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C O N T E N T S

THE RESEARCHES REGARDING THE BIODIVERSITY OF THE ENTOMOLOGIC FAUNA OF THE CORN CULTURES IN THE SIBIU COUNTY

Iuliana ANTONIE, Mirela STANCIU, Camelia SAND, Robert BLAJ

"Lucian Blaga" University, The Faculty of Agricultural Sciences, Food Industry and the Protection of the Environment, Sibiu, 7-9 Dr. Ion Raţiu, 550012, Sibiu, Romania, Phone: +40 269 211338, Fax: + 40 269 213381, E-mail: iuliana_antonie@yahoo.com

Corresponding author: iuliana_antonie@yahoo.com

Abstract

As Romania joined the European Community there can be noticed a greater interest for the biodiversity of the entomologic fauna in the soil mainly regarding the management of the plants protection against the pests as well as the protection by different methods of the useful biodiversity of the fauna. The first step in fulfilling this aim is the identification of the pest in the corn culture in the Sibiu County, considering rightly that the upper the soil entomologic fauna can't be regarded as being isolated from the entomologic fauna in the soil, but on the contrary there are connections with reciprocal influences. The collected material during 3 years comes from four localities: Poplaca, Ocna Sibiului, Axente Sever and Copşa Mică. The used methods were as follows: the direct gathering with the hand, the gathering together with different parts of the plants, the use of the entomologic jar, pheromones traps. In the corn culture there were identified the following pest species: Tanymescus dilaticollis, Agriotes spp. and so on. These species can produce great losses in the production and sometimes even to compromise the entire culture. Beginning with 1996 there was confirmed the presence of the Diabrotica virgifera virgifera Le Conté. As a result of the identification of the pest entomologic fauna we can draw the following conclusions: the changes in the biodiversity of the entomologic fauna can give important indicators of the deterioration or rehabilitation of the soil; knowing the laws that rule the researched agro ecosystem allow us to choose the optimum method in order to keep the equilibrium between the species of the system and applying an integrated management which to affect less the system in its assembly and in the same time to obtain greater productions and a healthy, quality soil.

Keywords: biodiversity, agricultural entomologic fauna

INTRODUCTION

The corn represents the main agricultural field culture in Romania, having areas spread in all zones of the country. In the corn cultures there were identified over 20 species of pests with an important economic importance. From these we want to quote the following: *Tanymescus dilaticollis* (corn leaves weevil), *Agriotes spp.* (sarma worms), *Phyllotreta spp.* (the ground fleas), and so on [3], [4]. These species can produce a lot of damages in the production, and sometimes even to compromise the culture. Beginning with 1996 there was added the western worm of the corn roots (*Diabrotica virgifera virgifera* Le Conté) [1], [2] In the moment Romania joined the European Community there could be seen a raised interest for the biodiversity of the fauna on the ground as well as for that in the soil with sustained preoccupations thought the management of the protection of the plants against the pests and protecting , by different methods, the biodiversity of the useful fauna. The interest for the agricultural entomologic fauna in Sibiu County is determined also by the lack of researches regarding the pests of this culture. A first step in fulfilling this aim is the identification of the pest's species in the corn culture in our County, considering rightly that the entomologic fauna on the ground can't be regarded as being isolated from the soil entomologic fauna, but on the contrary there are connections with reciprocal influences.

MATERIAL AND METHOD

The researches of the agricultural entomologic fauna in the corn field were done in four localities in Sibiu County: Poplaca, Ocna Sibiului, Axente Sever and Copşa Mică during 2009 – 2011.

From the used methods there are as follows: the direct gathering with the hand, the collecting together with the other parts of the plant, the use of the entomologic jar and the pheromone trap.

In the four localities there were identified the main species of the agricultural entomologic fauna, estimating the attack of the pests on the plant. Monitoring the goal species has as its aim establishing the situation as correct as possible regarding the spreading of these in the County and the connection of these with soil fauna.

RESULTS AND DISCUSSIONS

The Sibiu County is situated in the central part of Romania, in the south west of Transylvania, with a surface of $5432km^2$, representing 2.3% of the total surface of the country. From the total surface of 305,351 ha, the arable soil represents 115,973 ha, occupying the biggest surface (Table 1).

Table 1. The total agriculture surface of the Sibiu County (ha)

	Arable	**115.973**
1	Vineyard	2.528
2	Orchards	4.578
3	Pasture	106.895
4	Hay Field	75.377
5	Total	305.351

The surface cultivated with corn is rendered in table 2.

Table 2. The surfaces cultivated with corn in the researched localities during 2009 - 2011 (ha)

Locality	The year								
	2009			2010			2011		
	G.P	S.C	Total	G.P	S.C	Total	G.P	S.C	Total
Axente Sever	370	-	370	300	-	300	300		300
Copşa Mică	150	-	150	148	-	148	148	-	148
Ocna Sibiului	782	180	962	690	300	990	415	315	730
Poplaca	127	-	127	95	-	95	90	-	90

For each and every locality we identified the goal species of the agricultural entomologic fauna and evaluated the attack for each of the species.

Table 3. The agricultural entomologic fauna of the cultures in Axente Sever during 2009 – 2011.

The year	The goal species	The existing agricultural surface (ha)	The controlled agricultural surface (ha)	The controlled agricultural surface with attack (ha)
2009	Agriotes spp.	720	120	32
	Ostrinia nubilalis	370	280	200
	Diabrotica virgifera virgifera	370	280	15
	Tanymecus dilaticollis	370	210	140
	Rhopalosiphum maidis	370	280	75
2010	Agriotes spp.	680	180	42
	Ostrinia nubilalis	300	36	29
	Diabrotica virgifera virgifera	-	-	-
	Tanymecus dilaticollis	300	172	75
	Rhopalosiphum maidis	300	36	22
2011	Agriotes spp.	40	20	3
	Ostrinia nubilalis	300	150	85
	Diabrotica virgifera virgifera	-	-	-
	Tanymecus dilaticollis	300	110	40
	Rhopalosiphum maidis	300	150	85

The main monitoring goal species in Axente Sever during 2009 – 2011 were: *Agriotes spp., Diabrotica virgifera virgifera, Tanymecus dilaticollis* (Coleoptera), *Ostrinia nubilalis* (Lepidoptera), *Rhopalosiphum maidis* (Homoptera). The result of the attack is rendered in the table 4.

Table 4. The result of the attack in Axente Sever (ha).

The year	The goal species	Weak attack	Middle attack	Strong attack	Very strong attack	Extremely strong attack
2009	Agriotes spp.	32	-	-	-	-
	Ostrinia nubilalis	103	80	17	-	-
	Diabrotica virgifera virgifera	15	-	-	-	-
	Tanymecus dilaticollis	35	35	30	20	20
	Rhopalosiphum maidis	65	20	-	-	-
2010	Agriotes spp.	42	-	-	-	-
	Ostrinia nubilalis	13	10	6	-	-
	Diabrotica virgifera virgifera	-	-	-	-	-
	Tanymecus dilaticollis	25	21	19	5	5
	Rhopalosiphum maidis	**22**	-	-	-	-
2011	Agriotes spp.	3	-	-	-	-
	Ostrinia nubilalis	10	42	40	20	-
	Diabrotica virgifera virgifera	-	-	-	-	-
	Tanymecus dilaticollis	10	20	5	3	2
	Rhopalosiphum maidis	65	20	-	-	-

The frequency of the attacked plants presents different values for each and every species. So, for *Agriotes spp.* a weak attack means that 3% of the plants are attacked; middle attack means that 4/10% of the plants are attacked, strong attack corresponds to the values of 11-30% of attacked plants and very strong attack corresponds to 31-60% of attacked plants and extremely strong attack is of over 60% of attacked plants. For *Ostrilia nubilalis* the values are: weak attack with 15% attacked plants; middle attack means 16-30% attacked plants; strong attack represents 31/50% of the plants; very strong attack of 50-80% of plants and extremely strong attack of over 80% of plants. For *Diabrotica virgifera virgifera* a weak attack means 3% of the plants; middle attack represents 4-10% of the plants; middle attack represents 11-30% of the plants; very strong attack represents 30- 60% and extremely strong attack means over 60% of the plants. In the case of *Tanymecus dilaticollis* a weak attack means 3% of the plants; middle attack represents 4-10% of the plants; strong attack represents 31-60% and extremely strong attack represents over 60% of the plants are attacked. For *Rhopalosiphum maidis* the values are as follows: weak attack represents 25% of plants; middle attack represents 26-50% of plants; strong attack 51-70% of plants; very strong 70-90% of plants and extremely strong over 90% of plants. We notice that during the 3 years of monitoring the species *Tanymecus dilaticollis* presented all the forms of attack; from the weak one to the strongest one. So we can say that in this locality there is a focus of the corn leaves weevils.

Photo 1. Attack of *Tanymecus dilaticollis* in Axente Sever area, 2011

Table 5. The agricultural entomologic fauna in the cultures of the Copşa Mică locality during 2009-2011

The year	The goal species	The existing agricultural surface (ha)	The controlled agricultural surface (ha)	The controlled agricultural surface with attack (ha)
2009	Agriotes spp.	780	206	15
	Ostrinia nubilalis	780	85	77
	Diabrotica virgifera virgifera	150	85	2
	Tanymecus dilaticollis	150	105	44
	Rhopalosiphum maidis	150	85	20
2010	Agriotes spp.	785	136	7
	Ostrinia nubilalis	148	32	20
	Diabrotica virgifera virgifera	148	32	1
	Tanymecus dilaticollis	140	99	44
	Rhopalosiphum maidis	148	32	19
2011	Agriotes spp.	758	14	3
	Ostrinia nubilalis	148	54	54
	Diabrotica virgifera virgifera	148	56	2
	Tanymecus dilaticollis	148	56	20
	Rhopalosiphum maidis	148	56	15

The goal species from the Copşa Mică locality are the same as in Axente Sever: *Agriotes spp.*, *Diabrotica virgifera virgifera, Tanymecus dilaticollis, Ostrinia nubilalis, Rhopalosiphum maidis*. The result of the attack is represented in the table 6.

