); dry onion (-10.4%), dry garlic (-6.3%) and pepper (-12.3%).[3]

Table 2. Vegetables production, 2011-2015 (tons)

Specification	2011	2012	2013	2014	2015	2015/2011 (%)
Total vegetables	4,176,298	3,535,316	3,960,990	3,802,494	3,629,613	86.9
Tomatoes	910,978	683,282	749,128	706,200	695,188	76.3
Eggplants	160,010	126,005	123,278	127,578	126,755	79.2
Dry onion	394,305	345,340	391,837	386,989	353,622	89.6
Dry garlic	66,602	59,368	62,156	62,773	62,412	93.7
Cabbage and cauliflower	1,025,293	987,900	1,156,436	1,123,132	1,066,299	103.9
Peppers	253,505	207,072	227,.690	228,576	222,436	87.7

Source: [20]; Own calculation

In 2015, Romania held a 2.6% share of the total production of tomatoes done in the European Union. Top ranking tomato-producing countries in the European Union are occupied by: Italy (36.3% of total production); Spain (27.4%); Portugal (8%); Greece (6.2%); Netherlands (5%); Poland and France, each of them with five percent. According to data published in 2015,

[3] The period was taken into consideration is 2011-2015. Our calculation is a rapport between 2015 and 2011

Romania was placed 5th in the standings vegetable producing countries in the European Union. This position does not highlight the advantages of the high quality of the soil and climate in general. Romania held in 2015, accounting for 7.3% of the total vegetable production conducted in the European Union. First in this ranking is Italy (20.3%). The following places are occupied by Spain (17.2%); France (11.4%); Poland (9.1%). [9, 22]

In Romania, vegetables domestic production does not cover consumption needs for the population, especially in the case of early vegetables. [2]

The evolution of the average production for the main categories of vegetables at the nationwide is presented in Table 3. In 2015, compared to 2011 is a decrease of average production per hectare for these categories of vegetables: tomatoes (-9.8 %); dry onions (-3.1%) and peppers (-3.3%). Increases were registered for garlic dry (+ 8%) and cabbage (+ 2.1%). The lowest average production per hectare for all categories of vegetables was registered in 2012. The main factors that contributed directly to lower average productions per hectare were large snow fall, drought and lack of irrigation. [6]

Table 3. Average production of vegetables in Romania, period 2011-2015 (kilograms per hectare)

Specification	2011	2012	2013	2014	2015	2015/2011 (%)
Tomatoes	17,602	13,761	15,488	16,102	15,894	90.2
Dry onion	11,904	10,449	12,152	12,770	11,540	96.9
Dry garlic	5,492	5,223	5,855	5,865	5,933	108.0
Cabbage and cauliflower	21,807	20,125	21,062	23,478	22,264	102.1
Peppers	12,674	10,381	11,682	12,531	12,253	96.7

Source:[20]; Own calculation

For the period 2012-2015 average purchase prices for certain categories of vegetables in Romania are presented in Table 4. From the data it can be seen that for all categories of vegetables analyzed in the study, average purchase prices registered variations from one period to another. In 2015, it is observed that the average purchasing prices for vegetables decreased compared to 2012. The greatest reduction in the average acquisition price was recorded for tomatoes (-63.4%). The smallest reduction in the average acquisition price was registered in 2015 compared to 2012 to Kapia peppers (-9.7%).

Table 4. Vegetables average prices in Romania, period 2012-2015 (lei/kg)

Specification	2012	2013	2014	2015	2015/2012 (%)
Tomatoes	3.06	0.98	0.85	1.12	36.6
Kapia peppers	1.76	1.49	1.32	1.59	90.3
Capsicum	1.61	1.26	0.93	1.12	69.5
Fibber peppers	2.11	1.87	1.53	1.64	77.7

Source:[20]; Own calculation

Vegetable consumption level per capita in Romania is presented in Table 5. Consumption of vegetables is determined by many socio-economic factors, of which the most important are consumer income and age. [18]

Regarding the consumption of vegetables and canned vegetables in equivalent fresh vegetables finds that it was between 7.726-7.654 kg per person. In 2015, the category is ascertained an increase of 0.7% compared to 2011.

Table 5. Average monthly consumption of vegetables per person in Romania, 2011-2015 (kg)

Specification	2011	2012	2013	2014	2015	2015/2011 (%)
Vegetables and canned vegetables (kg)	7.597	7.575	7.617	7.726	7.654	100.7
Cabbage and cauliflower	0.779	0.74	0.798	0.83	0.791	101.5
Tomatoes	1.057	1.001	1.011	1.007	1.064	100.6
Peppers	0.404	0.42	0.395	0.405	0.427	105.6
Dry onion	0.838	0.834	0.847	0.853	0.879	104.8

Source:[20]; Own calculation

As regard average monthly expenditures of vegetables these are various in rural and urban. In 2015, at the national level the average monthly food costs were 190.3 lei per person and 506.0 lei per family. It finds an increase in the average monthly expenditure for purchase of vegetables and canned vegetables, from 12.06 lei (2011) to 13.9 lei (2015). In urban areas are achieved higher expenses for vegetables and canned vegetables than rural [7, 10, 16].

In 2015, in urban areas was performed monthly average cost per person of 19.04 Lei, while in rural areas only 7.9 lei. This situation is owed to the fact that the rural population cultivate in their gardens most of their vegetables necessary for both fresh consumption, but also to achieve cans consumed in winter.

Table 6. Average expenditure for buying vegetables in rural and urban area (Lei per person)

Specification	Area	2011	2012	2013	2014	2015	2015/2011 (%)
Vegetables and canned vegetables	Total	12.06	12.72	12.43	13.81	13.9	115.2
	Urban	16.78	17.56	17.46	19.31	19.04	113.4
	Rural	6.34	6.85	6.36	7.39	7.9	124.6
Cabbage and cauliflower	Total	1.29	1.52	1.38	1.4	1.76	136.4
	Urban	1.48	1.69	1.62	1.61	1.93	130.4
	Rural	1.07	1.32	1.09	1.15	1.57	146.7
Tomatoes	Total	2.41	2.8	2.59	3.23	3.01	124.8
	Urban	3.26	3.76	3.53	4.3	4.05	124.2
	Rural	1.38	1.63	1.47	1.97	1.79	129.7
Peppers	Total	1.26	1.43	1.35	1.58	1.54	122.2
	Urban	1.75	1.92	1.85	2.16	2.12	121.1
	Rural	0.67	0.84	0.75	0.89	0.86	128.3
Dry onion	Total	1.12	0.95	1.05	1.06	1.09	97.3
	Urban	1.51	1.3	1.45	1.48	1.47	97.3
	Rural	0.65	0.53	0.56	0.57	0.65	100.0

Source:[20]; Own calculation.

In 2015, one can observe an increase in the monthly average expenditure per person for various vegetable compared with 2012, as follows: cabbage and cauliflower (+ 36.4%); tomatoes (+24.8%); peppers (22.2%). The average expenditures per person for dry onions registered a decrease of 2.7%. The data presented in the above table can easily see that, in 2015, the biggest expenses in absolute terms was recorded for tomatoes (3.01 Lei) and the lowest expenses were for dry onion (1.09 Lei). The average monthly expenditures per person are influenced by many factors, among which: the pattern of food consumption; prices of various types of vegetables; income population.

Vegetable exports of Romania for the period 2011-2013 are presented in Table 7. According to official data, in 2012 vegetable exports were 63,150 tons compared to 88,759 tons in 2010. This highlights vegetable exports decrease, which affects directly the economy. [13]

Table 7. Quantitative vegetable export, 2011-2013 (tons)

Specification	2011	2012	2013	2013/2011 (%)
Vegetables, freshness	680	546	446	65.5
Cabbages and cauliflower	587	276	361	61.4
Tomatoes	1719	2990	2793	162.4
Pepper	29	61	62	213.7
Onions, dry	1866	1527	2904	155.6
Eggplants	308	232	175	56.8
Garlic	220	70	54	24.5

Source:, [14]; Own calculation

In 2015, exports decreased compared to 2011. The largest amount was exported in 2011 (680 tons), and the smallest amount was exported in 2013 (446 tons). In 2015, it is found that the highest exports were recorded for tomatoes (2,793 tons) and dry onion (2,904 tons). In contrast, there were quantitative exports much lower for cabbages and other brassicas (361 tons); eggplants (175 tons); pepper (62 tons); garlic (54 tons).

Value vegetable exports of Romania for the period 2011-2013 are presented in Table 8. Exports value for various categories of vegetables recorded the differential evolution from one period to another. Exports highest values were recorded for tomatoes. This grew from 1,918 thousand dollars (2011) to 2,785 thousand dollars (2013). The increasing is due mainly to the large amounts of tomatoes exported. The value tomatoes export increase with 45.2%.in 2013 compared to 2011. Low value exports in 2013 were recorded for: pepper ($ 552,000); freshness vegetables ($ 326,000); eggplants ($ 284,000); garlic ($ 167,000) and cabbages ($ 149,000).

Table 8. Value vegetable export, 2011- 2013 (thousand dollars)

Specification	2011	2012	2013	2013/2011 (%)
Vegetables, freshness	862	384	326	37.8
Cabbages and cauliflower	217	120	149	68.6
Tomatoes	1,918	2,890	2,785	145.2
Pepper	259	527	552	213.1
Dry onion	1,395	737	970	69.5
Eggplants	332	333	284	85.5
Garlic	839	187	167	19.9

Source: [14]; Own calculation

Imports of vegetable are presented in Table 9. It found that in 2011, imports of vegetables and vegetables products was 6.9 times compared to exports. This situation reflects negatively on the trade balance and not the least on the national economy. In 2011, the highest share in the import of vegetables had tomatoes with 43.4%. Dry onion held a share of 13.3%, in the same year [19].

Table 9. Quantitative vegetable import of Romania, 2011-2013 (tons)

Specification	2011	2012	2013	2013/2011 (%)
Vegetables, freshness	15,228	12,048	13,435	88.2
Cabbages and cauliflower	18,691	20,972	15,261	81.6
Tomatoes	47,514	41,469	45,033	94.7
Pepper	2,018	1,476	1,345	66.7
Onions, dry	45,179	38,332	38,510	85.2
Eggplants	2,368	1,519	3,265	137.8
Garlic	3,270	2,123	2,445	74.7

Source:[14]; Own calculation

Mainly, Romania has imported vegetables

from Turkey (28,424 tons tomatoes), Egypt (14,921 tons onion), Macedonia (12,638 tons cabbage), China (1,564 tons garlic) [7].
According to statistical data, Romania has imported 431,424 tons vegetables in 2012 compared to 330,481 tons in 2010. Also, in 2013 vegetables import decreased compared to 2011, exception being eggplants [15].
As regards the import value in the vegetables sector of Romania these are various from year to year (Table 10). The most important value obtained to tomatoes from 40,271thousand dollars (2011) to 44,805 thousand dollars (2013).

Table 10. Value of vegetable import of Romania, 2011-2013 (thousand dollars)

Specification	2011	2012	2013	2013/2011 (%)
Vegetables, freshness	9,340	6,597	8,201	87.8
Cabbages and cauliflower	3,918	4,098	3,747	95.6
Tomatoes	40,271	37,182	44,805	111.2
Pepper	7,266	7,382	7,707	106.0
Onions, dry	12,253	6,641	11,005	89.8
Eggplants	1,721	1,457	2,443	141.9
Garlic	4,576	3,733	4,468	97.6

Source: [14]; Own calculation

The economic analysis of the value of import shows a decrease on total vegetable sector (87.8 %). These decrease registered to cabbages (95.6%), dry onion (89.8%) and garlic (97.6%). Also, it can be noted increasing the value of the import to tomatoes (11.2%), peppers (6%) and eggplants (41.9%). Anyway should be mentioned that the value of import depends by many factors such as quantity imported, vegetables price and self sufficiency in vegetable sector of Romania.

CONCLUSIONS

Analyzing the economic indicators can argue that Romanian vegetable sector decreased in the period 2011-2015. It can note that vegetable area and production decreased. As regards vegetables area registered a diminishing by 89.5% in 2015 compared to 2011. The biggest diminishing was to tomatoes (84.5 %) and dry garlic (86.7%). The only increase was to cabbages (1.8%). Also, has decreased average vegetable production to tomatoes (90.2%), dry onion (96.9%) and peppers (96.7%). Some increase registered to dry garlic (8.0%) and cabbage (2.1%). These have had a negative influence on the total vegetable production that decreased.
It found that quantitative vegetables export decreased in 2015 compared to 2011 (from 680 tons to 446 tons). In 2015, the highest exports were recorded for tomatoes, peppers and dry onion.
As regards export value declined in total vegetable export especially to cabbage, dry onion, eggplants and garlic. Therefore, the quantitative vegetable import decreased in the period analyzed. From quantitative point of view imports are higher than exports which mean that domestic production of vegetables made not cover consumption needs of the population. Anyway, Romania's exports of vegetables can grow because of positive geographic allowing the cultivation of vegetables on favorable terms, tradition and farmers ability. Other conclusion refers to prices average procurement for certain types of vegetables which have decreased significantly in 2015 compared to 2012.

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DEFOLIATING INSECTS IMPACTS ON FOREST ECOSYSTEMS

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Abstract

The impact on forest ecosystems caused by insect has two components, one ecological and one socio-economical. Ecological component relates to the effects of environmental parameters overview of the stands, with direct results in time on individual trees, as on the other components of ecosystems. The socio-economical component of the impact shows how these effects influence the forest resources including the productive ones and the aesthetic recreational ones. While the socio-economic value is expressed in units of currency/unit area (euro/ha), the environmental impact can be expressed in terms like: modifying the composition stands, reducing density, reducing annual growth rate or period etc. Each of these two components of the impact can be treated after the effect of time on the ecosystem, namely: long or short. At the level of forest ecosystems, with a complexity and objectives of management different, the concept of short or long term, is quite relative, so that below will not be explicit reference to the mode of action in time of the defoliators effects but only on each component of the forest ecosystem.

Key words: *forest, defoliating insects, ecosystems, types*

INTRODUCTION

The trees, like the main components of the forest ecosystem, following the loss of foliage primary due to defoliating insects, they become forced to produce a new line of foliage at the expense of reserve substances accumulated in previous years. This additional power consumption leads to depletion of reserve substances and debilitating the trees body, as biological unit. This presents some morphological and physiological changes with direct implications on the assimilatory trees. Amid these physiological weakening trees become more sensitive and vulnerable to various pathogens [37-41] attacks (*Oidium, Armillaria, Fomes*) which start the stress before the defoliating rushing dieback. At the same time it is created propitious conditions to mass propagation of various secondary pests already present in the ecosystem endemic with pests such as bark or wood fructification.

In these circumstances it lowers the productive capacity of the ecosystem to significant reductions in the increase in radial and axial tree and also by the fierce competition in air and ground, specific floor trees being advantaged trees species that are not hosts or that are defoliation, usually less valuable economically. In these circumstances it can capture additional growth of these trees that are not hosts, on the whole, does not cover losses in value of defoliated trees.

MATERIALS AND METHODS

Through gradual depletion of defoliated trees repeatedly reduce their reproductive capacity and default fructification. Seed production decreases quantitatively, by thinning the year fructification and reduce the abundance and quality, reducing seed germination by potency or attack of various fructification pests. In this way stand capacity for natural regeneration diminishes or becomes impossible.

On repeated defoliation, produced by chaining various defoliation gradations, stand density decreases on account of the species of trees dry in time the preferred tree species by defoliation. In this way, it contributes in printing the defoliation direction and rate of vegetation succession in the ecosystem and first floor of the trees [3-7, 35].

However, due to changes in environmental conditions within the forest (more light and

heat), it produces changes in the undergrowth structure. Under these conditions, floor undergrowth can fade over time or can be replaced with special light, with serious implications on the stability of the ecosystem and biodiversity [10-17, 32-34].

RESULTS AND DISCUSSIONS

At the herbaceous forest also occur significant changes in coverage soil composition and is dominating one or another species. Usually species of forest flora signs are replaced with perennial grasses with high coverage, which makes it impossible to bring the tree to natural regeneration.

Photo 1. Pheromone traps in combating defoliators Ord. Coleoptera (Original photo)

In such conditions, the pressure is intensifying in grazing and in the forest increase the risk of burning, with the most disastrous effects.
The other component of forest ecological communities, fauna and entomofauna - suffering obvious changes in the general economy with negative effects on the ecosystem as a whole [18-23]. Thus, hunting target quantity diminishes through migration or natural enemies fall easy prey, but also by lack of proper food quality and intensifying the consangvinity phenomenon [22, 32]. Amend also the specific game by focusing the temporary composition of predators, who are doing well in a stand more rare.
The worsening of nesting, in such conditions lowers useful bird populations and even some insects [24-31]. Also worsen conditions species nests of ants of the genus Formica. In such conditions gradations decreases resistance to various pests forest ecosystem, which develops more frequently and more intensely.
In establishing relationships between components of biota affected by defoliation and structural changes of this, they have an important transformations role that occur in the stationary factors (biotype), the interconnections with biota. Inside ecosystem under the defoliators impact produced on the first floor of trees, the amount of heat and light grows, intensifying air movements and also the air components, decreases the amount of heat and light increases, it intensify air movements and also the composition of the air decreases the atmospheric humidity and increase the bioactive length. Edaphic factors also suffer changes with further implications on biota, reduce organic horizon quantitatively (thickness) and quality by reducing the humification process soil content changes in nutrients and trace elements, it changes the pH of the soil under the impact of caterpillar excrement, worsening soil structure and porosity directly related to grazing. Increasing temperature and increasing the light intensity at ground level has direct influence on increasing evapotranspiration and even intensifying breathing roots.
Surface water from reservoirs (lakes, ponds, rivers, etc.) inside forests affected by defoliation, suffer transformations evident by increasing temperature and pH, the unfavorable influences on plankton and aquatic fauna.
The most important method to determine the presence and evolution of insect biological control method using pheromone traps. This method consists in using different race types (panel, funnel tetratrap) provided with bait containing specific pheromone synthetic defoliator [7,14,20].

Photo 2. Pheromone traps in combating defoliators Ord. Lepidoptera (Original photo)

The installation of these types of pheromone traps is made all spruce and fir stands of these species or mixed with beech, spruce and fir that provide over 30%, no matter the age stands. The location field racing takes place before the flight, this time differs from one area to another, depending on altitude and latitude forests monitored.

CONCLUSIONS

Socio-economic impact, although difficult to ascertain, involves considering the following:
-reducing the increase in volume of defoliation tree remained in the biotope [2,8,36],
-loss produced by extracting prematurely dried trees, taking into account the inferior varieties gathered,
-loss produced by forced promotion of quantitatively lower essences.
-the costs of artificial regeneration mandatory in such conditions [1,9], (without stand wounded fruition, grassy ground) or ecological reconstruction of these arboreta,
-the costs of additional work for screening, prognosis, quarantine and various gradations combat new pests,
-the costs for creating and implementing new technologies for the management and care of such arboreta.
In addition to economic considerations listed above, the social impact is hard to quantify defoliators and requires consideration of establishing the protective role played by this stand, as well as diminishing their aesthetic and recreational role.

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NOCTURNAL LEPIDOPTERA CAPTURED DURING 2013-2015 IN THE SPECIFIC AREA SIBIEL-SIBIU (ROMANIA)

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Abstract

The paper presents the abundance of species of nocturnal Lepidoptera that favorable environmental conditions may constitute a danger to crops near the pasture analyzed. Capturing harmful insects by using trap light years in the period 2013-2015, contributes to protecting the environment and thus eliminate the use of pesticides in soil persistence that can be used to combat pests of crops, and to establish optimal combat moments when treatment it is justified economically.

***Key words*:** *Lepidoptera*, *capturing, environment, Sibiel-Sibiu, Romania*

INTRODUCTION

Anticipating the time of appearance and multiplication of pests, it is necessary to assess the composition of the cohabitant structure a meadow ecosystems biodiversity of crops in the vicinity of the village of Sibiel located 22 km from Sibiu.

Sibiel village is recognized as an old tourism settelment in Sibiu Surroundings situated 22 km from Sibiu [1]. The whole village Sibiel belongs the Cibin basin in form of a triangle pointing Bărcu Roșu Hill 1400 m alt. It is bordered in the south and southeast of Orlățelului springs, creeks which flow gather on the left side that spring from them Cacova forests and then discharged into the river Orlat a total length of 15 km. In the west, NV triangle bounded by the river right branch of Sibiel river whose headwaters are and where the Red Bărcu reap streams: Scoroşet, Săroaia Fortress Valley, Uţii Valley.

MATERIALS AND METHODS

This method consisted of installing the light trap in one place in a meadow those of 3000 m^2 in the village of Sibiel [6,11,15,33,36,], could draw such conclusions on the insect population density variation with nocturnal flight. To determine the structure, abundance, species Lepidoptera [30-39] numerical fluctuation night, valuations were performed by using trap light collection.

During operation trap light between the years 2013-2015, at regular intervals, were recorded number of seizures, results, observations and interpretation curve flight dominant species collected. After the curve flight Lepidoptera in relation to the biology of species, frequency of rises catches, the traps have provided data on the appropriateness of applying the treatments to combat grassland crops from neighboring areas analyzed [12,13,15,40,45].

It watched inventory pest, establishing distribution area, highlighting the activity is flying and sometime in the life cycle, the alert warning time for establishing optimum periods of combat.

Photo 1. Meadows of 3000 m^2 in the village of

Sibiel (Original Photo)

Comparing data on flight dynamics between different generations of a pest species in one year, and the flight curves set in different years, are elements of guidance on pest populations increase and decrease [24-26].

RESULTS AND DISCUSSIONS

In the three years of observations were collected specimens grouped in seven families (Table 1).

Climate conditions specific to each year have influenced the number of species collected. The low number of Lepidoptera copies since 2013-1093 due to large amounts of rainfall 497 mm-450 mm and low average temperatures 14-15.5°C. In 2014, year of low rainfall 147.5 mm and average temperature 15.6°C, observed in capturing the highest abundance for customized Lepidoptera-7,441 individuals.

Table 1. Family of nocturnal Lepidoptera capturing in the period 2013-2015

No. crt.	Family	Number of species	Number of samples	%
1	**NOCTUIDAE**	21	5651	75.6%
2	**GEOMETRIDAE**	8	624	17.3%
3.	**ARCTIIDAE**	5	985	11%
4.	**SPHINGIDAE**	3	67	0.7%
5.	**NOTONTIDAE**	2	57	0.8%
6.	**LASIOCAMBIDAE**	2	23	0.3%
7.	**PYRALIDAE**	1	34	0.4%

Photo 2. *Xestia c. nigrum*

Lepidoptera species dominated the Fam. Noctuidae: *Xestia c. Nigrum* (Photo 2), 944 copies of which 231 copies, 28.1% (2013), 264 specimens, 23% (2015). *Agroti segetum* (Photo 3), - 354 samples of which were 147 copies collected in 2015.

Photo 3. *Agroti segetum*

Subfamily Plusiinae: *Autographa gamma (Photo 5)*, - 672 copies, flying upward in June to 36 copies-17.9% (2014) 45 copies-3.1% in August (2015).

Subfamily Amphiperinae: *Oligia strigilis* (Photo 4), - 268 copies of which 127 copies were seized in 2013.

From table 1 it is observed a large number of lepidopteran belonging to the Fam. Actiidae-11.0% in 985 copies, with 354 copies flight in July-August to 12.8% and 276 copies- 11.2%.

Photo 4**.** *Oligia strigilis*

Dominated species: *Phragmatobia fuliginosa* (Photo 6), 132 copies-4.8%, *Spilosoma lutea* (Photo 7), 124 copies, 4.3%.

Photo 5. *Autographa gamma*

Photo 6. *Phragmatobia fuliginosa*

Photo 7. *Spilosoma lutea*

Collecting fauna by this method is representative of Lepidoptera [2-10, 16-29, 40-42] species and for other groups of insects, beetles (*Carabidae, Coccinelidae, Elateridae*), contributing to improving knowledge of entomofauna useful in the study area[14,43-47].

Most species of flying upward in August, the month with average temperatures of 16.5% and low rainfall, species *Xestia c. nigrum* had two generations better distinct a flight without interruption in July, 208 copies peak for the year in August-286 copies (2013-2015). *Oligia strigilis*, one generation in June with a maximum of 120 copies-catching 44.2% in 2013. Depending on weather conditions, constant activity showed the following species.

CONCLUSIONS

The abundance of species in seizures showed Fam. Noctuidae (Table 2): *Xestia c. nigrum*-218 copies, 29.8% in 2013, 122 copies-24% in 2014, 154 copies -17.8% in 2015.
Autographa gamma: 144 copies in June, with a total of over 342 copies between 2013-2015
Agrotis segetum: total 138 copies: 114 copies, 34% in 2013 and fewer, 122 copies in 2015.
Climatic factors characteristics of each I have fluctuations in the number of species affected. Flight upward for most butterfly seen in June and August when average temperatures were 16.9^{o}C and low rainfall.
The presented method helps knowledge of the fauna in the area Sibiel Sibiu, lepidopteran species but also those of Diptera and Coleoptera. After the captured abundance crop treatments were carried out in the area.

Table 2. The abundance of species in seizures showed Fam. Noctuidae

No.crt.	Species	Month	2013	2014	2015	Total
1.	*Xestia c. nigrum*	July	95	37	76	208
		August	123	85	78	286
2.	*Agrotis segetum*	June	18	6	43	67
		August	23	13	35	71
3.	*Autographa gamma*	June	15	82	47	144
		July	47	11	43	101
		August	52	13	32	97
4.	*Oligia strigilis*	May	32	7	73	112
		June	24	2	94	120
TOTAL			429	256	521	1206

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ASSESSING ALLOCATIVE AND ECONOMIC EFFICIENCY OF FARM AT REGIONAL LEVEL

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Abstract

The present paper aims to assess the allocative and economic efficiency at Romanian regional agriculture level for a certain level of input prices, by Data Envelopment Analysis approach. We utilize in our research the following FADN data from 2007 and 2013: inputs – labor (AWU- annual working unit), land (UAA-utilized agricultural area) and capital (euro – average farm capital); outputs – total output (euro) and farm net income (euro); input prices (rent paid, wages paid and depreciation). The main results of our research revealed for 2007-2013 period an increase in economic efficiency, but also indicate the allocative inefficiency (inefficient mix of inputs) us major cause for not reaching optimum levels in 2013 despite the improvement in technical efficiency (an increase in farm volume activities) .

Key words**:** *allocative efficiency, economic efficiency, farms*

INTRODUCTION

The concept of efficiency, calculated based on frontier production approach, was introduced in literature by Debreau [6] and Farell [7]. Starting with these studies the approach was utilized to assess the input mix and economic efficiency (through a combination between technical and allocative efficiency) and, in the following years, to assess the productivity and performance of firms. N'Gbo [12], Atkinson și Cornwell [1] and Briec *et al.* [3] focused on the identification of firms technical efficiency at a certain mix of inputs and outputs, Rodriguez-Alves*et al.* [13] studied the allocative efficiency by creating a connection between inputs and market prices and Coelli *et al.* [5] calculated the economic efficiency (or cost efficiency). All these papers have at base the Data Envelopment Analysis (DEA), a non-parametric method for the measurement of efficiency and productivity.

MATERIALS AND METHODS

DEA, under CRS assumption (constant return to scale), permits the calculation of technical efficiency (TE) and, under VRS assumption (variable return to scale) we can obtain the pure technical efficiency (PTE). The ratio between TE and PTE measures the potential productivity (scale efficiency, SE) which can be reached by a DMU at optimal level. Allocative efficiency (AE) reflects the ability of a DMU to utilize inputs in optimal proportion at a certain level of prices. In fact, AE shows, under optimal efficiency, the level of inputs at which a firm obtains the minimization of production costs. By multiplying the EA with ET we measure the economic efficiency or cost efficiency (EE). In this way cost efficiency it's reached only when a firm is technical and allocative efficient.

In agriculture, these indicators were studied to point out the efficiency and productivity of farms in many studies like the ones of Jan *et al* [8], Mary *et al* [11], Špička *and Smutka* [15], Špička [14], Kaneva [9] and Cesaro *et al.* [4]. In the spirit of our research we emphasize the paper of Bojnec *et al.* [2] in which the economic efficiency is calculated based on FADN data. The author established the following input prices inside the DEA model: rent paid, wages paid and depreciation. Starting of his research we applied the DEA method on the following FADN data [10]: Total labour input (SE010) (Annual Working Unit); Total utilised

agricultural area (SE025) (hectare); Average farm capital (SE510) (euro); Total output (SE131) (euro); Farm net income (SE420) (euro). The efficiency measurements were performed with DEAP program.

RESULTS AND DISCUSSIONS

The descriptive analysis of variables reveals at Romanian farm level an agricultural output of 11,223 ERuro and an obvious inequality between regions (from a minimum of 4,671 Euro in North-Est Region to a maximum of 20,973 Euro in Center Region) (Table 1). The average farm physical dimension oscillated between 5.44 ha in North-Est Region and 16,21 ha in West Region, reaching a value of 10.11 ha at country level. The average farm capital varied between a minimum of 8,866 Euro in North-Est Region and 53,615 Euro in West Region and a value of 25,883 Euro at national level.

Table 1. Descriptive statistics at farm level, on regions, 2007-2013 periods

Region		Input 1	Input 2	Input 3	Output 1	Output 2	Cost Input 1	Cost Input 2	Cost Input 3
		Total labour (AWU)	Total utilized agricultural area (hectare)	Average farm capital (euro)	Total output (euro)	Farm net income (euro)	Wages paid	Rent paid	Depreciation
Center	Minim	1.14	9.11	24,273.10	10,791.50	2,779.10	182.20	754.20	797.50
	Maxim	2.24	11.31	40,014.80	20,973.40	7,199.00	402.00	2,685.50	1,376.10
	Average	**1.47**	**10.07**	**30,820.04**	**13,840.34**	**4,678.57**	**264.47**	**1,200.10**	**1,065.07**
	Std.	0.384	0.820	5,106.887	3,341.442	1,621.263	81.623	681.031	215.798
North Est	Minim	0.97	5.44	8,865.60	4,670.50	1,757.20	76.00	223.30	390.50
	Maxim	2.37	8.32	19,422.20	9,553.20	3,879.80	306.00	303.60	1,085.20
	Average	**1.42**	**7.19**	**16,955.01**	**7,623.34**	**3,013.03**	**211.60**	**265.83**	**791.06**
	Std.	0.491	1.113	40,65.486	2,058.992	877.519	99.964	26.960	251.398
North West	Minim	1.42	7.00	14,949.30	8,380.50	3,248.00	90.10	411.80	601.00
	Maxim	2.16	9.66	33,302.00	12,168.00	7,561.00	277.30	1,173.60	959.50
	Average	**1.73**	**8.55**	**26,966.61**	**10,776.84**	**5,043.70**	**184.14**	**718.56**	**736.17**
	Std.	0.250	0.943	6,481.308	1,496.630	1,419.304	74.017	245.385	154.887
South	Minim	1.28	8.87	18,309.60	7,670.10	1,696.20	217.70	424.60	712.00
	Maxim	2.05	11.42	40,561.00	14,920.00	4,811.00	924.00	1,013.80	2,101.10
	Average	**1.50**	**10.58**	**29,718.31**	**11,470.91**	**3,200.84**	**563.56**	**668.03**	**1,668.26**
	Std.	0.260	1.157	9,926.538	3,006.865	1,225.355	270.892	209.593	563.484
South Est	Minim	1.31	11.88	12,328.40	7,254.40	325.20	334.50	632.00	810.80
	Maxim	2.01	14.95	29,586.00	16,442.00	8,852.00	1,100.20	2,045.30	1,125.20
	Average	**1.55**	**13.81**	**24,463.97**	**12,455.57**	**5,115.97**	**713.94**	**955.64**	**947.87**
	Std.	0.228	1.345	5,934.984	3,899.370	3,038.705	329.981	488.180	124.549
South West	Minim	1.29	6.29	10,180.40	6,194.70	2,214.70	80.60	401.10	436.90
	Maxim	2.13	8.28	26,361.00	10,454.70	5,673.50	242.80	607.10	1,274.00
	Average	**1.59**	**6.91**	**15,819.16**	**8,407.71**	**3,901.19**	**158.60**	**481.90**	**876.86**
	Std.	0.319	0.858	5,996.404	1,898.581	1,401.734	54.110	68.166	331.957
West	Minim	1.05	9.69	27,001.90	8,147.90	2,276.10	325.90	588.80	910.60
	Maxim	1.86	16.21	53,614.90	18,427.20	9,893.40	928.80	746.00	1,512.60
	Average	**1.41**	**13.68**	**36,441.89**	**13,986.39**	**6,483.80**	**604.13**	**684.20**	**1,248.44**
	Std.	0.355	2.784	9,364.874	4,779.419	3,374.245	244.854	51.363	218.784
Total	Minim	0.97	5.44	8,865.60	4,670.50	325.20	76.00	223.30	390.50
	Maxim	2.37	16.21	53,614.90	20,973.40	9,893.40	1,100.20	2,685.50	2,101.10
	Average	**1.52**	**10.11**	**25,883.57**	**11,223.02**	**4,491.01**	**385.78**	**710.61**	**1,047.68**
	Std.	0.333	2.964	9,569.336	3,736.307	2,232.741	284.084	427.009	411.891

Source: Own calculation.