Table 6. The result of the attack in Copşa Mică (ha)

The year	The goal species	Weak attack	Middle attack	Strong attack	Very strong attack	Extremely strong attack
2009	Agriotes spp.	15				
	Ostrinia nubilalis	32	23	12	10	
	Diabrotica virgifera virgifera	2				
	Tanymecus dilaticollis	20	12	8	2	2
	Rhopalosiphum maidis	20	-	-	-	-
2010	Agriotes spp.	7	-	-	-	-
	Ostrinia nubilalis	13	5	2	-	-
	Diabrotica virgifera virgifera	1	-	-	-	-
	Tanymecus dilaticollis	19	10	6	3	2
	Rhopalosiphum maidis	19	-	-	-	-
2011	Agriotes spp.	3	-	-	-	-
	Ostrinia nubilalis	24	25	3	2	
	Diabrotica virgifera virgifera	2	-	-	-	-
	Tanymecus dilaticollis	9	7	2	1	1
	Rhopalosiphum maidis	15	-	-	-	-

In the Copsa Mica locality the attack with the biggest frequency was represented by *Tanymecus dilaticollis.* During the three years of monitoring this species presented the frequency from weak to extremely strong.

Photo 2. Attack of *Tanymecus dilaticollis* in Copşa Mică area. 2011

In the Ocna Sibiu locality the spectrum is formed only by *Agriotes spp., Diabrotica virgifera virgifera, Ostrinia nubilalis, Rhopalosiphum maidis. Tanymecus dilaticollis* is missing.

Table 7. The agricultural entomologic fauna in the corn culture in Ocna Sibiu locality 2009-2011

The year	The goal species	The existing agricultural surface (ha)	The controlled agricultural surface (ha)	The controlled agricultural surface with attack (ha)
2009	Agriotes spp.	3500	260	24
	Ostrinia nubilalis	962	769	535
	Diabrotica virgifera virgifera	926	769	34
	Tanymecus dilaticollis	-	-	-
	Rhopalosiphum maidis	962	769	216
2010	Agriotes spp.	3500	260	24
	Ostrinia nubilalis	990	767	535
	Diabrotica virgifera virgifera	990	415	27
	Tanymecus dilaticollis	-	-	-
	Rhopalosiphum maidis	990	767	216
2011	Agriotes spp.	3200	45	2
	Ostrinia nubilalis	990	165	165
	Diabrotica virgifera virgifera	990	165	25
	Tanymecus dilaticollis	-	-	-
	Rhopalosiphum maidis	900	165	115

The result of the attack is presented in the table 8.

Table 8. The result of the attack in Ocna Sibiu (ha).

The year	The goal species	Weak attack	Middle attack	Strong attack	Very strong attack	Extremely strong attack
2009	Agriotes spp.	24	-	-	-	-
	Ostrinia nubilalis	117	302	116	-	-
	Diabrotica virgifera virgifera	34	-	-	-	-
	Rhopalosiphum maidis	216	-	-	-	-
2010	Agriotes spp.	24	-	-	-	-
	Ostrinia nubilalis	176	302	57	-	-
	Diabrotica virgifera virgifera	27	-	-	-	-
	Rhopalosiphum maidis	216	-	-	-	-
2011	Agriotes spp.	2	-	-	-	-
	Ostrinia nubilalis	90	70	5	-	-
	Diabrotica virgifera virgifera	24	-	-	-	-
	Rhopalosiphum maidis	70	45	-	-	-

In the case of Ocna Sibiu locality the species that produces the biggest damages is *Ostrinia nubilalis*. The so called the corn penetrating presents in the corn culture attacks from weak to strong ones. In the case of the so called the quarantine pest, *Diabrotica virgifera virgifePra,* the attack was a weak one.

Photo 3. Attack of *Diabrotica virgifera virgifera* in Ocna Sibiului locality, 2009
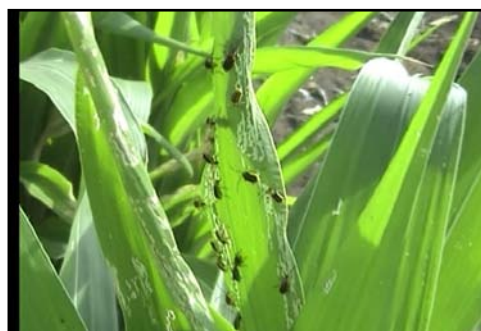
Photo 4. Attack of *Diabrotica virgifera virgifera* in Ocna Sibiului locality, 2009

For the Poplaca locality the spectrum of the species in the corn culture is made up of only: *Agriotes spp., Ostrinia nubilalis, Rhopalosiphum maidis. Tanymecus dilaticollis, Diabrotica virgifera virgifera* (Table 9).

Table 9. The agricultural entomologic fauna in the cultures of Poplaca locality during 2009-2011

The year	The goal species	The existing agricultural surface (ha)	The controlled agricultural surface (ha)	The controlled agricultural surface with attack (ha)
2009	Agriotes spp.	780	206	15
	Ostrinia nubilalis	780	85	77
	Rhopalosiphum maidis	150	85	20
2010	Agriotes spp.	785	136	7
	Ostrinia nubilalis	148	32	20
	Rhopalosiphum maidis	148	32	19
2011	Agriotes spp.	758	14	3
	Ostrinia nubilalis	148	54	54
	Rhopalosiphum maidis	148	56	15

Analyzing the result of the attack of both *Ostrinia nubilalis* and *Rhopalosiphum maidi* the conclusion is that these species determine in the researched agricultural ecosystem strong and very strong attacks (Table 10).

Table 10. The result of the attack in Poplaca (ha)

The year	The goal species	Weak attack	Middle attack	Strong attack	Very strong attack	Extremely strong attack
2009	Agriotes spp.	24	-	-	-	-
	Ostrinia nubilalis	117	302	116	-	-
	Rhopalosiphum maidis	216	-	-	-	-
2010	Agriotes spp.	24	-	-	-	-
	Ostrinia nubilalis	176	302	57	-	-
	Rhopalosiphum maidis	216	-	-	-	-
2011	Agriotes spp.	2	-	-	-	-
	Ostrinia nubilalis	90	70	5	-	-
	Rhopalosiphum maidis	70	45	-	-	-

As result of the analysis of the attack we noticed that the pest producing the biggest damages in this area is *Ostrinia nubilalis.* The attack is from the weak to the strong one during the 3 years of research.

CONCLUSIONS

The researches took place in 4 localities in Sibiu County, *Poplaca, Ocna Sibiu, Axente Sever* and *Copşa Mică* during 2009-2011, obtaining important data about the phytophaguos fauna.

The study of the complexes of the agricultural entomologic fauna emphasized a spectrum of 5 pest species of the corn culture in the studied localities. These are as follows: *Agriotes sp., Diabrotica virgifera virgifera, Tanymecus dilaticollis, Ostrinia nubilalis, Rhopalosiphum maidis.*

The changes in the biodiversity of the agricultural entomologic fauna can give us clues of the deterioration or the rehabilitation of the soil.

The knowing of the laws that leads the researched agricultural system allow us to chose the optimum method of keeping the equilibrium among the species of the system and the application of an integrated management, which to affect as less as possible the system in its assembly and in the same time to be obtained big productions and a quality, healthy soil.

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PROBLEMS REGARDING THE MANAGEMENT OF SOIL BIOLOGY FOR AURADUR DURUM WHEAT IN 2011 AND THE ANALYSIS OF THE ELEMENTS INVOLVED IN THE PRODUCTION FORMATION

Mihai BERCA

University of Agricultural Sciences and Veterinary Medicine, Bucharest 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 21 318 25 64/232, Fax: + 40 21318 28 88, E-mail: unibercamihai@yahoo.com

Abstract

Auradur durum wheat variety was introduced in production, in Romania, for the first time in 2006, after a preliminary verification of its behaviour in our experimental fields. Its production increased continuously. The highest yields were obtained în 2011 (4-7 tons/ha). However, there were controverses, especially among some farmers, but also distributors, concerning the excellent characteristics of this variety. In a multifactor experience made at Alexandria and Modelu - Călăraşi, has been equally studied the effect of some tehnological links on the production and quality of the variety. In this study are presented the detailed analysis of the variety behaviour compared with the pedoclimatic conditions, studying its biology from emergence to adulthood, as well as the main production indicators, such as: the ear weight, the number of grains in the ear and the production of grain in the ear. Correlations were established between the components of production and a pattern of production forming. In the final part, it is also presented a map of the pedoclimatic conditions which are the most appropriate for the variety Auradur, in order to obtain the best productions.

Keywords: *Durum, Auradur, production components, patterns, production*

INTRODUCTION

In Romania there are few varieties of Durum wheat with autumn seeding and the possibility of choosing producers is limited. Durum grain, although niche varieties, covers an important area in the food industry, offering that quality desired by consumers of pasta and bread, but also of a special bread.

Figure 1. The genetic appearance of today's grains. A model of ecological adjustment and human selection (original)

Durum wheat appeared from rustic ancestors with 14 chromosomes, as illustrated in Figure 1 (processing after Wikipedia - The Free Encyclopedia - wikipedia.org/wiki/weizen), havinh a genome type AA·BB with 24 chromosomes [3].