Starting from these variables we estimated that, in 2007, the allocative efficiency was 86.1%, with a minimum of 50.1% in West Region and a maximum of 100% in North-Est, North-West and South-West Regions (Tabel 2). This means that a Romanian farm can have a cost saving of 13.9% at an optimum level of allocative efficiency. Also the results indicate that in West Region, the most inefficient region, the cost saving would've been of 37.8% if the farms would have reached the production frontier.

The combined effect of technical and allocative factors reveals a medium level of economic efficiency (74.1%) with a minimum of 41.3% in West Region and a maximum of 100% in North-West and South-West Regions. At national level we obtained 25.9%

cost savings, but in West Region (the most economic inefficient region) the economic efficiency would have increased with 46.8% if the farms would have been operated at optimum level.

If we compare the results at regional level we observe that only the North-West and South-West Regions have maximum cost savings, being technical and allocative efficient. The Centre and West Regions present an inefficiency regarding the costs due especially to an inefficient mix of inputs (low allocative efficiency). These two regions overcome the minimum costs with 32.5% and 58.7%. In South, South-Est and North-Est Regions the cost inefficiency is due to the low technical efficiency (46.8%, 24.4% and respectively 18.5%). Actually the South Region was the most technical inefficient region and the West Region the most allocative inefficient region.

Table 2. The technical, allocative and economic efficiency in 2007 (at regional level)

	2007		
	Technical efficiency (TE)	**Allocative efficiency (AE)**	**Economic efficiency (EE)**
C	1.000	0.675	0.675
NE	0.816	1.000	0.815
NW	1.000	1.000	1.000
S	0.622	0.854	0.532
SE	0.757	0.999	0.756
SW	1.000	1.000	1.000
W	0.824	0.501	0.413
Average	**0.860**	**0.861**	**0.741**
Minimum	0.622	0.675	0.532
Maximum	1.000	1.000	1.000
Cost savings – C	0.0	32.5	32.5
Cost savings – NE	18.4	0.0	18.5
Cost savings – NW	0.0	0.0	0.0
Cost savings – S	37.8	14.6	46.8
Cost savings – SE	24.3	0.1	24.4
Cost savings – SW	0.0	0.0	0.0
Cost savings – W	17.6	49.9	58.7
Cost savings average	**14.0 %**	**13.9 %**	**25.9 %**
Cost savings for the most technically inefficient region	**37.8 %**	**32.5 %**	**46.8 %**

Source: Own calculation with Win4Deap 2

In 2013 the allocative efficiency was 81.6%, with a minimum of 68.2% in South Region and a maximum of 100% in South-est Region (Tabel 3). This means that a Romanian farm can have a cost saving of 18.4% at an optimum level of allocative efficiency. Also the results indicate that in South Region, the most inefficient region, the cost saving would've been of 31.8% if the farms would have reached the production frontier.

Table 3. The technical, allocative and economic efficiency in 2013 (at regional level)

	2013		
	Technical efficiency (TE)	**Allocative efficiency (AE)**	**Economic efficiency (EE)**
C	1.000	0.863	0.863
NE	0.975	0.883	0.861
NW	1.000	0.759	0.759
S	0.971	0.682	0.662
SE	1.000	1.000	1.000
SW	1.000	0.710	0.710
W	1.000	0.819	0.819
Average	**0.992**	**0.816**	**0.810**
Minimum	0.971	0.682	0.662
Maximum	1.000	1.000	1.000
Cost savings – C	0.0	13.7	13.7
Cost savings – NE	2.5	11.7	13.9
Cost savings – NW	0.0	24.1	24.1
Cost savings – S	2.9	31.8	33.8
Cost savings – SE	0.0	0.0	0.0
Cost savings – SW	0.0	29.0	29.0
Cost savings – W	0.0	18.1	18.1
Cost savings average	**0.8 %**	**18.4 %**	**19.0 %**
Cost savings for the most technically inefficient region	**2.9 %**	**31.8 %**	**33.8 %**

Source: Own calculation.

The combined effect of technical and allocative factors reveals a medium level of economic efficiency (81.0%) with a minimum of 66.2% in South Region and a maximum of 100% in North-West and South-Est Region. At national level we obtained 19.0% cost savings, but in South Region (the most economic inefficient region) the economic efficiency would have increased with 33.8% if the farms would have been operated at optimum level. Actually only the South-Est Region had maximum cost savings, being technical and allocative efficient.

If we compare the results at regional level we observe that, after the changes from 2007-2013 periods, almost all the regions became technical efficient, but in 2013 the allocative inefficiency (wrong mix of inputs) remain a major problem of Romanian farms and the main cause of economic inefficiency.

CONCLUSIONS

Based on 2007 data, we concluded that the allocative inefficiency was comprised between 32.5% and 0% with an average of 13.9% and the technical inefficiency was

comprised between 37.8% and 0% with an average of 14.0%. So the major source of economic inefficiency was the technical one. Also in South, South-Est and North-Est Regions labor and land inputs were oversized compared with the outcomes, while in West Region the major cause of inefficiency is allocative (wrong mix of inputs). However an economic efficiency over 70% suggests that, except for South and West Regions, farms were productive at a cost close to minimum and the level of technology from 2007.

In 2013, given that the allocative was comprised between 31,8% şi 0% (with an average of 18.4%) and the technical inefficiency was comprised between 2.9% and 0% (with an average of 0.8%) we can conclude that the main source of economic inefficiency was the allocative one. Also except for South Region, all the regions had productive agriculture at a cost close to minimum and the level of technology from 2013.

Our research based on DEA permits a comparison between the two analyzed years in terms of structural changes. However the results permit us to conclude that the small increase in size of Romanian farms from 2007-2013 periods doesn't influence the level of efficiency, the major cause of inefficiency being the allocative factors (wrong mix of inputs).

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IDENTIFICATION OF THE RELATIONSHIP BETWEEN STRUCTURAL VARIABLES AND TOTAL FACTOR PRODUCTIVITY AT REGIONAL LEVEL IN ROMANIA

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Abstract

The present paper aims to assess the relation between the main structural variables and total factor productivity (TFP) based on Malmquist indices at the regional level in Romania. In order to set up this paper, there were used the data for the period 2007-2013 which were processed using Win4DEAP Program. The main results of our research revealed the necessity to increase the farms size and the share of farms with 50-100 ha and over 100 ha in order to improve the agricultural productivity. Also the results pointed out that the regions with a more developed vegetal sector have a higher TFP.

Key words**:** *farms, total factor productivity, productivity elasticity*

INTRODUCTION

Efficiency was for a long time assimilated with the concept of productivity, respectively through the capacity of a firm to transform inputs into outputs in production process. Among the first studies regarding productivity we mention the ones of Barton & Cooper [4]and Loomis & Barton [14], but there are a lot of studies starting from the sixties (like Kendrick [11]) which introduced the concept of total productivity factors (TFP) based on linear programming and input prices. In the same period others authors studied the relationship between Cobb-Douglas production function and inputs (Domar [8]; Chandler [6] and Lave [13]) or contested the use of this indicator (Abramovitz [1]; Solow [16]).

Only after2000 concerns regarding identifying the determinants of the increase / decrease productivity expanded. The paper of Alvarez-Cuadrado [2] demonstrates that the growth of productivity in agriculture led to a reallocation of resources from agriculture to other economic sectors and to an increase of aggregated output. The study of Fuglie *et al* [9] specifies that the growth of agriculture output decreased in developed countries over decades, especially due to a reduction of agriculture share in economy. According with Trostle *et al.* [17] and Choises [7] this phenomenon is also due to the increase of agricultural prices, the process of production concentration and the increase of competition for resources (land, water, energy, etc.). On this background, Martín-Retortillo [15] establish at European level three model of TFP growth: West European countries model characterized by TFP growth and an increase of utilized capital; Central and Eastern European countries model characterized by capital investments but lower growth in TFP; Mediterranean and Nordic European countries model characterized by higher capital investments.

Assessment studies of structural change in the agriculture of Central and Eastern European countries (Čechura *et al.* [5]) demonstrate that exists major gaps regarding productivity. However, in 2015, Hamulczuk [10] concludes that these countries prove a real convergence towards a higher level of productivity. In this context, Jitea and Pocol [12] prove that in Romania the CAP subsidies didn't raise the TFP, the growth of inputs being higher that the growth of agricultural output. They point out the orientation of support towards big farms and the ineligibility of the majority of farms (subsistence and semi-subsistence

farms) like the major causes for a low total factor productivity.

MATERIALS AND METHODS

Agricultural productivity analysis through the change in total factor productivity of production (TFP) is based on Malmquist indices. They are: TEFch - technical efficiency change; TECHch - technological change; PEch - pure technical efficiency change; SEche - scale efficiency change; TFPch - change in total factor productivity. TFP scores above 1, generated by an input orientation method under CRS assumption, emphasize the rational use of inputs, while the values below 1 emphasize an overuse of inputs.

We realized the evaluation of Total Factor Productivity with Win4Deap Program which permits the generation of Malmquist index. The Malmquist model oriented on input can be described as following [3]:

$$TFPch(x^{t+1}, y^{t+1}, x^t, y^t) = TEFch(x^{t+1}, y^{t+1}) \cdot TECHch(x^{t+1}, y^{t+1}, x^t, y^t) \cdot SEch(x^t, y^{t+1}, y^t) \cdot PEch(x^{t+1}, x^t, y^{t+1}) \quad (1)$$

or

$$TFPch = \frac{D^t(x^t, y^t)}{D^t(x^{t+1}, y^{t+1})}$$

where:

x= inputs

y = outputs

$$TEFch = \text{technical efficience change} = \frac{D^{t+1}(x^{t+1}, y^{t+1})}{D^t(x^{t+1}, y^{t+1})}$$

$$TECHch = \text{technical change} = \frac{D^t(x^t, y^t)}{D^{t+1}(x^{t+1}, y^{t+1})}$$

$$SEch = \text{scale efficience change} = \frac{SE^t(x^t, y^{t+1})}{SE^t(x^t, y^t)}$$

$$PEch = \text{overall } (pure)\text{efficiency change} = \frac{SE^t(x^{t+1}, y^{t+1})}{SE^t(x^t, y^{t+1})}$$

Technical efficiency change (TECHch), under input orientation approach, outlines the modification of inputs from t to *t+1*periodfor a given level of outputs. SEch is calculated based on scale efficiency scores through which the productivity given by an input and output mix is evaluated compared with technical optimum scale. PEch measures the modification of production frontiers when the level of inputs changes at a given level of outputs.

The assessment of the relation between agricultural structural change and total factor productivity was accomplished by linear multiple regression models:

$$Y = A\, x_1^{\beta_1}\, x_2^{\beta_2} \dots x_n^{\beta_n}$$

where: x_i- exogenous variable

A –exp. (intercept)

βi = parameters for measuring the TFP elasticity.

By logarithmic transformation we obtain the following regression model:

$$lnY = ln\alpha + \beta_1 lnx_1 + \beta_2 lnx_2 + \cdots + \beta_n lnx_n + \varepsilon$$

where:

-if $\sum_1^2 \beta_i < 1$ we have decreasing returns of scale (an increase of x_i generates a smaller increase of Y);

-if $\sum_1^2 \beta_i = 1$ we have constant returns of scale (an increase of x_i generates the same increase of Y);

-if $\sum_1^2 \beta_i > 1$ we have increasing returns of scale (an increase of x_i generates a higher increase of Y).

RESULTS AND DISCUSSIONS

Regarding the evolution of productivity in Romanian agriculture, in 2007-2013 periods, we may observe in South-East and West Regions an effect of catching-up which dominate the production frontier (Table 1).

Table 1. Malmquist indices – regional average values in 2007-2013 periods

	TEFch	TECHch	PEch	SEch	TFPch
South-East	1.048	1.108	1	1.048	1.161
West	1.033	1.171	1	1.033	1.21
South	1.077	1.045	1.004	1.072	1.125
Center	1	1.036	1	1	1.036
North-West	1	1.069	1	1	1.069
South-West	1	1.025	1	1	1.025
North-Est	1.03	1.026	1	1.03	1.057
Average 2007-2013	1.026	1.067	1.001	1.026	1.096

Source: own calculation with Win4Deap 2

In these regions we have a better managerial efficiency than scale efficiency. Also they have higher TFP values those other regions which indicate a more rational use of inputs relative to outputs and a real capacity to

optimize the volume of activities. The growth of technical efficiency of 10.8% in South-East Region and 17.1% in West Region reflects a bigger dimension of farms and higher incomes.

In South Region the managerial efficiency was lower suggesting that even we have an efficient utilization of inputs, those weren't adapted to the structural evolution of agriculture or activities volume. Also the capital investments doesn't reflect in outputs, the increase of productivity (with 12.5%) being due to the scale economies. The small productivity changes in Center, North-West and South-West are due to technological progress (an increase in invested capital) and to the efficient use of inputs. In North-East Region the catching-up effect dominate the production frontier curve proving that this region managed to optimize their volume of operations and that the economies of scale influence on productivity is higher than the influence of managerial efficiency (technical efficiency of inputs and outputs use) which led to a higher agricultural productivity index.

The TFP had major growths in the South-East in the 2007-2010 periods and in West Region in 2008-2010 periods but these remain the most performant regions in the 2007-2013 periods (Table 2). However at actual level of technology (inputs and outputs) we identify major impairments regarding agricultural productivity in Center and South-West regions, a positive evolution in North-West, North-East and South regions and a growth stagnation in South-East and West regions (they reached an optimum level of structural organization).

Table 2. Malmquist indices – Total Factor Productivity (TFP) in 2007-2013 periods

	South-East	West	South	Center	North-West	South-West	North-Est
2007-2008	1.462	1.012	1.268	0.937	0.925	0.991	1.105
2008-2009	0.871	1.407	1.105	0.855	1.05	0.933	1.211
2009-2010	1.578	1.985	1.211	1.355	1.124	1.032	1.09
2010-2011	1.094	1.074	1.151	1.09	1.039	1.343	0.977
2011-2012	1.053	1.027	0.897	0.977	1.096	0.943	1.199
2012-2013	1.059	1.007	1.157	1.07	1.199	0.959	1.113
Average 2007-2013	1.161	1.21	1.125	1.036	1.069	1.025	1.057

Source: own calculation with Win4Deap 2

Further we correlate the TFP scores with the farm size (ha/farm) (X_1), the share of farms with 50-100 ha in total farms UAA (X_2), share of farms with over 100 ha in total farms UAA (X_3) and number of cattle per farms (X_4) (Table 3):

Table 3. Farm structure variables and TFP_{REG} - average 2007-2013

	X_1	X_2	X_3	X_4	TFP_{REG}
South-East	5.5	0.4	0.9	4	1.161
West	6.2	0.4	0.6	3.8	1.210
South	3.5	0.2	0.4	2.5	1.125
Center	4.8	0.4	0.5	4.6	1.036
North-West	3.7	0.2	0.2	3	1.069
South-West	2.8	0.1	0.2	2.4	1.025
North-Est	2.6	0.1	0.2	2.3	1.057

Source: own calculation with Win4Deap 2

The regression model is statistically significant ($p=0.027<0.05$) and explain 98.62% of TFP_{REG} variation (Table 4). The intercept was very high suggesting that there are other factors which have a major influence on TFP_{REG} evolution.

The model reveals that the productivity growth is directly influenced (positively) by the share of farms with 50-100 ha in total farms UAA and negatively by the physical dimension of cattle farms.

Table 4. Regression model – farm structure variables and TFP_{REG} (average 2007-2013)

$TFP_{REG} = 1{,}184 + 0{,}041\ X_1 + 0{,}749\ X_2 + 0{,}018\ X_3 - 0{,}141\ X_4$			
Multiple R			0.99306
R^2 (R Square)			0.986169
Adjusted R^2			0.958507
Standard Error			0.014146
F			35.65099118
Significance F (p)			0.02747
	Coefficient	*t Stat*	*P*
Intercept	1.184358	14.62163	0.004644875
X_1	0.040708	2.067503	0.174619535
X_2	0.748602	1.898482	0.198048037
X_3	0.017593	0.341632	0.765183976
X_4	-0.14126	-4.49401	0.046116332

Source: own calculation Excel – Data Analysis

But what is the real influence of structural variable on productivity? To respond at this question we constructed a linear multiple regression models based on logarithmic transformation of previously used variables (Table 5).

Table 5. Farm structure variables and TFP_{REG} - average 2007-2013 values expressed in natural logarithms

	$LN(TFP_{REG})$	$LN(X_1)$	$LN(X_2)$	$LN(X_3)$	$LN(X_4)$
SE	0.1493	1.7047	-0.9163	-0.1054	1.3863
V	0.1906	1.8245	-0.9163	-0.5108	1.3350
S	0.1178	1.2528	-1.6094	-0.9163	0.9163
C	0.0354	1.5686	-0.9163	-0.6931	1.5261
NV	0.0667	1.3083	-1.6094	-1.6094	1.0986
SV	0.0247	1.0296	-2.3026	-1.6094	0.8755
NE	0.0554	0.9555	-2.3026	-1.6094	0.8329

Source: own calculation Excel – Data Analysis

The model in basically a Cobb-Douglas function, statistically insignificant (p=0.078>0.05) and explains 96.0% of TFP_{REG} variation:

Table 6. Regression model – farm structure variables and TFP_{REG} (average 2007-2013 values expressed in natural logarithms)

$TFP_{REG} = 1.0609 * X_1^{0,319} * X_2^{0,006} * X_3^{0,029} * X_4^{-0.324}$ where: $e^{0,0591} = 1,0609$ (the proportionality coefficient between factors)			
Multiple R			0.979793
R^2 (R Square)			0.959993
Adjusted R^2			0.87998
Standard Error			0.021627
F			11.99794
Significance F (p)			0.078413
COEFICIENTS			
	Coefficient	*t Stat*	*P*
Intercept	0.059105	0.202139	0.858504
X_1	0.318791	2.994126	0.095789
X_2	0.005942	0.07753	0.94526
X_3	0.028862	0.889668	0.467514
X_4	-0.32392	-3.49314	0.073083

Source: own calculation Excel – Data Analysis

We may observe that the parameters sum is very small and sub unitary (0.0297) which means that the productivity grows more slowly than the growth of others variables (decreasing efficiencies of scale). The TFP elasticity is negative reported to the size of cattle farm, while a change of 1% in the overall size of farms (ha per farm) leads to an increase of 0.319% of the TFP. In these conditions we may conclude that we have to increase the vegetal farm size and the share of farms with over 100 ha with 1% to obtain an increase with 0.348% of agricultural productivity.

CONCLUSIONS

In the 2007-2013 periods the Total Factor Productivity increased with 9.6% and the catching-up effect (+2,6%) shows that the higher level of TFP is due to changes of production frontier form and to a real convergence to optimum. Bu also we observed that the growth of TFP was mainly due to technological changes (managerial decisions) than to catching-up effects (scale economies). This means that the inputs remain higher compared with the outputs which point out real problems in costs control and income maximization. Also at regional level the productivity may increase with 0.354% if we increase with 1% the farm size, the share of farms with 50-100 ha and with over 100 ha in total farms UAA.

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COMPARATIVE ANALYSIS ON THE QUALITY OF SEVERAL BREADS ASSORTMENTS AVAILABLE ON THE ROMANIAN MARKET AND ON THE TECHNOLOGICAL PROCESSES RELIABILITY

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Abstract

Our investigations have focused on the analysis of several bread assortments manufactured by the largest producer in Romania, in terms of key quality parameters. There were analyzed four breads assortments coming from a local producer, namely Vel Pitar, as follows: whole wheat bread (500g), white bread (300 g), intermediate bread (300 g) and dark bread (300 g). Of each assortment were taken 15 samples from different batches. For each sample were analyzed: Weight (W, g), Moisture (M, %), Acidity (A, grade), Porosity (P, %), Elasticity (E %), Water activity (aW), Length (cm), Width (cm), Height (cm). We have identified highly significant statistical differences between varieties of bread (Student test). We find that all the significant correlations formed have particularized bread assortments, because of the fact that the assortments of bread did not show significant correlations between the same quality parameters. It is highlighted in this way, the differences between recipes and technological process. To conclude, we can say that the whole wheat bread and dark bread are most alike, in terms of quality characteristics, given that both had an increased fiber content. It was also noted the similarities of quality parameters in white and intermediate bread. All observed differences, with varying degrees of significance, constituted peculiarities of bread assortments taken for analysis.

Key words**:** *bread, quality parameters, statistical evaluation, technological process*

INTRODUCTION

Bread is one of the most consumed foods in Romania. The average consumption of bread was estimated in 2015 to about 100.6 kg per capita [10]. Consumption is declining relative to the previous decade, but it is at a level about 25% higher than the European average [9]. Decreasing consumption of bread has forced manufacturers to invest in technologies and recipes that enable the increase of products added value, in order to maintain or increase profit margins. Generally, the diversification of products range aimed to satisfy consumer interest in diet products, with functional properties suitable to a healthy lifestyles [1].

The bread, traditionally eaten in Romania, is 300 grams white bread, obtained from 650 type flour [7]. Although its market is shrinking, it is the best sold product on the current market of bread.

Our investigations have focused on the analysis of several bread assortments manufactured by the largest producer in Romania, in terms of key quality parameters.

The aim of the study was to evaluate the quality profile of each assortment, to analyze the degree of quality parameters variability (as an indicator of the technological processes reliability) and to highlight the main distinguishing features between quality parameters, considered as purchase consumer criteria.

MATERIALS AND METHODS

There were analyzed four breads assortments coming from a local producer, namely Vel Pitar, as follows: whole wheat bread (it

contains whole wheat flour, ash > 1.4%), white bread (contains flour type 650, ash 0.65%), intermediate bread (contains a mixture of flour type 650 + flour type 1350) and dark bread (contains flour type 1350, ash 1.35%) [2]. Of each assortment were taken 15 samples from different batches. For each sample, there were analyzed the main quality parameters, according to the methods shown in Table 1 [2, 3, 11].

Table 1. Quality parameters and analytical methods used to analyze different assortments of bread

Parameter	Analysis method
Weight (W, g)	SR 91:2007
Moisture (M, %)	
Acidity (A, grade)	
Porosity (P, %)	
Elasticity (E %)	
Water activity (aW)	Aqualab Series 4 TE
Length (cm)	Direct measurement with the ruler
Width (cm)	
Height (cm)	

The results were statistically interpreted using the IBM SPSS Statistics 20 computer program.

RESULTS AND DISCUSSIONS

Table 2 shows the quality parameters descriptive statistics of the four assortments of bread.

The results revealed that **whole wheat bread** did not exceed the limits set by the laws in force, concerning pre-packaged products (500 ± 15 g). Constant weight overcoming is in favor of the purchaser, but in time it will increase the production costs.

At the same time, whole wheat bread acidity was significantly lower compared to the limit, making the bread to be more vulnerable to infection with microorganisms. It is however noted that the elasticity and porosity are very good, as aW and bread dimensions.

Variation coefficients are within the permitted limits (under 12%), that which characterizes a normal distribution for quality parameter values. This reflects the fact that the technology of whole wheat bread production is sustainable and provides industrial process repeatability. We note, however, that the largest variation was presented in whole wheat bread acidity (CV = 9.59%).

Table 2. Descriptive statistics of the quality parameters (n = 15)

Para-meter	Assortments of bread	Li-mits	X±s	CV %
Weight (g)	Whole wheat bread	500 ± 15	509.39 ± 7.60	1.49
	White bread	300 ± 9	**311.23 ± 6.05**	1.94
	Intermediate bread	300 ± 9	**309.29 ± 4.14**	1.33
	Dark bread	300 ± 9	**310.62 ± 5.55**	1.78
Moisture (%)	Whole wheat bread	46	45.52 ± 0.63	1.38
	White bread	43	42.60 ± 0.38	0.89
	Intermediate bread	44	43.52 ± 0.47	1.07
	Dark bread	44	44.46 ± 0.42	0.94
Acidity (degrees)	Whole wheat bread	3	**1.98 ± 0.19**	9.59
	White bread	2.8	**1.16 ± 0.10**	8.62
	Intermediate bread	3	**1.63 ± 0.18**	11.0
	Dark bread	3	**2.04 ± 0.12**	5,88
Porosity (%)	Whole wheat bread	min. 80	82.28 ± 1.63	1.98
	White bread	min. 80	85.13 ± 0.86	1.01
	Intermediate bread	min. 83	85.49 ± 1.10	1.28
	Dark bread	min. 83	82.28 ± 1.15	1.39
Elasticity (%)	Whole wheat bread	min. 90	97.06 ± 1.47	1.51
	White bread	min. 90	99.21 ± 1.77	1.78
	Intermediate bread	min. 90	98.20 ± 2.57	2.61
	Dark bread	min. 90	97.87 ± 2.64	2.69
Water activity	Whole wheat bread	max. 0.95	0.93 ± 0.02	2.15
	White bread	max. 0.95	0.93 ± 0.019	2.04
	Intermediate bread	max. 0.95	0.94 ± 0.02	2.12
	Dark bread	max. 0.95	0.94 ± 0.02	2.12
Length (cm)	Whole wheat bread	29-30	29.67 ± 0.89	2.99
	White bread	29-30	**27.41 ± 0.40**	1.45
	Intermediate bread	27-28	27.36 ± 0.50	1.82
	Dark bread	26-27	26.26 ± 0.36	1.37
Width (cm)	Whole wheat bread	11-12	11.26 ± 0.43	3.81
	White bread	12-13	**10.07 ± 0.33**	3.27
	Intermediate bread	9,5-11	10.30 ± 0.31	3.00
	Dark bread	9-10,5	9.68 ± 0.30	3.09
Height (cm)	Whole wheat bread	7.5 – 8.5	7.76 ± 0.31	3.99
	White bread	> 8	**7.06 ± 0.16**	2.26
	Intermediate bread	max. 7	7.18 ± 0.26	3.62
	Dark bread	> 6,5	6.74 ± 0.19	2.81

Source: Own calculations.

That means that the influence of external factors on the proofing process had a greater extent than on other parameters [5, 8].

It appears that the weight limit (300 ± 9 g) of **white bread** is exceeded, on average with 2.23 g and acidity is also much lower compared to the limit. The dimensions of white bread did not conform, being smaller than those set by limits. Moisture, porosity and elasticity meets the standard for this type of bread. Coefficients of variation are normal, but higher concerning acidity parameter (CV = 8.62%).

It is noted that in the case of **intermediate bread**, weight exceeded the limit provided in the specifications, while the acidity did not reach the value needed for the bread to stand

in front of microbial contamination, if not quickly consumed. Basically, low acidity decreases storage stability of the product. Intermediate bread porosity, elasticity and dimensions enrolled within limits, as well as the variation coefficient. Acidity registered the higher variation coefficient (CV = 11.04%) at
intermediate bread, compared to other assortments.

Although the process showed consistency and repeatability, however we can say that the most vulnerable stage and less easily controlled was the proofing stage, that influenced acidity levels.

Dark bread weight and acidity did not comply with manufacturing limits, similar to other bread assortments. Thus, the weight exceeded the limit with 1.62 g and the acidity was lower below the permissible limit, but less lower than to the other bread assortments. Porosity, elasticity, aW and dimensions were compliant. Variation coefficients of the dark bread quality parameters were low, so the techological process of bread obtaining is reliable and sustainable. We should mention that CV% of acidity parameter (5.88%) had the lowest value of CV% values of other bread assortments. Water activity was similar for all assortments of bread and enrolled within limits (max. 0.95).

The four bread assortments presented features to be highlighted by the Student test (t), respectively the significance of quality parameters mean difference (Table 3).

Table 3. Significance of quality parameters mean

Pairs of bread assortments	Mean difference	t
Significance of mean difference for moisture		
white – dark	-1.86	**-12.059*** **
white – intermediate	-0.91	**-4.880*** **
white – whole wheat	-2.92	**-16.934*** **
dark – intermediate	0.94	**6.112*** **
dark – whole wheat	-1.06	**-4.579*** **
intermediate – whole wheat	-2.01	**-8.196*** **
Significance of mean difference for acidity		
white – dark	-0.88	**-17.963*** **
white – intermediate	-0.47	**-8.122*** **
white – whole wheat	-0.81	**-14.764*** **
dark – intermediate	0.41	**7.503*** **
dark – whole wheat	0.06	1.254
intermediate – whole wheat	-0.35	**-5.426*** **
Significance of mean difference for porosity		
white – dark	2.84	**7.212*** **
white – intermediate	-0.36	-1.356
white – whole wheat	2.85	**6.010*** **
dark – intermediate	-3.21	**-6.746*** **
dark – whole wheat	0.01	0.016
intermediate – whole wheat	3.1	**6.206*** **
Significance of mean difference for elasticity		
white – dark	1.34	1.491
white – intermediate	1.01	1.464
white – whole wheat	2.15	**3.456***
dark – intermediate	-0.33	-0.0321
dark – whole wheat	0.81	0.989
intermediate – whole wheat	1.14	2.131
Significance of mean difference for aW		
white – dark	-0.01	-0.729
white – intermediate	-0.01	-1.039
white – whole wheat	0.01	0.525
dark – intermediate	-0.002	-0.387
dark – whole wheat	0.01	1.604
intermediate – whole wheat	0.01	1.448
Significance of mean difference for lenght		
white – dark	1.15	**9.289*** **
white – intermediate	0.05	0.275
white – whole wheat	-2.26	**-9.113*** **
dark – intermediate	-1.11	**-8.090*** **
dark – whole wheat	-3.41	**-15.868*** **
intermediate – whole wheat	-2.31	**-8.582*** **
Significance of mean difference for width		
white – dark	0.39	**4.465** **
white – intermediate	-0.23	**-2.598***
white – whole wheat	-1.19	**-7.724*** **
dark – intermediate	-0.63	**-6.028*** **
dark – whole wheat	-1.58	**-10.076*** **
intermediate – whole wheat	-0.09	**-6.217*** **
Significance of mean difference for height		
white – dark	0.32	**4.125*** **
white – intermediate	-0.13	-1.456
white – whole wheat	-0.70	**-8.228*** **
dark – intermediate	-0.45	**-5.399*** **
dark – whole wheat	-1.02	**-10.048*** **
intermediate – whole wheat	-0.57	**-5.143*** **

Recipe and technological process differences between bread assortments is seen by large differences in quality parameters. There are significant differences related to **moisture**, between pairs of bread assortments. It is noted that bread assortments which contained more fibers, respectively whole wheat bread and dark bread had higher moisture, because the fibers retained more water.

Acidity is very significantly increased in

whole wheat bread and dark bread assortments, compared to white bread and intermediate bread assortments. The fact is explicable as the whole wheat bread and the dark bread contained high extraction flours, which had higher acidities (whole wheat flour and 1350 flour). Between white bread and intermediate bread or whole wheat bread and dark bread there are no significant differences concerning acidity.

The same is found in **porosity**. There were established significant differences in porosity between white bread or intermediate bread, and whole wheat bread or dark bread. Bread with a higher amount of fibers (whole wheat and dark bread) had a lower porosity, while white bread and intermediate bread showed porosities over 85% and higher volumes.

Elasticities are very good in general and did not significantly differ between bread assortments, except the elasticity of white bread, which is significantly increased compared to elasticity of whole wheat bread (t = 3.456 *). The **water activity** aW did not differ significantly between the assortments of bread.

The **dimensions** of bread assortments are significantly different from each other, but this is naturally, because we must take into account the technical specifications.

Intermediate bread and white bread did not differ on the length or height, but differed significantly (2.598 *) on width.

All these reported differences, with varying degrees of significance, represent peculiarities of bread assortments taken for analysis.

The correlations established between quality parameters of bread assortments, are also characteristics of the respective assortments.

Concerning **whole wheat bread** there were established between pairs of quality parameters, the following correlations: weight-porosity significant negative correlation (correlation coefficient r = - 0.606*), lenght-aW significant positive correlation (r = 0.632 *), width-porosity significant positive correlation (r = 0.551 *), width-elasticity significant negative correlation (r = - 0.524 *) and height-moisture significant negative correlation (r = - 0.573 *).

Concerning **white bread** there were established: a significant positive correlation elasticity-moisture (r = 0.573 *), a distinct significant positive correlation high-acidity (r = 0.666 **) and a height-length positive correlation (r = 0.517 *).

Some quality parameters of **intermediate bread** established a significant positive correlation (r = 0.626 *), namely height and porosity.

The quality parameters for **dark bread** did not correlate to each other, except the significant negative correlation between width and aW (r = - 0.541 *).

We find that all the significant correlations formed have particularized analyzed bread assortments, because of the fact that the assortments of bread did not show significant correlations between the same quality parameters. It is highlighted in this way, the differences between recipes and technological process.

Length-aW regression analysis of **whole wheat bread** must proceed from the factors that determine the elongation of bakery products during the technological process of bread obtaining. The essential factor in determining the bread length is the size of dough roller when final molding (before proofing).

However, subsequent to this stage, the dough roller undergoes a series of size changes (including stretching) at the proofing stage.