Its ancestor was *T. turgidum*. Durum wheat has been formed by allopolyploid evolution [3].

genomAA+genomBB=genomAB→genom AABB

Doubling the set of chromosomes led to a genome of equal size, but with the doubling of gene expression effect. It was formed, in this way, a smaller genome than the one from the common wheat (AA BB DD) with a complete genome (6x = 42 chromosomes) and a smaller ecological plasticity.

For agricultural producers, the confusion between Durum and Aestivum wheat is very severe because the ecological plasticity of Durum species is much lower. It claims more calcareous soils, well-structured and aerated (usually chernozems) and a greater amount of heat, with at least $0.5\text{-}1^0\text{C}$ thermal isocline. Because of this, it can't be cultivated all over Romania, but it requires a specific zoning, that we tried to identify, al least for the Auradur variety.

Researches on production components to Premium varieties from Romania were published in 2011 [1] and for Romanian varieties we find references in the work of Tabără and al. [6]. *Triticum Durum* is less cultivated in Western Europe and in Germany [4], while in Romania is at its beginnings (about 10000 ha, according to the information of MADR - Ministry of Agriculture and Rural Development). The necessity of going deep with the biological and technological studies is, therefore, extremely needed.

In Romania are cultivated varieties of Durum wheat produced by The Research Institute from Fundulea such as Rodur, Pandur, Condurum and Grandur. More cultivated is Pandur, the one with the best quality properties is Condurum [5] [2].

Auradur variety is brought by us from The Pannonian Plain of Austria, where the climat is similar to the one from Romanian Plain (450 mm of precipitation and an annual average temperature of $10,5^0$C).

MATERIAL AND METHOD

Taking into account the conditions required by Durum variety, the researches were made on the experiences installed in the extreme south of Romania, under the parallel of 44^0, on the plateaus near the Danube, both at Modelu – Calarasi, as well as at Poroschia – Alexandria.

Soils are included in chernozem type, with at least 36% clay and 3.8% humus content at Poroschia (Alexandria) and 28% clay and 3.3% humus content at Modelu (Calarasi). The annual average temperature is slightly above 11^0C in both studied areas, temperature of June being just above 23^0C (average per 50 years) [7]. Average precipitation which fall are, in both locations, between the isoclines of 400-500 mm (a mean of 450 mm).

As for climate, the area in one with an accelerate risk of drought. Such pedoclimatic conditions are convenient for Durum wheat crop, Auradur variety in our case, which obtains not only the planned yields, but also an exceptional quality of them.

In the two experimental fields, measurements were made on the culture biology and on the components of production for the alternative presented above:

N_{100} kg/ha applied in the spring, in 2 rounds
+
P_{60} kg/ha applied in the autumn

Measurements were made in 2011, year with an extra precipitations value (+105-111 mm) in Modelu and Poroschia. Evaluations were performed in spring, starting with 31.03, and ended in June. A total of 8 assessments on surveys from field. Plants were taken from the field, were washed, their main biological characteristics were noted and they were measured. In the laboratory were determined, on 100 plants, the major indicators of production components: the ear weight, the number of grains in the ear and the weight of grain in the ear.

The interpretation of results was carried out through analysis of variance, of simple and complex correlations. Results are presented, afterwards, through pictures, graphs and a map.

For compiling the map was take account of the Auradur variety requirements for the pedoclimatic conditions and were carrie out surveys and evaluations of yields together with the cultivator farmers.

RESULTS AND DISCUSSIONS

Biological evolution of crop vegetation status is presented in Figure 2.
We mention that determinations were made in 8 stages, all in spring, on Auradur crops which were consciously planted delayed in order to observe even the ecological plasticity, now recognized, of the variety.
Are presented only the results from Modelu - Calarasi.
First determination has been made at 31.03.2011.
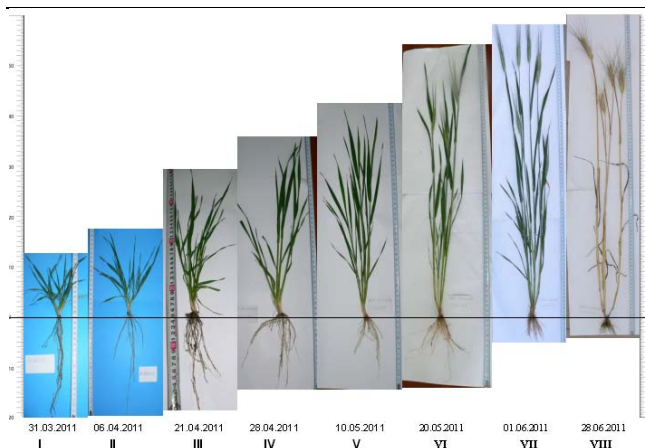
Figure 2. Evolution of development for Auradur wheat variety planted on 10.11.2010, with a month delay than the optimal period (original)

Although planted late, the crop entered into spring extremely strong, with a density of 200 plants/m^3, sufficient to obtain an optimal density of ears at harvest [1]. A very good twinning (3-4 twins) was maintained until harvest. The twinning node overlaps the root node. Plants saves, in this way, metabolic energy, by not forming of the coleoptile. Plant height is of about 15 cm, the one of the root is above 20 cm, ideal situation for a good further development.

The determination from 6.04 is a continuation of the one from 31.03, here are visible increases only at plants (+ 4-5 cm).

In 21.04 we see a robust growth of plants on each twin. Plants reach about 40 cm. Root became stronger, leaves gain force, photosynthesis is intense.

At 28.04 we notice a slight increase of plants, with a few inches.

In 10.05, twins are getting clean. It is already foresee the presence of 3-4 twins which are about to become fertile. Plants height exceeds 40 cm. On removal, the roots were broken and we could't measure their depht any more.

At 20.05, the plants reach a height of 65 cm. Ears come out of bellow, the plant is healthy and prepares itself for flowering.

On 1.06, the plant is right after the flowering stage, in the period of maximum storage. We find 4 well-developed ears, of approximately same size, and another 2, smaller, at the base of some plants, that will give healthy grains or not.

Finally, on 28.06 was made the last measurement, to maturity. The plant presented in the figure held 4 ears, but there were also plants with 3 ears (about 30%) and only 12% with 2 ears. Ears average density was of 598 ears/m^2.

Partial conclusion: good vegetative vigor. Growth rate of 0,75 cm/day, so 7,5 cm/10 days. Final height of the ears was of 70 ± 8 cm, 3-4 wins maintained, deep rooting visible at first measurements = 2 x h (plants height), which held to a good development of plants. Estimated production at last measurement – 6974 kg –, effectively harvested production = 6120 kg/ha. A very good production of this variety in 2011.

Figure 3. Grains of Auradur wheat variety collected from 10 ears (original)

Figure 4. Longitudinal section in Auradur grains. Is observed a vitrescence of ≈ 70%. Are fulfilled the quality parameters after the UE standards

The results of statistical processing of variation sequence for the ear weight, the number of grains in the ear and the weight of grains in the ear are presented in Figures 5, 6 and 7.

For ear weight, the average value = 1.82 g/ear (52% in category 1-2 g/ear, 41% in category between 2-3 g/ear and 7% in class 0-1 g/ear) – Figure 5.
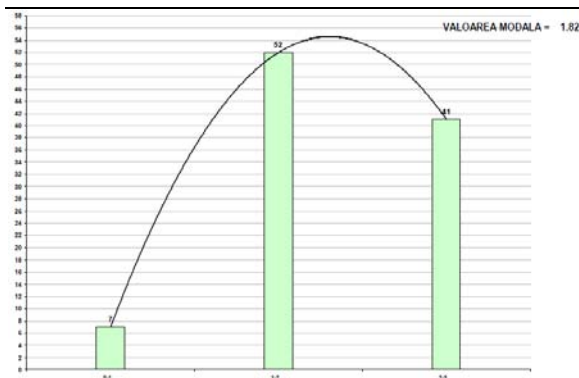
Figure 5. Statistical calculation of the variation sequence for the ear weight from the Auradur variety - Southern Romania 2011 (original)

For number of grains in the ear, the average value = 35.19 grains (49% between 30-40, 30% in the interval 40-50, 19% between 20-30 and only 2% between 50-60).
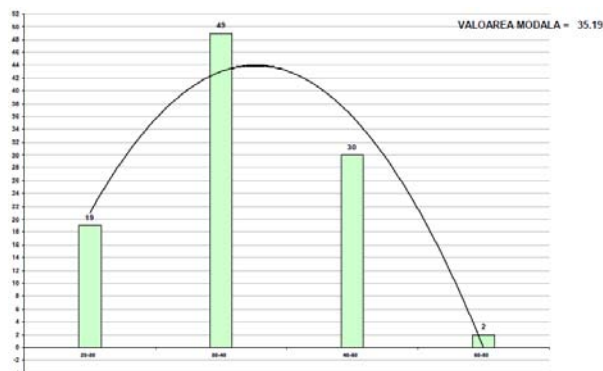
Figure 6. Statistical calculation of the variation sequence for the number of grains in the ear at the Auradur wheat variety - Southern Romania 2011

For weight of grains in the ear, the average value = 1.30 g (75% between 1-2 g, 21%

between 0-1 g and 4% among 2-3 g).
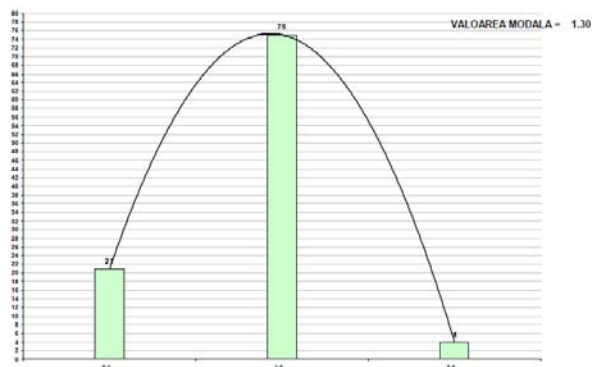
Figure 7. Statistical calculation of the variation sequance for the weight of grains in the ear - Auradur wheat variety, Southern Romania 2011

The ratio grains weight / ear weight = 0.714 = 71.4%, a very good yield..