Dough proofing is a process that involves its increase in volume, due to accumulation of gas from fermentation. The increase in volume takes place in all three dimensions of bread (width, length, height), so an increase of the length during fermentation is normal. It is reasonable to believe that this increase in volume causes a decrease in the amount of soluble carbohydrates in the aqueous phase of the dough, because carbohydrates turns into CO_2 through fermentation by yeast metabolism [4]. The water activity of a product is dependent on the amount of substances solubilized in the aqueous phase, therefore decrease of water activity may increase water mobility in the product. At the same time, the increase in bread volume can be correlated with the increase of its internal surfaces, the surfaces to which the product is

able of exchanging substance (water) with the environment [6].
Therefore, increasing the exchange surfaces with the environment, can lead to an increase in the quantity of exchanged substances (mainly water). This phenomenon leads to the increase of the vapor pressure at the surface of the product, namely the relative humidity (Fig. 1).

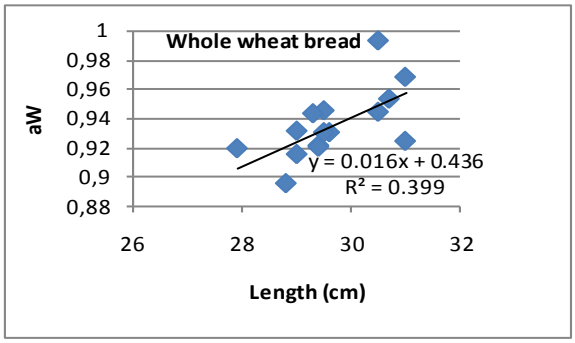

Fig. 1. aW-lenght regression

The porosity of the bread is a measure of the volume of product displaced by the air. This contributes to the total volume of the bread and the product width is one of the three-dimension of the volume. Therefore, the correlation is normal, the porosity represent the internal volume occupied by air, and the total volume of the product (whose one of the components is the width) includes the volume of air (Fig. 2).

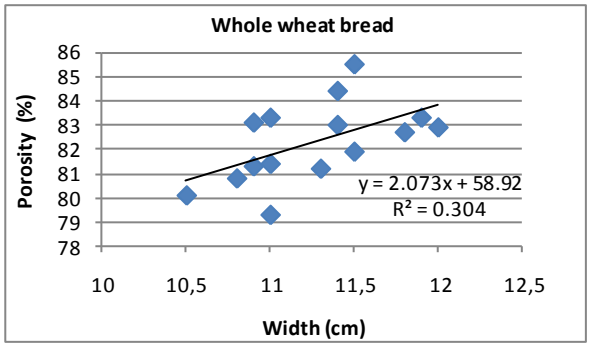

Fig. 2. Porozity-widht regression

The elasticity of bread crumb was smaller to the products with larger width. It is very likely that this is an effect due to raw material quality or applied technology.
The trend of bakery products flattening may be the result of using a weak gluten flour or an excessive proofing. In both cases, the elastic properties of the crumb became worse, due to the degradation of protein matrix and to the degree of starch retrogradation in the cumb (Fig. 3).

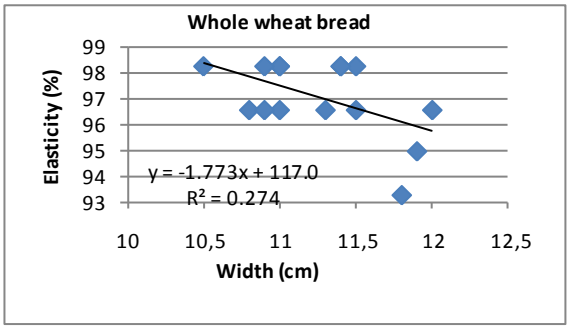

Fig. 3. Elasticity-widht regression

Increase of the bread height accelerates moisture loss in the product, due to volume growth (increase of the exchange surfaces with environment) (Fig. 4)

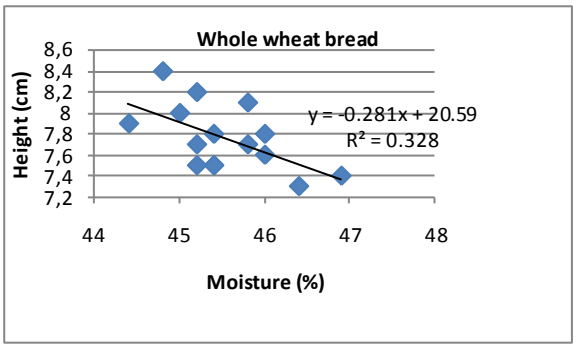

Fig. 4. Height-moisture regression

The porosity of the crumb shows the degree of its compaction. Therefore, breads with heavier weight had a lower porosity (Fig. 5).

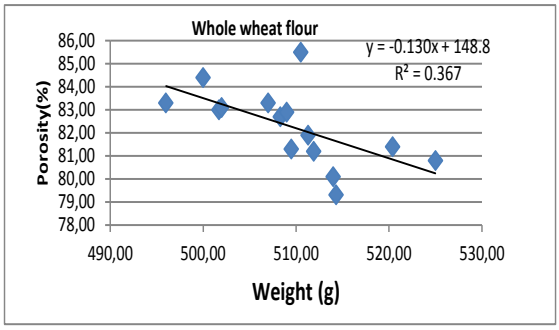

Fig. 5. Porozity-weight regression

The elasticity of **white bread** crumb is influenced by the retrogradation of starch in product, because the retrogradation (the transition from the gel state to the crystalline

state) occurs through water loss. Accordingly, the rate of starch retrogradation in the crumb is influenced by the product moisture (specific phenomenon of bread aging) (Fig. 6)

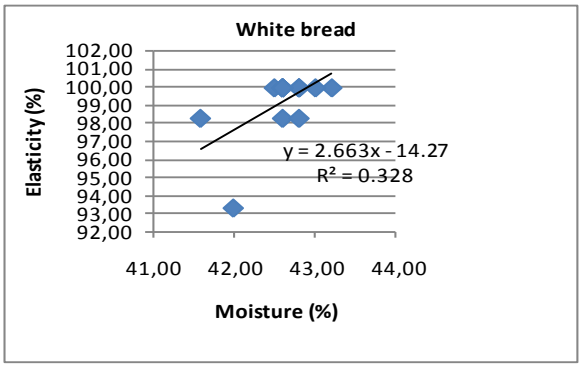

Fig. 6. Elasticity-moisture regression

The product acidity is higher in a greater height bread. The height of the final products is the result of their ability to hold a larger amount of fermentation gas. Bread acidity is the direct result of sugars fermentation by yeasts. Advanced fermentation can be correlated with a better volume of finished products (and implicitly with a larger height) (Fig.7.).

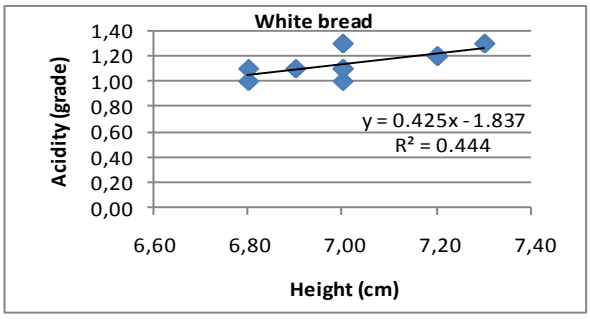

Fig. 7. Acidity-height regression

Porosity-height correlation in **intermediate bread** describes the increase of the porosity due to the increase of the bread volume (Fig.8.).

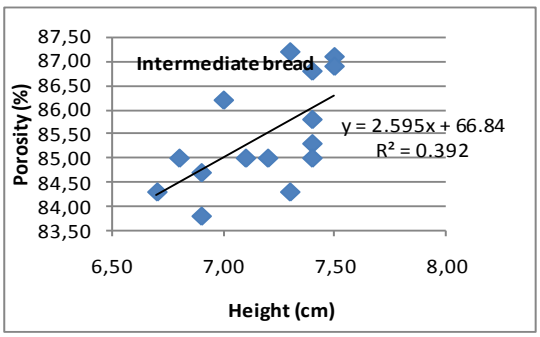

Fig. 8. Porozity-height regression

aW-width regression in **dark bread** can be explained in the same way as it is explained the regression aW-length in whole wheat bread (Fig.9.).

Dough proofing is a process that involves increasing in volume, due to accumulation of fermentation gas. But the increase in volume takes place on the growth of the three dimensions of the bread, accordingly, including width.

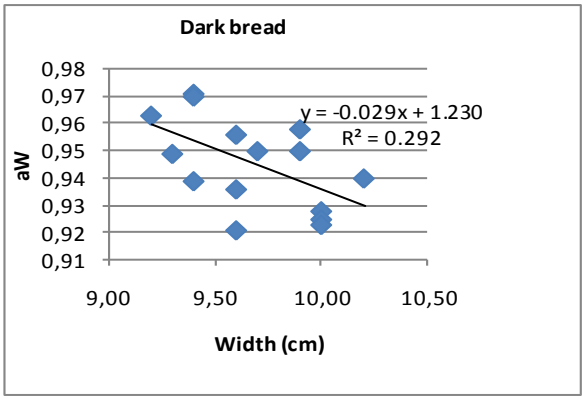

Fig. 9. aW-width regression

CONCLUSIONS

All bread assortments have constantly exceeded the weight provided by recipe, leading to economic harm and increased production costs.

The four assortments of bread showed significantly lower acidity compared to the range considered optimal.

It was found that elasticity, porosity and aW fall within the limits set by the production standards.

The dimensions of bread assortments were compliant, except white bread, where the length, width and height have been constantly lower than the minimum.

Variation coefficients have not exceeded 10%, whatever the parameter taken into consideration. This fact proves that the technological processes of bread preparing are well controlled and the results are reproducible.

The bread assortments had different characteristics regarding humidity (differences significantly different) and acidity (differences significantly different), except the pair dark bread - whole wheat

bread to which no significant differences in acidity were registered.

Porosity was very significantly different between white and whole wheat or dark bread and between intermediate and whole wheat or dark bread, but did not differ between white and intermediate bread and also between whole wheat and dark bread.

There were significant differences in terms of elasticity between white bread and whole wheat bread.

The water activity aW showed no significant differences between bread assortments.

The dimensions of bread assortments were mostly very significantly different.

No similar significant correlations were established between quality parameters of the four bread assortments. The significant correlations formed are different for each assortment of bread and represent a peculiarity.

Notable linear regressions were observed, such as: aW-length- porosity-width, elasticity-width, height-moisture, porosity-weight, in whole wheat bread, elasticity-moisture, acidity-height, in white bread, porosity-height in intermediate bread and aW-width in dark bread.

It is noted the regression acidity-height in intermediate bread, where the variation of one parameter is influenced by the variation of other in proportion of 44% ($r2 = 0.44$).

To conclude, we can say that the whole wheat bread and dark bread are alike, in terms of quality characteristics, given that both had an increased fiber content. It was also noted the similarities of quality parameters in white and intermediate bread.

All observed differences, with varying degrees of significance, constituted peculiarities of bread assortments taken for analysis.

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ASPECTS REGARDING THE PHYTOSANITARY SITUATION OF AN UNTENDED APPLE ORCHARD

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Abstract

Romania, an European country in which pomiculture is of a main significance, especially from an economic point of view, is well represented by a diversity of species, amongst which the apple (Malus domestica) plays a significant role when it comes to quality production and thus economic profit. This paper aims to look at the main harming agents of the apple at the Rusciori Farm, a plantation where the apple cannot turn its genetic production material to advantage, given the interference of multiple restrictive factors, especially vegetal and animal pests that cause significant damage, thus leading to a qualitative and quantitive decrease in production due to the deterioration of the commercial aspect of the fruit. The main pathogens for apples are those that produce mycoses; and amongst mycoses the most wide-spread ones are mildew (Podosphaera leucotricha Ell. and Ev. Salm*), scab disease (Venturia inequalis* Cooke Wint.*), brown fruit rots (Monilinia fructigena* Honey*) and twig cankers (Nectria galligena* Bres.*); all of them causing significant damage under favorable environmental conditions. Although the orchard in the present study is in decline, not all trees show obvious aging signs, therefore a total land clearing does not come into question. This paper attempts to suggest efficient solutions for prelonging the age of those trees that still promise economic productivity.*

Key words: apple, mycosis, crop loss, plant protection management

INTRODUCTION

Apple trees require permanent attendance and attention in order to render large crops of high quality fruit. Without regular tending some trees may die prematurely. It can be frustrating when the fruit harvest is damaged as a result of diseases and pests. This is the case of the orchard at which we look at in the present study; and which has not seen any maintenance work in almost 10 years. Therefore, the question one has to ask is how efficient this orchard is and whether it can be revigorated. In order to discuss the rehabilitation and revigoration of this orchard, one has to know and evaluate its phytosanitary state; and only after finding certain answers can one evaluate its status realistically and determine whether its revigoration would be useful in increasing its productivity to the degree of the farm’s heyday.

As mentioned before, all observations have been made on the surface of the apple orchard of the Rusciori Farm. The farm is located in the Sibiu basin; and belongs to the territory of Şura Mică, thus being a part of the fruit tree region IV, an area favorable to apple cultures, but also to several pathogens [17]. The farm has a surface of 39.29 hectares of infield, out of which 86% has trees of the Starkrimson, Wagner Premiat, Jonathan, Red Melba and Golden delicious varieties, laid out in three parcels. The aim of the paper: to identify pests and other harming agents affecting the apple culture in this particular orchard, thus enabling the finding of suggestions regarding their integrated management.

There is a series of plant diseases occurring as a general rule every year, in both orchards and gardens. Meteorological conditions influence to a great extent not only the occurrence, but also the evolution and severity of such diseases [18]. Therefore, these plant diseases are much more difficult to contain during warm and humid years [22], [25].

Mildew, caused by the *Podosphaera leucotricha* fungus (Ell. and Ev.) Salm., occurs in all regions in which apple trees are cultivated worldwide; and represents the most

frequent and malign disease [6], [22] on the orchard analysed in this study. The disease generates economic losses by affecting both the trees' vigor and the production of blossom and fruit [16], [13]. In our case-study orchard, mildew is a chronic recurring issue, given that the lack of an appropriate tending of the orchard determines the disease levels of a particular season to increase the percentage of infected tree buds during the following season, thus also the decrease in or even the complete loss of fruit production for the following season. As symptoms, this fungus appears in the form of small felt cushions on young buds, leaves, flowers and fruit; and then as a white powder (Photo 1).

Besides mildew, other occurring diseases affecting the orchard are scab (Photo 2), moniliosis, open canker and – with a frequency of 100% on all trees regardless of their variety – mosses and lichens.

MATERIALS AND METHODS

The apple tree orchard analysed in this study is located in the Sibiu basin, in a region with a mild continental climate and having climate and soil conditions that are favorable to apple production, thus reducing the risk of production instability. The physical, chemical and biological characteristics of the soil – as a brown soil of different varieties – are more than adequate.

Temperatures are within limits during the vegetation period, the median annual temperature for the last 100 years being of 8.9 degrees Celsius. Although during the last years the median annual temperature has been above the median of the last 100 years, temperature is not a limitative factor in the region.

The annual precipitation median is of 662 mm, but the the precipitation repartition throughout a given year is uneven, having caused periods of drought, especially during the last ten years. Determined by the geographic position, in the Sibiu basin, due to the Olt chute and terraces, the winds of a medium speed and frequence blow from northwest, whereas local winds are mountain breezes and the so-called Great Wind (Snow-eater), at the beginning of spring, which melts the snow and is thus important for agricultural activities [25].

For an analysis of the apple orchard from a phytosanitary perspective, as well as for the formulation of final conclusions regarding the rehabilitation of the plantation, periodic inspections are necessary, not only during the vegetation period, but also during vegetative repose. The time frame in which studies were performed on the farm were the years 2014-2016, during which pests and their attacks on plant organs were monitored and identified. Moreover, samples for an ulterior identification were also harvested, a soil analysis was performed, crop damages were evaluated and a complex of measures was suggested as efficient solutions to prolong the life and productivity of those trees.

RESULTS AND DISCUSSIONS

In agro-ecosystems man modifies the trophic relationships between populations, encouraging the autotrophic producers (cultured plants), and limiting the consumers and those autotrophic producers that are useless to man [7]; something that has not happened in the orchard under study for the past ten years.

The knowledge of fungal biodiversity and of its biological characteristics is crucial for taking decisions and deciding on plant protection policies based on scientific research. Systematic studies are the basis for the knowledge on biodiversity and they include the discovery and description of species [6], as well as their monitoring, sampling of the attack and loss evaluation.

At the Rusciori tree farm, besides the lack of treatment against pests for the last ten years, no phytosanitary hygiene measures, cropping, fructification or agro-technical measures have been taken either. Therefore, the percentage of affected fruit is of approx. 90%, whereas the degree of harm when it comes to the trees is from moderate to severe and extremely severe, in the case of all vegetal or animal pests identified in the orchard.

The most significant pathogens identified in the orchard are: *Podosphaera leucotricha*

(Photo 1), *Venturia inequalis* (Photo 2), *Monilinia fructigena* (Photo 4), si *Nectria galligena* (Photo 3), as well as mosses and lichens (Photo 5). The state of mildew in the orchard is represented in the next table (Table 1).

As visible in Table 1, all apple tree varieties have been attacked, the most sensitive one being Jonathan (Photo 1), whose attacked blossom dried out without providing fruit. Thus, being a variety sensitive to mildew, this type of attack led to significant crop losses (up to 100%).

Tabel 1. Frequency of mildew attack on apple varieties

Variety	Weak attack	Medium attack	Powerful attack	Extremely powerful attack
Starkrimson	X			
Wagner Premiat	X			
Jonathan				X
Red Melba	X			
Golden delicious		X		

It might be asserted that those apple varieties having a thin peel are less resistant to mildew [5].

Table 2. Pathogens and range of attack

Variety	Measure unit	Pathogen	Range of attack / density
STARKRIM-SON	Fr. GA	*Podosphaera leucotricha* Powdery Mildew of Apple	Weak attack
	Pomi %	Moss/lichens	100%
WAGNER PREMIAT	Fr. GA	*Podosphaera leucotricha* Powdery Mildew of Apple	Weak attack
	Pomi %	Moss/lichens	100%
JONATHAN	Fr. GA	*Podosphaera leucotricha* Powdery Mildew of Apple	Extremely powerful attack
	Pomi %	Moss/lichens	100%
RED MELBA	Fr. GA	*Podosphaera leucotricha* Powdery Mildew of Apple	Weak attack
	Pomi %	Moss/lichens	100%
GOLDEN	Fr. GA	*Podosphaera leucotricha* Powdery Mildew of Apple	Medium attack
	Pomi %	Moss/lichens	100%
	Fr. GA	*Venturia inaequalis* – Apple scab	Weak attack

According to our own observations, the most sensitive varieties to mildew attacks are Jonathan (strong attack) and Golden Delicious (medium attack), whereas when it comes to scab, Golden Delicious was most heavily affected. It ought to be mentioned here that scab was only noticed on leaves and twigs, given that fruit were never produced, also due to the attack of ladybeetles.

Photo 1. Powdery Mildew of Apple (original photo)

It is beyond doubt that – unless necessary measures are taken – the scab disease will spread to the other varieties in the orchard, which are more resistant but are not immune [26].

Photo 2. Apple scab (original photo)

Photo 3. Nectria canker on Apple (original photo)

Photo 4. Moniliosis on Apple (original photo)

It ought to be mentioned as well that numerous plants – from all varieties – were affected by cankers (*Nectria galligena*).
Unattended orchards or farms with old trees are usually characterized by a high occurrence of lichens and mosses on the trees' trunks and twigs; and the same goes for the Rusciori orchard, in which the occurrence of mosses and lichens on apple trees is of 100%. These types of pests are very harmful to trees, leading to low production, low quality fruit and eventually causing twigs or even the entire tree to dry out.Furthermore, they represent a favorable environment for pests [9], are indicators declined orchards [27] and the worst scenario is when lichens attack main twigs, so the thickest ones that cannot be cut off – as in the case of the apple trees at the Rusciori farm. The only advantage of lichens is the fact that they indicate a clean air, rich in oxygen with hardly any pollution [20].

Photo 5. Moss and lichens (original photo)

CONCLUSIONS

In conclusion, the main question is whether the necessary time and financing to renovate a currently untended orchard can be justified, given the fact that in 2014 and 2015 there was no harvest due to the powerful attacks by vegetal and animal pests; the most sensitive apple variety being Jonathan.
The suggested answer is that the orchard of the Rusciori farm is a declining one, but although the apple trees have been attacked by a multitude of pathogens and pests, not all trees show obvious signs of aging; and therefore a total land clearing does not come into question. The cultivated varieties are highly demanded in the region , both for their consumption as fresh produce and for their processing; and there are efficient solutions to lengthen the life of those trees which still promise economic productions: the riddance of exhausted trees; radical regeneration croppings of the main branches by removing half of the twigs' extremities; scraping and brushing of trunks and twigs, as well as their whiting as a measure against lichens and mosses; fertilization of decaying trees, by using moderate dosage of nitrogen, phosphorus and potassium or conpost heap [22]; decreasing infection sources by a multitude of agro-phytotechnical measures: deep autumn tillages, used to bury the attacked leaves having a large number of germs [21] or the burning of affected leaves and dry twigs as a means to decrease the source of infection. Urea spraying favorizes leaves to come off, so by removing the leaves the harm is noticeably reduced. The elimination of contamination sources (attacked sprouts, mummified fruit, etc.) can be achieved by the following measures: ploughing between lines; mulching or herbicidation between lines in order to destroy weeds; avoiding lesions during harvesting; triage of the fruit before storing; planning and performing a programme of phytosanitary treatments during vegetative repose and during the vegetation period, treatments that constitute chemical protection [11], [14], a fundamental measure often applied in apple orchards. The treatments are performed after

recommendation from the advisory/warning stations, by respecting and applying the indications from the warning bulletins, together with controlling those pests that provoke damages to the fruit.

Protection measures against pathogens represent important chains in the context of the culture technology of cultivated plants [8]; and they contribute to the saving of considerable crop quantities and the provision of high quality products.

Special attention must be given to integrated protection [1], by the combination of all preventive and curative measures and methods [13], [16], and if possible their integration in the plant culture technology, striving to attain a healthy culture, while protecting the environment. Due to the multitude of pests occurring on apple plantations, individual control methods cannot be successful [2]. Therefore, it is advisable to combine chemical means with other compatible methods [22].

The complex of measures (Fig.1) having real consequences on decreasing the attack of pathogens, obtaining high quality fruit, with increased possibilities of preservation and efficiency, defines the modern concept of integrated protection [24], [15], [23].

Prevention and protection methods are established according to pest species [5], [12], [16], [10], orchard surface, technical possibilities as well as ecological [3], [6] or agro-technical conditions [15], [16], [4].

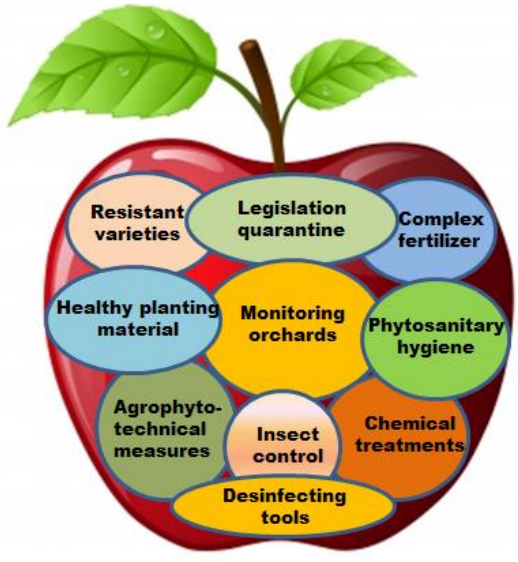

Fig. 1. Integrated protection scheme (original)

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ORGANIC FARMING IN SIBIU COUNTY, ROMANIA

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Abstract

Romania has a relatively new history of the organic market, but increase the number of operators registered in the system is a spectacular one. Currently Romanian agriculture is going through a long and difficult transition from centralized economy to the European economy. In these conditions, organic agriculture is an opportunity for the rural population to increase their standard of living, which is far behind the European economy while respecting "sustainable development" by: environmental protection, natural resource conservation, preservation and promotion of cultural values in these areas, keeping the population in rural areas by removing the population exodus, diversification and promotion of occupational opportunities, in order to reduce unemployment in rural areas. This paper aimed to analyze the application of the concept of sustainability in agriculture by organic farming in Sibiu County, a central region of Romania, where it is the largest producer organic in the country, where organic agriculture is applied in the half of village number in the county and where most organic operators are grouped in a core (Vurpar). Methods used followed the knowing awareness among organic operators about benefits of organic farming about human health and environment. The main conclusion of this study is that the operators are aware of benefits and they must look for corresponding methods for products development recovery by getting value added.

Key words: *ecological (organic) agriculture, environmental protection, sustainable development*.

INTRODUCTION

Romania and organic farming. "Organic agriculture is an ecological alternative, rational, that harness the "vocation" of the environment and conserve soil fertility, considered the most valuable component of the agricultural ecosystem" [19]. Fukuoka, a Japanese farmer from the 1940s called it "agriculture that do nothing - no plowing, no fertilizing, no control weeds without pesticides" consider it superior economic even modern methods [20]. Romania has a relatively new history of the organic market, but the growth registered in the system operators is a spectacular one[6].

In Romania, organic acreage increases every year and the number of organic operators also. However, most operators have small areas and fewer animals [16]. In 2012 acreage grew organically so reaching pastures and fodder to hold 44% of the total, 29% cereals, oilseeds and protein 22%.

Most manufacturers export their production as raw material due to lack of processing points. Exports of organic products in 2012 were EUR 200 million Eur and the consumer market is estimated at 80 million Eur. In terms of consumption per capita, it is the lowest in Europe, with € 1.2 per capita [12].

According to the latest data published on the website of the ministry of agriculture, Romania is the country with the fastest growing in the world in the number of operators enrolled in the organic farming system [13].

Regarding the processed products in 2012 was an increase in the number of processors and the range assortment of organic products was more diversified including: processed milk cow and sheep (cheese, butter, cream, etc.), processed soy products (milk, tofu pate, croquettes), sunflower oil, a wide range of bakery products (bread, pasta, cookies) products processed from rice, corn flakes, herbal teas, juices berry products processed hemp seeds, bee-products (wax, propolis, pollen), processed pork products (sausage, ham) and organic wine [4[, [14].

Studies on biodiversity (component of sustainable development) around Sibiu were made over years of various specialists,

diversity and the richness it is an indicator of environmental pollution in the area [7], [10].

MATERIALS AND METHODS

The materials and methods used were: consulting bibliographic data, statistical data, and many incursions into the county to meet farmers practicing organic farming, to get information about why the conversion, traditional practices, opportunities, risks, production, profit, awareness of the benefits of organic farming on the environment and human health. information was processed through analysis, evaluation or comparison with a high coefficient of synthetic truth. According to sources IFOAM [15] the number of producers has increased from 2920 in 2005 to almost 15,315 in 2012, this being possible due to grants awarded by the Romanian state, the area increased from 92,770 ha in 2005 to 288,261 ha in 2012 and from 0.67% organic in 2005 to 2.10% in 2012 (Table 1, Fig. 1.).

RESULTS AND DISCUSSIONS

In terms of area, it seems that Sibiu is the top organic farming, because it has the largest areas of land for organic farming ie: 450 acres of orchards, 414 hectares of various crops, 3,700 acres pasture and meadow, and most organic sheep farms (21 farms) [18].

Tabel 1. Evolution of organic farming in Romania

Year	2005	2006	2007	2008	2009	2010	2011	2012
Area (ha)	92,770	107,578	131,401	140,132	168,288	182,706	229,946	288,261
% Organic	0.67	0.77	0.96	1.01	1.21	1.33	1.67	2.10
Producers	2,920	2,033	2,238	2,775	3,078	2,986	9,471	15,315

Source: http://www.organic-world.net/statistics-data-tables-dynamic.html?&L=0 [15]

In the county of Sibiu, organic farming has experienced in recent years a special scale. "We have the largest organic producer in the country" - claimed George Budrala, executive director of the County Department of Agriculture Sibiu at the time: "It's Ital Agroturism Maluda of Sura Mare, registered with 230.26 acres of apple and cherry trees; Mihai Eminescu Trust Company Malancrav - registered with 114.97 hectares of apples, nuts and plums and 21 shepherds of Vurpar holding 3,700 acres pasture and meadow green for an effective ecological 16,000 sheep."

Due to the benefits to farmers, the number of applications for organic farming in the county is growing [5], [17].

During numerous incursions in the county, I met, talked and questioned 305 people working in agriculture, forestry and agribusiness, in which 185 people aged under 40, five people are members of a producer group, 80 people farmers are in a semi-subsistence farm.

During these activities were undertaken managed a good exchange of information about organic farming and its benefits on human health and the environment.

Organic farming of Sibiu county is a sector with_many development opportunities and a viable alternative to develop a sustainable European agriculture, maintaining biodiversity and maintain environmental health [11].

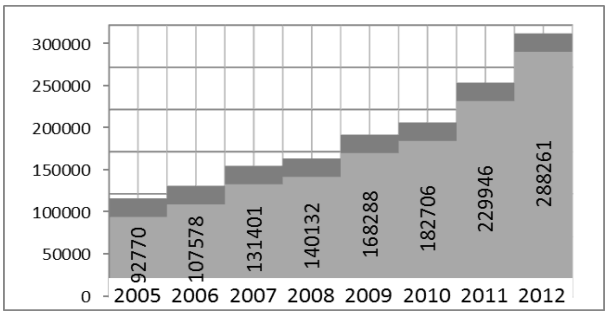

Fig. 1. Organic area evolution in Romania [14]

Organic production involves a global production: agriculture and food, by combining the best environmental practices, with a high level of biodiversity [9], [10], conservation of natural resources, application of high animal welfare standards and a method for production that complying preference of certain consumers. Organic production delivers public goods contributing to environmental protection [8], animal welfare and rural development [1].

Natural honey is the sweetest and miraculous product of nature resulting from processing by honey bees into nectar or other sweet substances found in all kinds of honey (manna

of vegetable or animal origin, fruit juices), by their transformation under the enzymatic action of saliva and gastric juice of the bees [18].

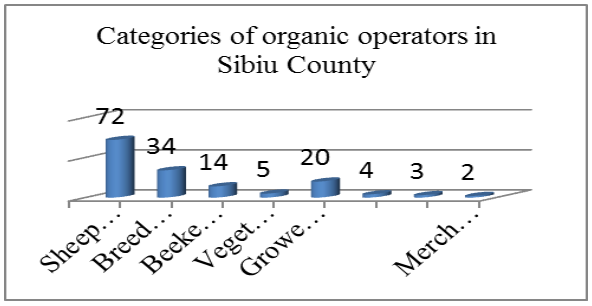

Fig. 2. Categories of organic operators in Sibiu County
Note: some organic operators dealing with sheep and goats were certified feed production and other crops as well.

Why organic farming in Sibiu county? Because in this county chemicalization and industrialization have not yet reached the level of other counties or in Western countries, organic production is not dependent on them! One can define perimeters green, unpolluted, where specific techniques can be applied to organic farming.
In 2012, the Department of Agriculture and Rural Development Sibiu were a number of 130 registered organic operators. Of these 121 are farmers, that are either certified as organic producers, or in a period conversion, processors, importers and merchants. They deal with the cultivation of plants (grasses, vegetables, fodder plants, shrubs and fruit trees etc.) and animal breeding (sheep, goats, cattle, buffaloes, bees).
The farm production stage prohibiting genetically modified organisms (GMOs and their derivatives) of synthetic fertilizers and pesticides, growth stimulators and regulators, hormones, antibiotics [3]. In the food processing stage restricting the use of additives, complementary substances and synthetic chemicals used in the preparation of organic food. Organic farming has a major contribution to sustainable development, increasing economic activities with significant added value and increase interest in rural areas [2], [3].
Following checks carried out inspection and certification bodies, operators have complied with production rules will receive a certificate of organic product will be able to label products with the words, organic. The label affixed to an organic product are required following: referring to organic production, logos, names and code inspection and certification body that issued the certificate of inspection and ecological product. National logo ae specific for organic products with the Community logo is used to supplement labeling by consumers to identify products produced in accordance with organic production methods [3].
The process and procedures for obtaining organic products are regulated by strict production rules and principles that go from the quality you need to have to obtain land and ecological product. In our country there are many certified inspection bodies, five of them out inspections and monitoring in Sibiu county.

CONCLUSIONS

After studying the data provided in this article we conclude that sustainable agriculture in Romania is an opportunity for producers and organic food production is a steady increase in recent years. That certified organic farming areas progressively increased in recent years marked interest among farmers, that from the point of view of the rural economy, make viable expansion of economic activities with high added value and generate new jobs enabling revenue growth and providing job satisfaction.
Currently, organic farming is in Sibiu county productive, conserve environmental resources, but not for all operators sufficiently profitable. For many farmers it is at a subsistence level and trying hard passage of this level. Only a few operators have reached the level of agriculture practiced in other European countries, where family farms are only one source of income for the family.
Although common Vurpăr "the first eco-village" in the county through the will of the majority of the village farmers to practice organic farming operators expect from the authorities in their favor legislation; expects support by facilitating access to projects to

develop; expect help in promoting organic products on the local, national and international.

Some farmers were formed an association to easier access European funds and have big plans for the future (a mini-factory to process raw materials: milk) to open a shop for the sale of raw materials and processed products, to create added value.

Remarkable increase in consumer interest from year to year (2014 - 2015) to purchase and consume organic products, it is known that organic products are important in human life, only that the purchase price is unaffordable for a large segment of the population.