Correlations in 2D:

→   **Between the ear weight and the number of grains in the ear** is presented in Figure 8 – highly significant coefficient and correlations ratio, exponential type function. Ear weight increases with the number of grains, but only up to the maximum value of 240 ear grains. The variation interval on which the function is valid is fron 4 to 40 grains/ear. For the ear weight, the function is valid during the interval 0.5 - 2.5 g.
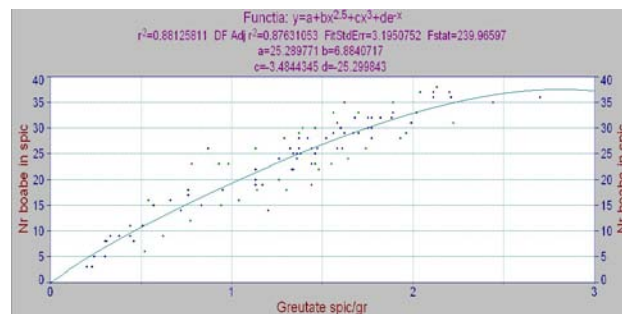
Figure 8. Correlation between the ear weight and the number of grains in the ear - Modelu, Calarasi 2011 (original)

→   **Between the number of grains and their weight** (Figure 9) – also very significant experimental correlation $r^2 = 0.8865$, where $r = 9.9415$. The functions manifests its influence on the interval 5-40 grains in the ear and on the interval of weight of 0.15 – 1.75 g/grains/ear.
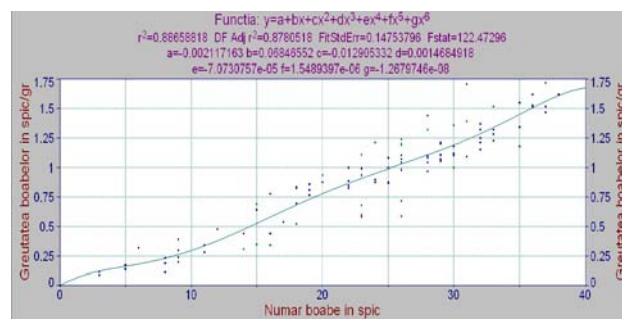
Figure 9. Correlation between the number of grains in the ear and their weight for Auradur wheat variety - Modelu, 2011 (original)

→ *Between the ear weight and the weight og grains in the ear* (Figure 10) – an exponential function type NL, high correlation ratio, close to determinism. Function applies the same range as above, that is 0.5-2.5 for the ear weight and 0.15-1.75 to the grain weight in the ear.
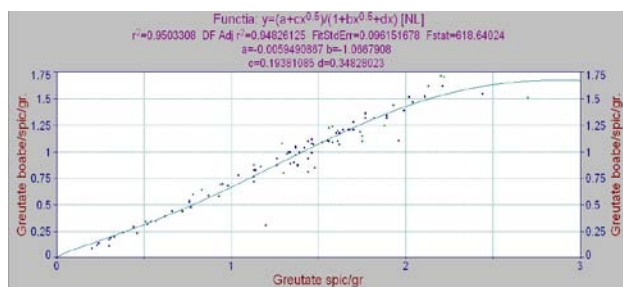
Figure 10. Correlation between the ear weight (g) and the weight of grains in the ear - Auradur wheat variety, Modelu 2011 (original)

Conclusion: all components of production are very significantly correlated between them and are expressed through different exponential functions.

The formation of grain yield, according to the ear weight and to the number of grains in the ear, is shown in Figure 11. Grain yield can be taken into account from 1 g ear weight and around 30 grains in the ear and obtain maximum harvest to 2.5 g ear weight and more than 40 grains in the ear. The model can be modified based on the results of the following years.
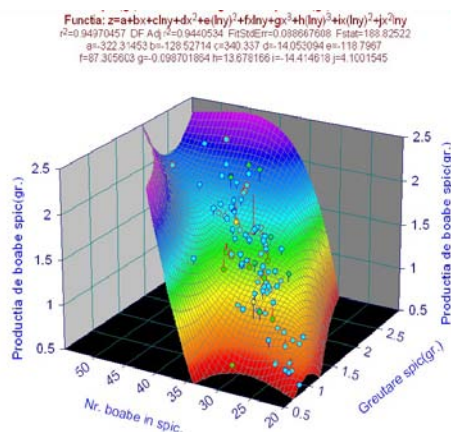
Figure 11. The production of grains in the ear (g) under the influence of ear weight (g) and of number of grains in the ear - 2011 (original)

In the end, in Figure 12 we present a zoning of Auradur durum variety in Romania's conditions. Best growing areas of Auradur variety are the southern part and the extreme west, places where the conditions for achieving especially an excellent production quality, are excellent (very good area). This zone is surrounded, to the south and west, but also in the east (the eastern part of Moldavian Plateau) by areas of climate and soil that are suitable for the cultivation of this wheat variety. Between those two areas the difference is relatively small (only 2-500 kg/ha), but the one of quality is higher (around 10% vitrescence).
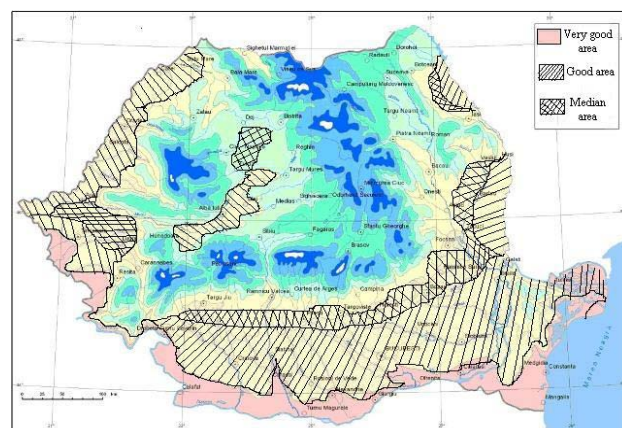
Figure 12. The zoning of Auradur wheat variety in Romania (processing after [7])

The median area is placed outside the se găseşte the good area. It occupies a large surface in the south, west and east and smaller in the area Turda – Cluj. The average difference in production in the 2nd and 3rd area is of approximately 500-600 kg/ha.
Outside these areas it can also be found growing areas of Auradur, but with much lower productions and, most of all, of lower quality. We recommend zones 1-3, the ones presented on the map.
Discussions. Necessity of researches presented by us in this study is extremely important for the farmers' performance. Even in 2011, in the areas where actions in productions were unprofessional, confusing

the behavior of Auradur variety with that of soft wheat varieties, even the results were poor.

The agricultural producer must know the fact that both, the biological characteristics of the Auradur variety and the production components, are different from those of Aestivum varieties and that it is necessary another professional approach of technologies, based on a new knowledge, like ours. Auradur is Durum, so it obtaines 40% less productions in comparison with, it has special needs to the climate and soil and it is necessary to take all this into account.

CONCLUSIONS

Auradur variety, selected from the species T. turgidum var. Durum, performed very well in the Romanian space in 2011, achieving exceptional growth and biological parameters. It has good growth, deep and a very good twinning – 3-4 twins.

The process of forming the production is determined by the ear weight, the number of grains in the ear and the grains weight in the ear, to a east plant density of 200-300 plants/ha.

The number of ears obtained with the parameters presented in the second point of the conclusions are around 450-600. In this interval, the productivity indicators don't change, they adjust themselves, and final production remains constant.

Durum, in general, and Auradur, in particular, has high needs from heat, light and soil, which is why the culture area is more restricted compared with that of Aestivum wheat. The only soils on which Auradur is doing very well are calcareous chernozem, profound and aerated.

ACKNOWLEDGEMENTS

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TOBACCO IN THE ECONOMY OF THE REPUBLIC OF MOLDOVA

Elena CALCHEI

Institutul of Plant Industry "Porumbeni" 4834, Paşcani, Criuleni,Republic of Moldova (+373 22) 24-55-71, email elenatutun@yahoo. Com

Corresponding author: elenatutun@yahoo.com

Abstract

The problems discussed in this article are the efficiency of tobacco growing in Moldova and the evaluation of the importance of tobacco culture for its economy. The research method was an experiment that involved two farms that grew150 ha of tobacco applying the technology developed and recommended by the Institute. The obtained results demonstrated that the increase of the tobacco economic efficiency can be conditioned by an increased productivity of tobacco plants, improved use of means of production, labor productivity and quantity of high quality tobacco, thus production is intensified the higher the final revenue is. According to the development indexes the growth of tobacco decreased substantially. Thus, the area under tobacco decreased in 2011 compared to 2005 by 60.5% (absolute value of 2.086 thousand hectares) whereas the yield per hectare remained stable - 1.53 t / ha in both years. The same scenario was observer on the farms where tobacco cultivation was conducted according to technical sheet. On the Festelita farm in 2011 tobacco was grown on a 100 ha. In 2009-2011 the average yield was 2.25 - 2.3 t / ha. The quality of the raw material constituted 89% on average being sold for 21000i lei per ton. The producers obtained 40 000 lei per hectare in revenue. Only by observing: crop rotation, planting periods of local varieties (Burley 320, Jubilee M, Moldavschii 456, Virginia 263, Virginia 401, etc..), fertilization, application of optimal doses of pesticides, introduction of mechanization in the harvesting process, application of the curing method, labor rules it will be possible to increase the profits from tobacco and what is more strengthen and modernize agriculture.

Key words: tobacco, technology, yield, economy, profitability.

INTRODUCTION

Tobacco is a traditional crop for the Republic of Moldova and it has always been the attention of not only farmers, but also the government. Tobacco is produced for the leaves, which, in dry form, serve as material for manufacturing cigarettes, cigars, cigarillos, snuff, chewing tobacco, etc. Raw material industrial processing waste, *i.e.* tobacco dust is used in plant protection against pests and in smoking orchards to protect them from apple suckers. The nicotinic acid is used extensively in the pharmaceutical industry to obtain cordiamin. Moreover, tobacco stems are used in chemical and forestry industry to obtain furfural, paper and cardboard. Tobacco seeds contain 35-40% semi-siccative oil, which is used in paint and soap production, in paint industry, and also after a special processing - as food product, containing phytin (a substance used in pharmacology) and phosphatides [1], and finally during an energy crisis it can serve as a source of bioenergy used for heating. Tobacco industry includes agricultural production and tobacco industrial processing, and it is part of the country's agrarian and industrial complex and its mission is to provide people with tobacco products of high quality and low toxicity. In 1986, Moldova produced maximal quantity of tobacco leaves namely 132,600 tons. This performance was possible due to the efforts of all the stakeholders of this industry: the Government, the scientists from the Institute of Scientific Research and Technology for Tobacco and Tobacco Products and the tobacco producers. After 1990 tobacco production decreased in the Republic of Moldova. Currently, under The Strategy for the Sustainable Development of the Agroindustrial Complex for 2006-2015, the tobacco industry in Moldova is declared a strategic industry and the strategic importance of this economic sector is determined by the high level of profitability and revenue what

enters the budget, and the potential for maintaining and creating jobs in rural areas. Tobacco exploits economically soils with low production potential (sandy and eroded soils) and provides 2-2.5 t/ha. The interest in tobacco increased significantly in recent years. Areas under tobacco doubles in 2010 compared with 2006-2009. By using soils the soils with low production potential (sandy and eroded soils,), tobacco provides very high revenues to the producers, hence increasing its phytotechnical importance and providing jobs to thousands of people both in rural and city areas. Though massive campaigns against smoking take place, as the use nicotine and substances which are byproducts produced by the burning process damage human health, so far there have been no significant decreases of smokers. To reduce the negative effects of smoking on the human body, new varieties of tobacco are implemented such as Moldavschi 272, Moldavschi 237 and Virginia 263 which have a low nicotine content (from 0.5 to 1.5%) and whose effect on smokers can be minimized or completely annihilated. Tobacco occupies a special place among food industry products. Its use is related to weak narcotic effect which is conditioned by the presence of nicotine with a special form of consumption through fumes formed as a result of burning tobacco. The efficiency of tobacco growing in Moldova and assessment of the importance of tobacco culture for the national economy are the issues at the basis of this research.

MATERIAL AND METHOD

On two farms from Glodeni and Stefan Voda rayons (Glodeni and Festelita respectively) tobacco was grown on 150 hectares (Virginia 401 and Moldavschie 456 varieties) following the technology recommended for the Virginia 401 and Moldavschie 456 varieties developed and recommended by the Institute [2-4]. On March 9 tobacco seeds were planted in greenhouses covered with film. During seedling growth the following processes were observed: watering, temperature, ventilation, banking with earth, prevention and control of organisms harmful weeding, thinning, and banking with earth. 7-10 day before planting the herbicide Stomp 330 EC was incorporated into the soil. Seedlings were planted from May 4 till May 15. Afterwards 3 manual hoeings and between plants and 2 mechanical weedings between rows. In a timely manner when it was necessary treatments aimed at preventing diseases and pests were carried out. Removal of leaves for sanitarian purposes, and 5-stage leaf were performed. Tobacco was hung both manually was performed manually and mechanically, and the drying method that was applied was the mixed one (natural and artificial drying). In the present research the following indexes were studies: yield, planting areas and global production [4].

RESULTS AND DISCUSSIONS

Statistical results demonstrate that in the last 10 years (2002-2011) the areas under tobacco fell dramatically. The causes are multiple: market decrease, decline in agriculture, lack of workforce and lower profits. In some years of this period (2007-2009) the surfaces under tobacco (2.7 to 2.9 thousand hectares) were comparable to those from the nineteenth century (1880-1900). This disaster in the tobacco industry was caused by: 1) loss of external market (primarily of the former USSR) 2) disintegration of the components of the tobacco industry (production, processing, marketing), 3) government's lack of interest, 4) yield and cheap labor decrease, 5) lack of material and modern equipment, 6) price on gas and other factors.

Furthermore, yield per hectare also dropped from the highest level of 2.06 t/ha in 1990 to 0.93 in 2002, 1.15 in 2003, which is below 1940. In the last 8 years the production has stabilized at 1.4 to 1.78 t/ha of cured tobacco except in 2007, when the yield was of 1.15 t/ha. As a consequence of surface reduction and dramatic drop of yield from 132,600 tons in 1986 to only 3400 tons in a 2007 (Table 1). Despite the economic importance of tobacco, its yield is not considerable. In 2011, areas under tobacco were 3200 ha, total production

was 4890 tons, and yield was 1.53 t / ha (data offered by the National Bureau of Statistics). The low level of yield is related to the failure to rotate crops, to apply tillage technology, and fertilizer, weeds, and expensive gas.

Currently, according to The Strategy for the Sustainable Development of the Agroindustrial Complex, tobacco industry is declared a strategic industry for the economy. This importance is determined by the high level of profitability and revenue, ability to maintain and create jobs in rural areas.

Table1. Dynamics of surfaces, yield and production of tobacco in Moldova

Years	Areas (housand, ha)	Yield (t/ha)	Total production (housand, t)
1940	5.5	1.19	4.6
1955	14.7	1.47	10.0
1965	35.5	0.71	50.0
1971-1980	65.5	1.39	91.1
1981-1990	59.3	1.70	100.9
1983	77.3	1.56	127.7
1984	74.1	1.63	20.7
1985	77.1	1.57	121.4
1986	68.6	1.93	132.6
1987	61.8	1.89	117.2
1988	42.4	1.86	78.96
1989	35.1	1.92	67.4
1990	32.1	2.06	66.2
1991	31.4	2.00	62.8
1992	28.1	1.60	45.0
1993	31.2	1.61	50.2
1994	28.4	1.49	42.3
1995	20.0	1.35	27.0
1996	16.3	1.19	19.4
1997	17.2	1.35	23.3
1998	21.8	1.04	22.6
1999	18.6	0.98	18.2
2000	23.5	1.08	25.3
2001	16.9	0.59	10.0
2002	9.1	0.93	8.450
2003	6.3	1.15	7.226
2004	6.264	1.44	9.000
2005	5.286	1.53	8.107
2006	3.396	1.52	5.166
2007	2.991	1.15	3.443
2008	2.713	1.78	4.835
2009	3.000	1.67	5.000
2010	4.279	1.77	7.566
2011	3.200	1.53	4,890

Economic efficiency of tobacco production on the farm Festelita, Glodeni is presented in Table 2. Indices show that although tobacco productivity grew from 2011 to 2009 to 53.8% (absolute value of 570 kg / ha), total production decreased further due to the reduction of cultivated area. These figures are illustrated in Table 2.

Table 2. Economic efficiency of tobacco production on the farms: Festelita Stefan Voda Rayon

Indixes	2009	2010	2011	2011 in % in comparison with	
				2009	2010
Yield, t/ha	1.06	0.97	1.63	154.0	168.0
Totfal costs, lei	1300	1150	1350	112.8	118.9
Average price of 100 kg sold, lei	1950	1850	2200	130.7	121.4
Profits, lei - on 100 kg of sold leaves	650	700	850	76.5	82.4
- efficiency, %	50.0	60.9	62.9	79.5	76.6

We know that economic efficiency of crop production is the maximum amount of production from harvest from 1 ha of planted area with minimum labor cost labor. This situation is observed on the farms, where in recent years the increase in the tobacco productivity has led to reduction of production costs per unit. Economic efficiency of farms, which includes the financial results they will obtain, is an important factor in the production. To return the investments it is necessary to take a series of recommendations were prepared: 1. Tobacco is often grown as a monoculture. Its cultivation as a monoculture has some disadvantages, e.g. development of diseases. Therefore, to obtain a good yield it is necessary to apply crop rotation. Tobacco plantations should follow cereal grains, i.e. wheat, barley, corn, alfalfa and peas, which ensure optimal conditions of soil preparation. 2. Areas under tobacco should be fertilized properly. Thus, the consumption of fertilizers on 100 kg leaf is 2.4 kg - N, 0.7 - and 5.0 kg P_2O_5 - K_2O (K:P:N = 2,08:2,09:1). For a cured tobacco leaf yield of 2.1 t / ha it is required: 128 kg of N, 30 kg of P_2O_5, 182 kg of K_2O. Thus, tobacco consumes leaves a large quantity of N and K for a normal yield, and especially of N that influences the percentage of nicotine in leaves. 3. it is necessary to plant tobacco on time. Overall, by May 15 tobacco should be planted on 90% of the total area. In 2009 tobacco planting Festelita and Glodeni farms was delayed, which led to a lower tobacco production. 4. It is paramount to apply optimal doses of fertilizers and pesticides. 5. There is a need to introduce of complex mechanization in the

harvest process. On Festelita farm tobacco was collected manually which lead to enormous losses of tobacco leaf on 1 ha. In Moldova new technologies for complete mechanization of tobacco harvest were developed. 6. Tobacco leaf curing through the mixed method (sun curing and fire curing are advisable as they maintain product quality, reduce the space required and reduce the curing time. 7. Planting native tobacco varieties with high productivity per 1 ha of cultivated area: Burley 320, Doina 211, Jubilee M, Moldavschi 237, Moldavschi 456, Moldavschi 272, Trapezond 209, Virginia 263, Virginia 401, which besides being very productive, they produce higher yield on less fertile soils and prefer the weather conditions of the Republic of Moldova. 8. Effective management and respect of labor discipline, remuneration of employees according to the obtained results. 9. Ensuring optimum production with the required quality car (100 ha is recommended 3-5 tractors). As a result of the analysis and technology, agricultural processes it was possible improved technology sheet - the tobacco industry model for cultivation, yielding and post yield processes which were reflected in scientific recommendations presented for wide implementation in production. These recommendations include preparation of nutrients, plant growth and seedling growth during the growing season.