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STOCHASTIC PROCESSES AND SOME APPLICATIONS

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Abstract

In this paper, we discuss about some applications to the birth and death process in biology and in the theory of waiting. First, we introduce some theoretical notions about the stochastic processes and we define the Markov chain and the Poisson process. Afterwards, we consider two processes of birth: "The Poissonian tide of particles" and " The Yule-Furry process", that have multiple applications, the theory of waiting being one of them. Finally, by using the theoretical concept presented above, we solve two examples: the first is a problem from veterinary medicine, and the second one is an example of the model M/M/1 from agriculture, which means if the entrance, the time of serving and the number of stations are given, we'll calculate the number of the biological units in system, the medium number of the applicants in line and the medium time of waiting.

Key words**:** *birth and death process, theory of waiting, the Poisson distribution*

INTRODUCTION

Random variables which depend on one or more parameters appear in many applications of probability. The theory of stochastic processes studies the families of random variables defined on the same probability space. Areas such as biology, science, technology and socio-economic are just some applicability domains of this theory. When we consider the reliability of a system (laboratory instrument, agricultural machine, computer, electronic device, etc.) we study the variations of its characteristics over time. Another example (which is just one of the topics of this paper) is about a problem in veterinary medicine, in which we want to determine the number of statistic units of a population from a particular habitat. We can determine the number of particles, bodies, etc., existing in a given space at a time "*t*". A second example solved through the stochastic process theory is an application of serving systems in agriculture.

If we know in terms of probabilities the inputs, outputs and mechanism serving, we study the estimation of the number of statistical units located in the service station at a certain time, the probability of existence of a number of applications in the system, the average waiting time and the average number of busy stations. For discussing and solving the study of the problems proposed in the first stage, it is necessary to define the concepts and basic properties of the theory of stochastic processes and afterwards to determine the solutions, by applying the concepts given above.

MATERIALS AND METHODS

We consider $(\Omega, \mathcal{K}, P)$ a probability space and T a lot.

We define in accordance [1] the notions such as: stochastic process, Markov chains and Poisson process.

Definition 1.

It's called stochastic process (random process or random function), a family of random variables parameterized, $\{X_t\}_{t\in T}$, $X_t : \Omega \to R^n$, $(\forall)t \in T$; T is the *parameter's space* and $S \subset R^n$ the lot of the values of random variables X_t, it's called the *space of state*.

Observations:

-If T=**Z** or T=**N**, then the stochastic process depends on a discreet parameter and it is called chain.

-If T=**R**, $T=[0,\infty)$ or $T=[a,b]$, then the stochastic process depends on a continuous parameter and it is called process with continuous time.

An important criterion for classifying the stochastic processes is determined by the connection between the random variables X_t, when *t* covers through the parameter space. A class of stochastic processes for which the

$$P\left\lfloor X_{t_n}=i_n \mid X_{t_{n-1}}=i_{n-1},...,X_{t_1}=i_1\right\rfloor = P\left\lfloor X_{t_n}=i_n \mid X_{t_{n-1}}=i_{n-1}\right\rfloor \quad (1)$$

provided that the left member of the previous relationship is defined.

A) The Poisson process is considered the most simple of discontinuous Markov processes and has a special place in the theory of probability, with many applications in biology, physics, engineering, telecommunications and transportation. Such a process is characterized by the following conditions:

a) For the process X_t, the probability to have a change in the time interval $(t,t+\Delta t)$ is $\lambda\Delta t+0(\Delta t)$, where λ is a given positive constant which represents the average number of events produced per unit of time with

$$\lim_{\Delta t\to 0}\frac{0(\Delta t)}{\Delta t}=0,$$

b) The probability to occur more than a change of the process in the time interval $(t,t+\Delta t)$ is $0(\Delta t)$,

c) The probability to occur no change in the time interval $(t,t+\Delta t)$ is $1-\lambda\Delta t-0(\Delta t)$.

These probabilities are independent of the state of the system [3].

If $p_n(t)=P(X_t=n)$, $n\in N$ represents the probability that at moment *t* the process is in the state *n*, then the probability that at some following point $t+\Delta t$ to be still in the state *n* will be:

$$p_n(t+\Delta t)=P\left(X(t+\Delta t)=n\right)=(1-\lambda\Delta t)\,p_n(t)+\lambda p_{n-1}(t)\Delta t+0(\Delta t), \quad (2)$$

The relationship (2) is equivalent to the following:

$$p_n(t+\Delta t)-p_n(t)=-\lambda\Delta t p_n(t)+\lambda p_{n-1}(t)\Delta t+0(\Delta t). \quad (3)$$

If the last relation is divided to Δt and then it proceeds to limit for $\Delta t\to 0$, we obtain the differential equations that characterize the Poisson process:

$$\frac{dp_n}{dt}=-\lambda p_n(t)+\lambda p_{n-1}(t),\ n\geq 1 \quad (4)$$

And for $n=0$, $p_{n-1}(t)=0$ and

$$\frac{dp_0}{dt}=-\lambda p_0(t) \quad (5)$$

The solutions of equations (4) and (5) are:

$$p_0(t)=e^{-\lambda t} \quad \text{and} \quad p_n(t)=\frac{(\lambda t)^n}{n!}e^{-\lambda t}, \quad (6)$$

and they represent the probability that at the time $t\geq 0$, the random variables X_t with the Poisson distribution to be in the state *n*.

The entire demonstration of the above relation is in [4], in the chapter dedicated to stochastic processes.

future is independent of the past, as soon as the present is known, is the Markov chains.

Definition 2

The family of random variables $\{X_n\}_{n\in N}$ is called the Markov chain if it verifies the Markov´s relation, i.e. $(\forall)n\geq 2, 0\leq t_1<...<t_n$ and $(\forall)i_1,...,i_n\in S$,

Observation:

In accordance with [3], these remarks regarding a Poisson process can be made:

* is a process whose streets are natural numbers,

* its increases are independent over an interval with length Δt,

* $\sum_{n\in N^*}p_n(t)=1$ (at the time *t*, the process is certainly in one of the states $x\in N^*$);

* is a process of counting, its states are often identified by the number of occurrences of a particular event within an interval with length *t*.

*the average of the process is $E(X_t)=\lambda t$.

B)The Yulle-Furry process is a linear process of birth, with $X_t=n$ and the property that each person in the interval $(t,t+\Delta t)$

independently of the other can give birth to another person with the probability $\lambda\Delta t + 0(\Delta t)$.

Then the variables have binomial distribution and the probability that the *n* people give birth to other *k* people is

$$P(X_{t+\Delta t} = k) = p_k(t+\Delta t) = C_n^k \left(\lambda\Delta t + 0(\Delta t)\right)^k \left(1 - \lambda\Delta t - 0(\Delta t)\right)^{n-k} \quad (7)$$

In particular, for $k = 1$,

$$p_1(t) = \lambda n\Delta t + 0(\Delta t) \quad (8)$$

The differential equations of the process are:

$$\frac{dp_n}{dt} = -\lambda n p_n(t) + \lambda(n-1)\, p_{n-1}(t),\ \mathrm{n} \geq 1 \quad (9)$$

$$\frac{dp_1}{dt} = -\lambda\, p_1(t) \quad (10)$$

With the solutions $p_1(t) = e^{-\lambda t}$ and

$$p_n(t) = e^{-\lambda t}\left(1 - e^{-\lambda t}\right)^{n-1} \quad (11)$$

A characteristic of the birth (this observation is made in [5]) and death processes is that if E_n is the state of process in the interval $(0,t)$, then in $(t,t+\Delta t)$ the system can either be in the state E_{n+1} or in the state E_{n-1}.

In [4], Orman G.V. describes The Furry-Yulle process. This process can be characterized by the following conditions:

a)For $n \geq 1$, from the state E_n, the process can pass either in the state E_{n+1}, or in E_{n-1}; and from the state E_0 only in E_1.

b)If $X_t = E_n$ (at time *t* the process is in the state E_n), then the probability that in the interval $(t,t+\Delta t)$ to be in the state E_{n+1} is $\lambda_n\Delta t + 0(\Delta t)$;

c)The probability that in the interval $(t,t+\Delta t)$ to be in the state E_{n-1} is $\mu_n\Delta t + 0(\Delta t)$;

d)The probability that in the interval $(t,t+\Delta t)$to have more changes than previous ones is $0(\Delta t)$, with $\lim_{\Delta t\to 0} \frac{0(\Delta t)}{\Delta t} = 0$.

The differential equations that characterize the Poisson process are:

$$\frac{dp_n}{dt} = -(\lambda_n + \mu_n)\, p_n(t) + \lambda_{n-1} p_{n-1}(t) + \mu_{n-1} p_{n+1}(t),\ \mathrm{n} \geq 1 \quad (12)$$

$$\frac{dp_0}{dt} = -\lambda_0 p_0(t) + \mu_1 p_1(t) \quad (13)$$

One of the areas where properties of the Yulle-Furry processes can be applied is serving systems theory.

D.Kendall [2] defines such a system through three elements: 1) input stream, 2) order serving; 3) serving mechanism.

*In case of the input stream (M), the interval between two arrivals $t_n - t_{n-1}, n \geq 1$ is a random variable with the Poisson distribution, so the probability that in the interval $X_t = n$ is $p_n(t) = \frac{(\lambda t)^n}{n!} e^{-\lambda t}$ and λ is the average number of requests in the time unit and the average time interval between two consecutive applications could be $\frac{1}{\lambda}$.

* Regarding the order of the servers it is assumed that it coincides with the order the arrivals;

*Regarding the mechanism of serving, it can be observed that the durations of serving are independent random variables that do not depend on the input stream, there were generally serving lines with the servings flow intensity μ and the average time between two servings being $\frac{1}{\mu}$;

* If both the order of serving and the serving mechanism are of poissonian type and there is only one service station, then the model type is M/M/1. It will be demonstrated by the application 2) that such a model is Yulle-Furry process.

It is considered the case of statistical equilibrium with $p_n(t) = p_n = \text{constant}$ (the probability of *n* server requests in system). Then the differential equations (12) and (13) become:

$$p_n'(t) = -(\lambda+\mu)\,p_n(t) + \lambda p_{n-1}(t) + \mu p_{n+1}(t) \qquad (14)$$

$$-\lambda p_0 + \mu p_1 = 0 \qquad (15)$$

$$-(\lambda+\mu)\,p_n + \lambda p_{n-1} + \mu p_{n+1} = 0 \qquad (16)$$

From the relation (15) it obtains:

$$p_1 = \frac{\lambda}{\mu} p_0 = \rho p_0 \ , \qquad (17)$$

where $\rho = \frac{\lambda}{\mu}$ is the serving factor of a station and $\rho^* = \frac{\rho}{s}$ is the traffic intensity.

Using the recurrence (16) the solution is obtained by mathematical induction:

$p_n = \frac{1}{n!}\rho^n p_0, n \in N$, with

$$p_0 = \left(1 + \frac{\rho}{1!} + \frac{\rho^2}{2!} + ... + \frac{\rho^s}{s!}\right)^{-1} \qquad (18)$$

If $\rho > 1$, then the average number of existing units in system at the time *t* in the case of *s* service stations is calculated using the next relationship:

$$T = \rho - \frac{\rho^{s+1}}{(s+1)!} p_0 \qquad (19)$$

The average waiting time in line to start serving:

$$S = T\frac{1}{\lambda} \qquad (20)$$

And the total average waiting time is:

$$S_t = S + \frac{1}{\lambda} \qquad (21)$$

RESULTS AND DISCUSSIONS

1. It examines the efficiency of a vaccine used to prevent of animals from certain diseases and is believed that to organisms don't act systematic factors but only random ones. If the arrival at the vaccination center is in accordance with a Poisson process by parameter $\lambda = 70$ animals / week and the probability to be adverse reactions is 1/7, what is the probability that in 4 consecutive weeks not to happen any adverse effects at any vaccinated animals?

Solution: It is noted with X_t the volume of the vaccinated animals at time t, which can be grouped into ones who have shown adverse effects $\{X_1(t)\}_{t\geq 0}$ and those which are not shown $\{X_2(t)\}_{t\geq 0}$.

It is known that the average of process is $\lambda = 70$ and we notice that the defined process verifies the conditions a), b), c) specific to a Poisson process.

We remark that can be made some observations regarding the process X_t:

-It is noticed that of the states of the process are natural numbers (number of animals vaccinated),

-Its increases are independent over an interval with length Δt,

- $\sum_{n\in N^*} p_n(t) = 1$ (at the time *t*, the process is certainly in one of the states $x \in N^*$);

-It is a process of counting, its states are often identified by the number of occurrences of a particular event within an interval with length *t* (the number of vaccinated animals with adverse effects)

-The average of the process is $E(X_t) = \lambda t$.

From the statement it follows that the number of the vaccinated animals who showed adverse effects $\{X_1(t)\}_{t\geq 0}$ is a Poisson process with parameter $\lambda_1 = \frac{1}{7}\lambda = \frac{1}{7}\cdot 70 = 10$. Then, the probability within 4 weeks not to occur any adverse effects to a vaccinated animal (i.e. the process $X_1(t)$ with the Poisson distribution to be in the state $n = 0$) is obtained by applying formula $p_0(t) = e^{-\lambda_1 t}$. Then,

$p_0(4) = P(X_1(4) = 0) = e^{-4\lambda_1} = e^{-40}$.

This result can be interpreted that the probability for 4 weeks may not occur adverse effects in any of the vaccinated animals under the circumstances is $e^{-40} = 4.24e^{-18}$.

If we want to know the probability that a certain number of vaccinated animals to manifest adverse effects in an interval of length *t*, then the answer could be give applying the formula $p_n(t) = \frac{(\lambda t)^n}{n!} e^{-\lambda t}$.

For example, the probability that in 2 consecutive weeks to happen adverse effects at one vaccinated animal is

$$p_1(2) = \frac{(2\lambda_1)^1}{1!} e^{-\lambda_1}$$

$$p_1(2) = \frac{(2\lambda_1)^1}{1!} e^{-2\lambda_1} = 20e^{-20}.$$

2. At a warehouse for raw materials arrive an average of 80 requests per day and are served on average 50 applications per day. If the deposit has 2 serving stops, we have to determine:

a) The probability p_4 in order to be 4 applications in system;

b)The average number of requests from the system;

c) The average waiting time in line to start serving;

d) The average total waiting time.

Solution: The situation fits in a M/M/2 model, with $\lambda = 80$ (there are in average of 80 requests per day) and $\mu = 50$ (i.e. in average 50 requests per day are served). If Y_t is the number of served requests until the moment *t*, then: $P(Y_t = n) = \frac{(\mu t)^n}{n!} e^{-\mu t}$.

a)The report $\rho = \frac{\lambda}{\mu} = \frac{80}{50} = 1.6 > 1$

and $\rho^* = \frac{\rho}{s} = 0.8 < 1$, the traffic intensity.

Using (18) it results:

$$p_0 = \left(1 + \rho + \frac{\rho^2}{2}\right)^{-1} = 0.2577,$$

$$p_4 = \frac{\rho^4}{4!} p_0 = 7\%.$$

b) The average number of existing units in system at the time *t* is calculated with the relation (19)

$$T = \rho - \frac{\rho^{s+1}}{(s+1)!} p_0 = \rho - \frac{\rho^3}{3!} p_0 = 1.4 \text{ requests.}$$

c) Using (20) we can determine the average waiting time in line of a request

$$S = T\frac{1}{\lambda} = 0.0175 \text{ days}$$

With (21) we obtain the total average waiting time

$$S_t = S + \frac{1}{\mu} = 0.0375 \text{ days.}$$

CONCLUSIONS

The examples discussed in this paper lead us to conclude that the stochastic processes can be the optimal solution to solve specific problems of agriculture.

Thus, if it is analyzed the evolution of a phenomenon in relation to time and we find that the results have a Poissonian distribution, then we can calculate the probability that in a given time, the event to happen a certain number of times.

In other cases, if the situation of the agriculture can be transposed in to a serving model with known inputs, outputs and serving mechanism, then the parameters associated can be determined by applying certain properties of stochastic processes.

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COMPARATIVE STUDY OF INTANGIBLE ASSETS OF APPROACH IN THE SPANISH ACCOUNTING SYSTEM COMPARED WITH THE NATIONAL ACCOUNTING SYSTEM

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Abstract

In the new economy based on knowledge, harmonization of the related accounting intangible assets is far from being completed. Conducted research identifies a number of controversies related to the recognition of separate initial measurement, subsequent measurement, measurement, depreciation and amortization of these categories of assets, as well as the requirements and applicability of accounting standards specific intangibles studied and the financial reporting related. The practical activity reflects the fact that unlike tangible assets or financial, the undertaking may hold a full control of the intangible assets, and this is the reason for which the activity of management and reporting of them in the current systems of financial reporting is quite complex. Poor control of these assets generates side effects on the ability of the undertaking concerned to obtain the benefits of the investment.