Tobacco industry has a special place in the economy. From each hectare under tobacco it was obtained the average revenue of about 20.0 thousand lei. In recent years the interest in the yield increased significantly. Using some soils with lower production potential (sandy soils, eroded), tobacco provides very high incomes, which increases its economic and agricultural importance, whereas tobacco and tobacco product sales provide a good income, which improve the living conditions of the workers from the rural areas . Tobacco industry contributes to more efficient use of labor from February to April (seedling production) until November-December (pre—industrialization period). Tobacco raw material is distributed in Russia, Belarus, Ukraine, Bulgaria, Greece and other countries. Farmers are interested in producing tobacco, since people in villages are provided with jobs. Currently in a hectare of tobacco requires 2.5 man / days (from February to December). As the tobacco industry contributes to the raise of the country's economy, job creation, especially in rural areas using less productive soils, the tobacco industry will be persist. Today the world is engaged in a campaign against smoking, because nicotine and substances resulting from tobacco burning affect negatively human health, but so far no significant decreases of smokers have been registered. Today every inhabitant of the Republic of Moldova consumes 1.37 kg tobacco, which means it ranks 6th, followed by France (1.35, and Norway (1.03 kg / person). According to the statistics, every second man in Moldova is a smoker. 7% of women and 14% of adolescents are smokers.

CONCLUSIONS

The timing and quality of technological production process, yielding and post yield processing of will allow tobacco manufacturers to obtain stable yield of 2.0 to 2.2 tones per hectare, to reduce labor costs per unit of production, thus improving the efficiency and competitiveness of Moldovan tobacco. Hence, it is possible to increase efficiency, quality and economic efficiency, and to contribute to the intensification and modernization of agriculture in the Republic of Moldova.

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SETTING PLANNING CONDITIONS FOR LANDSCAPE AND IRRIGATION OF GREEN SPACES IN BÂLDANA VILLAGE, DÂMBOVIŢA

Alexandru-Marian CHIPER , Sorin-Mihai CÎMPEANU, Ionel JINGA, Gabriela-Mariana STOICA, Viorel DINCĂ

[1]University of Agricultural Sciences and Veterinary Medicine, Bucharest, 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 723 283 141, Fax: + 40 311 058 861, E-mail: alexchiper@yahoo.de, mscimpeanu@yahoo.fr

Corresponding author : alexchiper@yahoo.de

Abstract

This study was conducted in the enunciation of an optimal landscape planning solution with irrigation of green spaces in Bâldana, village which is located in the Divagation Plain Titu-Potlogi. The works are necessary to increase the environmental quality of the related area. The site that has been the subject of research is a land area of 5.000 sq.m , located in built-up area of the village. Research has resulted in obtaining the data necessary in developing balance sheets of water in the soil, watering programs in developing areas served by irrigation facilities and a statement of optimal solutions on the design and operation of these arrangements under pedological and climatic conditions of the area.

Keywords **:** *green spaces, irrigation, landscape, planning, climatic conditions*

INTRODUCTION

The residential areas from rural spaces should also take advantage of the positive consequences of creating new parks [1] that can provide green spaces with entertainment functions and playgrounds nearby [2] and whose quality can be kept at high levels through irrigation [3].

This paper presents the pedological and climatic research [4] done in the area of the Divagation Plain Titu-Potlogi, in order to prepare the technical project for landscaping and irrigation of the site [5]. The project involves arrangement solutions of new green areas which are currently not arranged and the increase of the green areas surface in Bâldana locality, the endowment with street furniture of such arrangements in order to improve and rehabilitate the urban public infrastructure and the execution of a playground [6].

MATERIAL AND METHOD

To achieve the objectives set in this study were performed research, studies and measurements of: the site location, its topography, cadastre, climatic conditions (air temperature, precipitation, wind speed and humidity), specific natural vegetation of the area, pedological, geological, hydrological, hydrogeology, social, economic and demographic research.

Results of this research were used in landscape planning proposals enunciation, with irrigation of the site [7].

For the study period (2009-2011) and extended period of last 30 years (1980-2010) climate data on the mean air temperature, precipitation, average wind speed and relative humidity were estimated in Divagation Plain Titu-Potlogi by generating the arithmetic mean of these values measured at weather stations from Titu and Bucharest-Băneasa (average monthly and annual) [8].

RESULTS AND DISCUSSIONS

Geographic, Bâldana village is bounded by coordinates $44^0 36'N$ and $25046'E$.

The studied opencast land (5,000 sq.m) has the following neighborhoods: in north, east and west the land is adjacent to other public owned lands of the Tărtăşeşti commune and in

south the land adjoins to the local road for farming (DE787). The surface of this land is flat and it is located on the boundary with agricultural land.

From geological point of view, soil, climate, hydrologic the studied area presents specific features of The Divagation Plain Titu-Potlogi, its floodplain and terrace areas.

Thus, the particular climate of the area is determined by two important elements, namely, emphasized uniformity of the geographical landscape of relief, with low amplitude of height and the reduced slope.

The annual average of the temperature is between 10^0C and 11.2^0 C.

Negative valueswere found most frequently in January and February, which are also the coldest months of the year in the study area.

Rainfall is between 560 l/m^2 and 593 l/m^2, with a peak volume in the hot season, in June. There have been cases where they were high measured values in July (2009 with an average of 130 l/m^2). Recorded average of the annual aridity index value is 28.3 in the west near the Titu town, 25.5 in the southern to Potlogi and 29 in the north to Nucet. The snow is present for about 52-55 days a year.

	Ian	Feb	Mar	Apr	Mai	Iun	Iul	Aug	Sept	Oct	Nov	Dec
2009	50,8	36,1	42,1	18,0	62,6	93,8	130,2	47,8	45,4	73,6	25,9	61,8
2010	63,0	85,0	54,9	45,4	110,4	136,3	59,2	32,2	29,9	67,3	24,2	94,7
2011	39,6	20,3	6,6	38,9	84,0	53,7	90,2	40,9	6,5	36,0	1,8	39,3
Media 2009-2011	51,1	47,1	34,5	34,1	85,7	94,6	93,2	40,3	27,3	59,0	17,3	65,3
Media 1980-2010	32,4	31,0	37,1	47,6	58,0	76,5	67,2	52,8	52,3	44,6	42,5	42,1
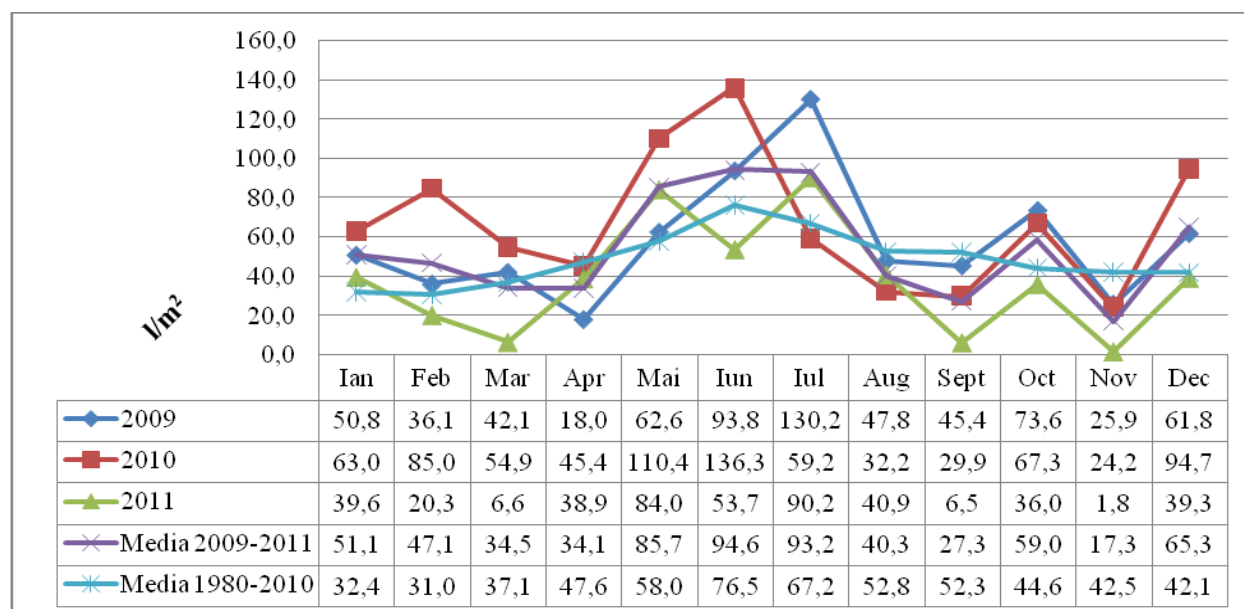
Fig.1.Monthly rainfall in The Divagation Plain Titu-Potlogi

The Divagation Plain Titu-Potlogi vegetation is specific for the floodplain areas of the Romanian Plain. The forests are composed with oak (*Quercus robur*) mixed with lime (*Tilia Argenta)* and hornbeam (*Carpinus betulus*) The forests are shield with characteristic herbaceous species such as *Asarum europaeum, Sanicula europaea, Lamium luteum, Geranium robertianum* and *asperula odorata*.

Geologically, the studied area includes Colentina-Dâmboviţa interfluve, and floodplain areas of rivers and Colentina Dâmboviţa. These deposits consist of alluvial-proluvial sandy clay and sand belonging to the floodplain areas and loess, both originating

from the upper Quaternary halocen. The specific soils Soil in the Baldana village are reddish brown soils and reddish brown podzolic and strips of gleyic and gleyic alluvial soils along seasonal watercourses. In the WRB soil taxonomy system they are majority Eutric solis (*Eutric Cambisol, Eutric Fluvisol*) and Chrome soils (*Chrome Luvisol*).

The Divagation Plain Titu-Potlogi is located in terms of hydrography, in the Argeş basin river, find enclosed by the Arges River to the south, the Ialomita river in north and northwest. The interior of the area is crossed from north-west to south-east the rivers with steady flow Dâmboviţa, Colentina and Ilfov with temporary water courses: Spălatura,

Frasin, Baranga in north, Valea Seacă, Băi, Crevedia, Ciorogârla central and Pasărea in the southeast.

Specific hydrogeological conditions in The Divagation Plain Titu-Potlogi defined call presence of four bodies of groundwater: groundwater body depth ROAG12 - Eastern Wallachian Depression, the formation of Cândesti and formation of Frăteşti, body of groundwater ROAG02 - Plain Titu, groundwater body ROAG05 - Meadow and river terraces of Arges and groundwater body ROAG03 - Colentina.

The commune consists of villages Baldana, Gulia and Tartasesti has a land fund of 6.077 ha of which 691 ha are insaide built space and 5.386 in the outside. The population of the village consist in 4900 inhabitants divided into 2.300 households and 2.100 housing. The commune own 5 kindergartens, 5 schools and one high school with agricultural profile. (Agricultural School Group Tartasesti).

After research has established that accordingly to the appropriate and complex interventions, this land area of 5,000 sq.m, can be arranged as a public park, with facilities that can be are open to all ages, an opportunity for meeting and leisure area. These goals will be achieved by creating playgrounds and recreation areas in an planted environment, conducive to promenade and relax. Planning solution, shown in Figure 2 took into account the needs of a public park using plant trees, shrubs, flowers and grass to create different perspectives but also in the climatic conditions of the area. Vegetation aims to improve local microclimate factors and also create a pleasant atmosphere and remarkable ambient.

Fig.2.Landacpe plans for Bâldana village Park

Solution plans for landscape irrigation, presented in figure 3 are based on the calculation and results of the water balance in soil, according to the specific climatic conditions in studied area [9].

The irrigation system was made by its proper dimensioning to the optimum operating parameters (flow and pressure) and developed program for watering.

Fig.3.Irrigation plans for Bâldana village Park

CONCLUSIONS

By complex and appropriate interventions, thus land of over 5.000 sq.m could be arranged as public park, with endowments addressing persons of all ages, an opportunity for meetings and relaxation in the said area and irrigation system. Such aims shall be achieved by means of rest area in a planted space, appropriate for walks and relaxation and playgrounds for children.

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THE TECHNOLOGY OF WORM CULTURE – THE IMPORTANNT FACTOR IN DEVELOPMENT OF DURABLE AGRICULTURE

Larisa CREMENEAC, Tatiana BOCLACI

Scientific and Practical Institute of Biotechnologies in Animal Husbandry and Veterinary Medicine, Republic of Moldova, Phone: 373-22-359-351 fax. 373-22-359-350,   Email: kremeneak@yandex.ru

Corresponding author: kremeneak@yandex.ru

A*bstract.*

Worm culture is a biological method of converting the organic wastes with the help of worms (worm growing), which use organic wastes as food and vital environment. Beforehand, organic wastes must be held to fermentation, in order to regulate the level of active acidity and of the content of azoth-ammoniac. The investigation performed bellow has the goal of showing how in development of durable agriculture can de improved through worm culture, meaning the bioconversion of organic offal. This can be achieved by obtaining valuable organic fertilizers and ecological agricultural production by worm culture. Technology of worm culture included: the preparation of nutritional substratum, the production of worm's compost and worm culture, the utilization of worm's compost. The object of technology included: the complete bioconversion of wastes, obtaining organic fertilizers with long-time action, the reanimation of damaged soils, the growth of the agricultural production, obtaining ecological production, the protection of the environment. In order to improve the ecological, sanitary-veterinary, epidemiological and epizootic situation, the bioconversion of organic wastes through worm culture method is strongly recommended. As a result of bioconversion of organic wastes through worm culture, we can obtain a quantity of 600 kg of organic enrichments (the worm's compost) form 1 tone of organic wastes, which grows the agricultural production.

Keywords: *Worm culture, organic wastes, bioconversion, organic fertilizer*

INTRODUCTION

The ecological situation at a global level, including the regional level also, has worsened in the last century. This happened because of the intense development of the industry, the use of chemicals in the agriculture, etc. All these lead to polluting the environment and its components. Purpose of the research consisted in assessing technology bioconversion of organic wastes in developing durable agriculture in rural areas [3]. A problem for the environment is keeping and using the organic wastes form animals. Keeping the wastes form the stables in unauthorized places pollutes the underground waters and the soil with azoth compounds (nitrates, nitrites and ammoniac), pathologic bacterium and other toxic substances. The researches regarding the water quality form the springs and the fountains from the rural localities [4] state a polluting level with nitrates up to 70% and with damaging flora up to 90% from the total number of water

sources. Nowadays, in the world, there are many promising methods and technologies concerning the bioconversion of the organic wastes. In order to avoid polluting the environment and to benefit from the use of the organic wastes, in many states like USA, Japan, Italy, Hungary, France, Ukraine, etc., the conversion of the organic wastes is practiced through worm growing [1], [2]. Technology bioconversion of organic wastes is a biological method of converting the organic wastes with the help of worms (worm growing), which use organic wastes as food and vital environment [5]. Beforehand, organic wastes must be held to fermentation, in order to regulate the level of active acidity and of the content of azoth – ammoniac.

MATERIAL AND METHOD

The experiment was carried in Technological-Experimental Station "Maximovca" where worm's cultivation in five sectors, with a width of 1 m and length of 50 m was placed nutrient

substrate for bioconversion prepared by worm's cultivation. As research materials were used cattle manure, fermentation, and the object of research - the California red hybrid rhyme, bio-transformed of organic waste has the following morphological features: length – 6,0 to 8,0 cm, diameter   3,5 – 5,5 mm, 0,6 to 1,0 grams body weight, colour - dark red, organisms are hermaphrodites.

Photo1. Rhymes Red Hybrid of California

The Red Hybrid of California reaches maturity in a period of 3, 0-3, 5 months. When reaching maturity, a worm can convert the same quantity of organic wastes as its own weight, in 24 hours. The wastes are used as food and vital environment by the worms. However, the can use only fermented wastes. In that certain purpose, the wastes are placed on special surfaces, implies having the length of 1,0-1,2m. The fermentation period is different for every kind of animal waste: for horses - 5-6 months, cows - 6-7 months, sheep -3-4 months, pigs -9-10 months, birds - 11-13 months. Rabbit wastes can be immediately used (if not containing urine) or after 6-7 months of fermentation. After the fermentation period, organic wastes are put in the worm growing of 1m×2m or in sectors designed for worm culture, with the dimensions of 1m×50m. Each section has to have one tone of organic wastes 80000-100000 mature worms, which convert those wastes after 4-6 months, converting it in valuable organic fertilizer – worm's compost.

To determine the nutritional quality of substrate used in bio-conversion process, was used the test "50 rhymes". According to the test, a box of dimensions 50 cm x 50 cm was placed nutrient substrate, and in it were placed 50 rhymes. If within 24 hours rhymes do not leave the substrate and active, then it is confirmed that nutritional substrate is beneficial for worm's cultivation.

Photo 2. The process of bioconversion of organic wastes using worm's culture

Nutritive substrate was placed in areas subject to the determination of physic-chemical and nutritional value. Quality of nutritive substrate (initially and during the experiment) and bio-fertilizer produced as a result of conversion of organic waste (worm's compost) was determined according to the following indices: active acidity (pH), ammonia nitrogen, total nitrogen, organic substance, potassium, calcium, magnesium, phosphorus and bacterial flora.

Quality analysis of nutritive substrate was performed according to the methods listed below: active acidity - pH-meter, total nitrogen - after Kjeldahl, ammonium nitrate, calcium, phosphorus, and potassium - after Petuhova.

RESULTS AND DISCUSSIONS

In sectors of worm's cultivation were placed each 25 tons of organic waste, which have undergone of bio-conversion to obtain worm's compost. Organic wastes have previously undergone 6 months of fermentation process. The thickness of nutritive substrate in the sectors for worm's cultivation was 25-35 cm - summer and 35-45 cm - winter. Each sector for worm's cultivation has been divided into sections with dimensions of 1m x 2m. In the

course of a month nutritive substrate from sectors of were sprayed for a week - daily and then once a week. After the spraying, the substrate prepared for worm's cultivation underwent chemical analysis to determine some indexes. The test results found that the nutritive substrate coincides parameters necessary for bio-conversion of organic waste by worm's cultivation (Table 1).