Key words**:** *intangible assets, accounting system, recognition, measurement and amortization*

INTRODUCTION

Accounting the intangible assets has been a controversial issue, primarily by the nature of obtaining a reliable estimate value of intangible assets which is one relatively difficult. Also, the evolution of the new economy which grant a high increasingly importance for intangible assets, can influence the related accounting treatment.

The global highlighting *(insufficient)* of intangible assets in the balance sheet shall allocate the financial statements, the quality of the incomplete resource of information. Currently, in most organizations intangible assets have become the main component in generating revenues and expenses. In this regard, the marks may represent even a third of the value of the company, but even so, they are still not exploited at their true value [10].

In the market economy, accounting represents the structured information office, which is motivated by the interest of human consumption in particular for the analysis and control of flows which reflects the economy state and evolution [9].

Belen et al. (2013) reported that the management of intangible assets are facing with many difficulties, mainly because of the lack of information, which shows their intangible nature [1]. In most cases, the value of the intangible assets does not appear in the financial statements. Mostly, this situation is due to the lack of transparency and the absence of a reference market which makes it difficult to appraisal or evaluation of these elements.

Any active intangible asset shall be measured according to its capacity to contribute to the increase of the revenue or to reduce costs, while the market remaining will determine the best value of these economic elements *(regardless of the indicators involved).*

MATERIALS AND METHODS

Given the fact that Spain is a country well developed that encourages investment in information and communications technology *(ICT)*, research and development *(R&D)*, innovation, design, creativity, image and brand, organization and training of specific human capital *(training/know-how, experience held by each employee)* in order to modernize and strengthen the production structure, the idea of comparative analysis in the evaluation of intangible assets in compliance of the Spanish accounting system has a significant contribution for the present scientific approach.

The purpose of the paper was to make a relevant comparison between various scientific approaches, using a set of six specialized articles ([2], [8], [5], [6], [7], [1]), in order to set up a comparative study of the approach of intangible assets in the national accounting system compared to the Spanish accounting system. *(Tables 3, 4 and 5)*

The data centralization in question is highlighted in the five tables presented in this research.

RESULTS AND DISCUSSIONS

Thanks to the information gained during the deep study of literature on the topic, we found that Spanish enterprises attach a quite great importance to the owned intangible assets *(but the information is quite difficult to access)*, moving from an industrial economy to implement the economic treatment application related to the knowledge society.

Through the study conducted by Córcoles (2010) [6] in Tables 1 and 2, it is presented a comparative accounting treatment of identifiable intangible assets acquired externally and internally generated to each of Regulations PGC-2007 *(Spain)*, IASB and FASB.

With regard to the depreciation, the IASB and FASB does not specify a time limit for the depreciated intangibles assets, while the Spanish accounting system, PGC-2007, proposes, as a criterion of the depreciation, the useful life of the assets, a maximum of 5 years. Thus, research expenses capitalized should be amortized over their useful life within 5 years and development costs activated should be amortized equally over their entire useful life, which usually is less than 5 years *(in the absence of any situation contrary to the idea).*

The accounting treatment related to identifiable intangible assets by which the three regulations have gone by mutual agreement can be highlighted as follows:

(i)the accounting recognition criteria for identifiable assets acquired externally are identical;

(ii)the creation of a very similar definition to the concept of *"identifiability"*;

(iii)the use of fair value as a criterion for measuring intangible assets arising from exchange transactions and intangible assets obtained as a result of a business combination;

(iv)the possibility of the intangible assets of having an indefinite useful life;

(v)elimination of the depreciation of intangible assets criterion with indefinite useful life, which will be checked annually for any impairment in value, also presented in Table 1.

Analyzing the data shown in Table 1, we can say the following:

-all three accounting regulations recognize the identifiable intangible assets acquired externally;

-the first two accounting treatments *(PGC-2007 and IASB)* recognize intangible assets acquired separately - at acquisition cost, while FASB recognition at fair value *(in the same way as in the situation of the operation of the exchange)*;

-according to the first two treatments accounts exchange transactions are recognized in the same manner;

-combinations of undertakings are recognized in the same way for all of the three accounting treatments, while the measurement of intangible assets concerned shall be carried out in a different way for each of the accounting treatment;

-in respect of depreciation all three accounting treatments are perfectly by the agreement;

-depreciation method is identical to the first two accounting treatments, while FASB

proposes a different variant; identical situation and for the methods for the recovery of past losses.

Table 1. The accounting treatment of identifiable intangible assets acquired externally

Comparable	PGC-2007 *(Spain)*	IASB	FASB
Recognized in the accounts	**YES**	**YES**	**YES**
Initial recognition	**Intangible assets acquired separately**		
	Cost of acquisition	Cost of acquisition	Fair value
	Exchange operations		
	Business transactions: • Fair value: *Non-business exchanges.* • The date of net assets.	*Business transactions:* • Fair value: *Non-business exchanges.* • The date of net assets.	Fair value
	Business Combinations		
	Fair value	Fair value	Fair value
The recognition of the measurement	Historical cost	- Cost model - The revaluation model	The revaluation model
Amortization	- *Finite useful life:* depreciates; - *Indefinite useful life: is* not depreciated.		
Depreciation	The book value > The recoverable value	The book value > The recoverable value	The book value > The fair value
The recovery of the past loss	Allows to flip the loss of impairment	Allows to flip the loss of impairment	Does not allow the reversal of the loss of impairment

Source**:** [6], pp.198.

Regarding the accounting treatment of identifiable intangible assets internally generated *(Table 2),* the situation is quite the reverse, that this time the last two accounting treatments *(IASB and FASB)* applies similarly, while first accounting treatment *(PGC-2007)* operates independently.

Therefore, the situation highlighted in the first two tables showed that the application of the three accounting treatment is relatively similar, and, in some instances, each of the studied treatments is distinctly individualized.

The growing importance given to activities based on knowledge [3] in the economic development of most advanced countries, such as investment in intangible assets - information and communications technology, research and development, innovation, design, creativity, image and brand, organization and specific training human capital is modernizing and reinforcing the structure of production safety, including the Spanish state.

Table 2. The accounting treatment of identifiable intangible assets internally generated

Comparable	PGC-2007 *(Spain)*	IASB	FASB
Recognized in the accounts	*Research expenditure:* - Capitalization *Development expenses:* - Capitalization.	*Research expenditure:* -Unfunded. *Development expenses:* -Capitalization.	Typically, research and development costs are not capitalized.
The recognition of the measurement	*Direct costs:* Capitalization. • *Indirect costs:* - Capitalization.	*Direct costs:* - Capitalization. • *Indirect costs:* - Unfunded.	*Direct costs:* Capitalization. *Indirect costs:* Unfunded.
Amortization	*Research spending:* - Within 5 years. *Development expenses:* - In less than 5 years.	It is not stated a deadline of depreciation.	It is not stated a deadline of depreciation.

Source: [6], pp.199.

Modern companies operate in a global environment characterized by competition, technological revolution [4] and the reversal of the balance in favor of intangible assets which require reporting of rigorous accounting purposes these new vectors generate new value created.

But there are doubts and why not the spare of some specialists in the field to which, the traditional accounting system currently provides sufficient and appropriate information for making decisions. In addition, there is the opinion that the search for methods and new models close to reality with a greater degree of truth but also relatively simple financial evaluation of intangible assets is still quite difficult to achieve.

In Romania, the companies listed on the Bucharest Stock Exchange satisfy the general provisions of the accounting framework and the National Commission of Securities Regulation and presents only information strictly required by accounting regulations, without insisting on the intangible business.

From the perspective of the Spanish companies, but in the reporting of their traditional indicators of the nature of the financial-accounting on intangibles assets are calculated and the results are analyzed and interpreted by enabling business a more realistic assessment of the assets held and its role in future developments.

At the level of the accounting system in respect of intangible assets, it is found that the companies have a low degree of disseminating information on the patrimonial structure.

All information relating to the initial recognition of intangible assets are recorded under International Accounting Standard, IAS 38 Intangible Assets *(IFRS, 2013)* [11], applicable from 31 March 2004 and relates primarily to the acquisition, accounting for intangible assets acquired as a result of a business combination, generating its own assets or to all other intangible assets *(Table 3)*.

Table 3. The initial recognition of intangible assets

IAS 38 *Intangible Assets*	**IASB**	**The economic perspective**
It can generate future economic benefits attributable to the asset in question *(which usually are transferred to the entity).*	Future economic benefit associated with the item will be a flow to or from the enterprise.	Can be identified by a specific name, at some point or as a result of actually identifiable.
The cost of the assets in question can be assessed in a realibly manner.	Have a cost or value that can be obtained in a relevant way.	To be the subject to a right of private property and it can be transferred legally.
Intangible assets obtained from research or from the research phase of an internal project **would not be recognized as assets** *(see the brands, trademarks, logos, patents, licenses, know-how, goodwill, copyrights internally generated newspaper and magazine titles, customer lists and similar items).*	Are separable, i.e. they can be separated or divided by the entity and sold, transferred, authorized, leased or changed, either individually or together with a contract properly, a identifiable active or an identifiable debt *(Order of Minister of Finance no. 3.055/2009 updated by Order of Minister of Finance no. 1.802/2014).*	There should be a manifestation or a tangible record of the existence of the intangible *(contract, patent, etc.).*
	To obtain the rights of the contractual or other legal nature: transferable or separate entity or other rights and obligations *(Order of Minister of Finance no. 3.055/2009 updated by Order of Minister of Finance no. 1.802/2014).*	

Source: Personal processing in accordance with the accounting rules

In order to support the exposure in Table 3, we must specify that goodwill internally generated may not be recognized as an active asset, because it is not an identifiable resource controlled by the reference, and it cannot be separated and do not result from the legal rights in the contractual or of any other nature, which can be assessed credible at cost.

The criteria for the recognition set out above have been reviewed by the International Accounting Standards Board (2004), which included intangible assets in the IAS 38 Standard.

The main objective of this project was to improve the quality and obtaining international convergence in the field of accountancy in the case of combination of enterprises for tangible and intangible goodwill acquired as a result of business combination.

One of the most difficult criteria to be satisfied is the measurement of credible cost.

Assuming that this condition may be met, intangible assets must generally be valued at the cost. Among other things, this will include, the purchase price and any costs which can be directly related to the preparation of the asset for use. The only exception to this rule is the cost of any intangible assets obtained during a scan. Such intangible assets must be recognized at a fair value, which is the price objectively determined, for which it can be changed an active, of her own accord, between the parties in question.

Also, in Table 4, through some of the most well-known Orders of Minister of Finance *(OMF)*, under which the Romanian accounting system operates, a comparative exposure of the recognition of intangible assets in Romania is presented [12], [13].

In accordance with the IAS 38: intangible assets, subsequent recognition of these elements property details the two methods of assessment of intangible assets, drawn up after the initial recognition.

Table 4. Recognition of intangible assets according to OMF

OMF no. 3.055/2009[4]	OMF no. 1.802/2014
If it is forecast that will generate economic benefits for the entity and its cost can be measured reliably.	If it can be separately or detached from the entity and sold, transferred, transferred through a license agreement, hired out or changed, either individually or together with another contract with an identifiable active or with an identifiable debt concerned, regardless of whether the entity it intends to take this.
To determine whether an internally generated intangible asset meets the criteria for recognition, an entity classifies the generation of the asset into a research phase and a development phase. If the entity cannot distinguish the research phase and the development of an internal project to create an intangible asset, it will treat the costs of that project as being determined only by the research phase.	If it can be obtained from the contractual or other legal rights, regardless of whether those rights are transferable or separable from the entity or from other rights and obligations.
An intangible asset arising from research *(or from the research phase of an internal project)* is not recognized. Expenditure on research *(or the research phase of an internal project)* are recognized as an expense unless they are generated. This is because in the research phase of an internal project, an entity can not demonstrate the existence of an intangible asset and generate potential economic benefits.	

Source: Personal processing as required by law in Romania

(a)**The base treatment** - cost or less any accumulated amortization and losses of gained impairment;
(b)**Alternative Treatment accepted -** the value is reassessed; it is about the fair value at the time of the re-evaluation of less any accumulated amortization afterwards and any loss of accumulated depreciation at a later time. The treatment is accepted where fair value can be determined by reference to an active market for that intangible asset.
Therefore, the comparative analysis of the three referential accounting related to recognition of assets, proved that between Romanian accounting regulations and International Financial Reporting Standards there are many similarities and few differences.

[4] Repealed by OMF no. 1.802/2014.

In this context, it is confirmed the trend of convergence of accounting regulations the existence at world level.

Table 5. The accounting treatment of intangible assets: OMF and IAS

OMF	IAS
INITIAL RECOGNITION OF INTANGIBLE ASSETS	
Presented in table no. 4	Presented in table no. 3
IMPAIRMENT OF INTANGIBLE ASSETS	
Cash generating unit and the recoverable value are not defined. The depreciation is performed at an individual level.	Shall apply to the provisions of IAS 36 Impairment of Assets.
Will perform annual impairment tests for goodwill and intangible assets with indefinite useful life.	
CAPITALIZATION OF INTANGIBLE ASSETS [14]	
An entity may capitalize the costs of lodging, in which must perform their amortization over a period of up to 5 years.	Shall apply the provisions of IAS 38 according to which, the expenses of the Constitution may not be capitalized *(affects the profit and loss account when they are engaged)*. IAS 22: *Business combination* requests that the goodwill to be capitalized in the case in which it was purchased.
VALUATION OF INTANGIBLE ASSETS	
According to OMF no. 3.055/2009, customer lists are not recognized as an intangible asset.	At historical cost at the current cost *(or replacement)*, realizable value and the discounted value.
RE-VALUATION OF INTANGIBLE ASSETS	
OMF no. 3.055/2009 does not allow revaluation of intangible assets.	IAS 38 requires revaluation of intangible assets that have an active market. *If an intangible asset is revalued, any accumulated depreciation at the date of the revaluation is either:* (a) restated proportionately to the change in the accounting value of the gross assets in such a way that the book value of the assets after the revaluation reserve should be equal to the value to be reassessed; or (b) eliminated the gross carrying amount of the asset and the net amount restated to the revalued amount of the asset.
AMORTIZATION OF INTANGIBLE ASSETS	
There are allowed four methods of depreciation: depreciation of the linear, degressive depreciation, accelerated depreciation and the amortization of the identified per unit of the product or service.	In accordance with the IAS 38, intangible assets with a duration of an indefinite life may not be depreciated over time.

Source: Personal processing in accordance with the accounting rules

However, in respect of intangible assets, major discrepancies were noticed between the three models of accounting, with respect to capitalized assets according to OMF no. 3.055/2009, which is the only one who

capitalizes expenditure formation, IFRS recognizes the residual value in the calculation of depreciation, while OMF no. 3.055/2009 does not do this.

Regardless of the differences arising between the three variants, we support the idea that the process of harmonization is in an advanced stage, due to national legislation to implement referential IASB, which is in turn an advanced harmonization referential FASB.

Both the Romanian as well as the Spanish ones are faced with the lack of an *Unitary Guide*, formally, in which to be treated the way of interpretation and presentation of reports on the intangible assets of the economic actors, which unfortunately, affect the comparability of the evolution of the companies at regional level and both at national and international one.

CONCLUSIONS

The opinion of the most Spanish authorities is that in the future, intangibles assets would be likely to facilitate the development of new active or factors of competitiveness. Thus, this economic element which have become basic resources for the generation of competitive advantages will represent one of the main challenges in the business management.

The accounting treatment for intangible assets, internally and externally identifiable, highlighted in Tables 1 and 2, that, the development of a higher level of convergence between the accounting regulations referred to (IASB, FASB & PGC-2007) is not a uniform one.

The main differences between the analyzed regulations consist of:

• The use of the fair value for the purpose of measuring certain categories of purchases;

• The criteria for the measurement are applied subsequently;

• Revaluation of intangible assets;

• Loss measurement of depreciation of the value and the possibility of their reversal, but also the recognition and the amortization of the costs of research and development.

The study compared on the treatment of intangible assets in the accounts of companies in Romania and the ones in Spain reveals the following:

• The majority of the Spanish companies forecast that their assets intangible assets could lead to the creation of new assets or factors of competitiveness.

• The Romanian and Spanish companies are affected by the lack of a single guide, formally, which would treat the mode of interpretation and presentation of reports on intangibles assets, because the degree of comparison of the evolution of the companies it is getting lower.

It is therefore needed as the experts of both Member States of the European Union to divert its efforts toward the development of a standardized model of processing and reporting of data reliable, comparable and relevant, so that in the future, through the accounting standards relating to intangible assets recommended by the European Union, the two systems of accounts, the Romanian and the Spanish one, to be able to perfectly harmonize, and become comparable.

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