As a result of the analysis of data was found that nutritive substrate is beneficial for bio-conversion by worm's cultivation. In the prepared Nutritive substrate was placed worm's culture (rhymes), reasons 30-100 thousands of individuals of all ages.

Table 1 Composition of nutritive substrate

No.	Indices	Admissible values, M ± m
1.	Active acidity (pH), units	$7,57 \pm 0,08$
2.	Ammoniacal nitrogen, mg/ kg	$5,56 \pm 0,57$
3.	Total nitrogen, %	$0,83 \pm 0,63$
4.	Organic substance, %	$30,35 \pm 0,60$
5.	Magnesium, %	$1,17 \pm 0,52$
6.	Phosphorus (P2O5), %	$0,65 \pm 0,32$
7.	Potassium (K2O), %	$0,68 \pm 0,01$
8	Calcium, %	$0,55 \pm 0,35$

Processing time complete nutritive substrate in a section, in this case was 6 months. During experimental nutritive substrate was sprayed with water (to the extent necessary). The sectors for worm's cultivation were covered with straw in order to reduce evaporation - summer and protection from the cold - winter. During the experimental period fulfilment of the requirements of bio-conversion technology of organic waste by cultivation worm's (humidity - 70-80%, ammonia nitrogen content from 1,0 to 20 mg / kg, active acidity (pH) – 6,8 to 7,6 units and cellulose content - 30%). After 30 days of the beginning of the experiment, was found that worm's culture. Nutritive substrate completely processed and eventually began adding additional nutritive substrate. This process was carried out every 10-14 days. At the end of the experimental period worm's culture was separated from the substrate and placed in other sectors, prepared in advance for bio-conversion technology of organic waste. The product obtained as a result of bio-conversion

of organic waste is a precious organic fertilizer, natural ecological (worm's compost). Worm's compost is one of the final products of bio-conversion of organic waste by worm's cultivation. It consists of small granules of dark brown colour, no smell, is hygroscopic and can be stored in dry years without losing its qualities.

A tonne of organic waste as a result of bio-conversion, over six months were obtained from 400 to 600 kg of worm's compost.

In the Table 2 are exposed quality indices of two fractions of worm's compost obtained as a result of bio-conversion of organic waste by worm's cultivation.

Table 2   Quality indices of worm's compost obtained from cattle manure

No.	Indices	Fractions and values of worm's compost, M±m	
		Fraction, 0,25 mm	Fraction, 1,00 mm
1.	Active acidity (pH), units	$7,81 \pm 0,03$	$8,08 \pm 0,02$
2.	Organic substance, %	$24,39 \pm 0,45$	$27,41 \pm 0,41$
3.	Total nitrogen, %	$1,09 \pm 0,01$	$3,00 \pm 0,04$
4.	Potassium, (K_2O), %	$1,92 \pm 0,02$	$2,50 \pm 0,03$
5.	Magnesium, %	$1,18 \pm 0,03$	$2,50 \pm 0,04$
6.	Phosphors, (P_2O_5), %	$1,37 \pm 0,08$	$2,50 \pm 0,06$
7.	Calcium , %	$0,62 \pm 0,02$	$3,80 \pm 0,05$
8.	Humus, %	$29,66 \pm 1,40$	$35,91 \pm 1,90$
9.	Non-pathogenic bacterial flora, colonies/g	$2x10^{12}$	$2x10^{12}$

Comparing values of worm's compost with nutritive substrate initially found that the active acidity, content of total nitrogen, calcium, magnesium, potassium and phosphorus in the fraction 0,25 of worm's compost from it exceed the nutritive substrate, respectively 3,17%, 31,33%, 12,70%, from 3,82 times to 2,11 times, and 1,0 mm fraction, respectively 6,74%, to 3,61 times, 6,90 times 2,14 times, 3,67 times and 3,84 times. Organic matter content decreased in the fractions investigated, respectively 19,64% and 9,69%. In the results of the investigations was found that worm's compost contains 100 times more non-pathogenic micro flora ($2x10^{12}$ colonies) than normal compost.

According to the results was found that worm's compost is superior nutritive substrate. Organic substance during the bio-conversion turned into humus.

The worm's compost has the following characteristics: humidity – 40,48%-50,29%; organic substance – 24,39%-27,41%; the non-

pathogenic bacterial flora - $2x10^{12}$ - $3x10^{12}$, colonies/g. It is dark-brown and can be used as it is or as fractions of different sizes obtained by filtration. The worm's compost should be placed in polypropylene sacks of 2 kg; 5 kg; 10 kg and 20 kg. In this way it can be kept a long period of time, without loosing its qualities.

The incorporation of worm's compost in the soil are considerable savings taking into account that the 3-6 tons per hectare using worm's compost compared with 40-70 t / ha of traditional compost. The obtained worm's compost is a valuable enrichment, which whilst being incorporated in the soil, once every 3 years, grows the agricultural production with 15,0%-35,0% and diminishes the quantity of azoth compounds.

In the worm's compost is well-balanced macro- and microelements content, allowing incorporation into the soil decreasing the dose of 8-12 times compared with normal compost. Action is effective to store worm's compost during 2-3 years. In the worm's compost are concentrated quantities of enzymes, vitamins and stimulating growth.

According to research conducted found that one ton of worm's compost contained a quantity of 270-300 kg of humus. This allows time to be reduced essentially to supplement the amount of humus in the soil, thus restored soil fertility and soil resistance to wind erosion and alluvial.

A consequence of the incorporation of worm's compost was decreasing soil density from 2,70 up to 2,67 g/cm3. Also improved some physical features of soil: humidity content, hygroscopic and structure. Worm's compost is a component of organic farming because its use allows for ecological agricultural production.

So, the obtained worm's compost as a result of bioconversion of organic wastes with the help of worm's culture has the goal of producing ecological agricultural production.

Finally, in the process of bioconversion of organic wastes, the worm's compost and the biological mass of the worms is obtained, which can be used as protein addition in the food of birds and animals.

Analyzing the research results, it can be said that one of the most efficient methods for improving the ecological situation of the environment is the bioconversion of organic wastes through worm's culture.

CONCLUSIONS

In order to improve the ecological, sanitary-veterinary, epidemiological and epizootic situation, the technology bioconversion of organic wastes through worm culture method is strongly recommended.

The technology of worm culture of organic wastes through worm growing allows dialing with the following acute problems in agriculture: the complete bioconversion of wastes, obtaining organic fertilizers with long-time action, the reanimation of damaged soils, the growth of the agricultural production, obtaining ecological production, the protection of the environment.

As a result of bioconversion of organic wastes through worm culture, we can obtain a quantity of 600 kg of organic fertilizer (the worm's compost) from one tone of organic wastes, which grows the agricultural production.

Values of the quality of worm's compost have exceeded the nutrient substrate.

Worm's compost furthers the ecological agricultural production.

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FOR THE RURAL ACTIVITIES IN OLT COUNTY THE CREDIT PROBLEM REPRESENTS A FORM AND A CONDITION FOR RURAL DEVELOPMENT.

Corina CRUCERU

University of Agricultural Sciences and Veterinary Medicine, Bucharest, Romania
Faculty of Management, Economic Engineering in Agriculture and Rural Development, Slatina Branch, 150 Strehareti Street, Zip code 230088, Slatina City, Olt County, Romania, Phone: +40 249 435 953 Phone: 0724561302, Email: c.cruceru@yahoo.com

Corresponding author : c.cruceru@yahoo.com

Abstract

The implications of bank credit in forms of support allocated to agriculture in Olt county. The agricultural sector in Olt county confronted with hard credit terms to which added high interest rates and asking for guarantees made difficult to be realized, due to lowered land value. Severe floods produced damages not only to cultivated land but also to livestock sector where were registered loss of animals and loss of feed stores. In these conditions the support of the State for Olt county was materialized into a set of regulations. Forms of intervention credits, systems financing programs FEGA and FEADR have been a possibility of access to finance farm but also a possibility of knowledge of the responsiveness of the potential beneficiary of rural. Also FEGA and FEADR are financial instruments created by UE for implementation of a Common Agricultural Policy, the amounts allocated, through these programmers were rounded with amplification of the State budget.

*Key words***:** *rural, credit*

INTRODUCTION

The credit role in the development of human society analyses the credit role for the development of society, treats the credit by content, shape, functions and role it has, as one of the most important elements gear in economic, reason to be known as his appearance, but also forms developmental forms nationally and international[3]. The history of the banking system in Romania it could be said it has been engaged in national economic development stages, and now there is a modern and competitive banking system. Within this framework, the credit policy in Romania falls for forms of credit, such as those for: investment, mortgage loans and credits for agriculture, the local public administration, for small and medium enterprises, derivative financial instruments.

The monetary market size had implications on the credit system in Romania, which has considered necessary the knowledge of connecting the monetary phenomena to the rural sector requirements, which involves the process of saving the restoration of depleted normal parameters (so as to create the necessary resources for investment business).

The types of agricultural loans, depending on their maturity have demarcated in the form of short-term, intermediate and long-term, which have created a distinguished conduct in the borrower and the borrowed relationship. But the design of investment targets in rural areas is based on a brief characterization of risk for which there is a fear for financing projects in rural areas (related to the good and gains) [2].

MATERIAL AND METHOD

The main features of agricultural credit consider these forms of using the computer methods in banking decisions. They are bound by the enterprises from rural area, the agricultural company manager, but the bank providing loans, which must find answers to purpose and opportunity, but gains too. The fundament of credit decisions in rural areas by computer methods requires the borrower lines of actions aimed at (activities efficient control

over the productive process activities, introducing) organizational and functional improvements of the borrowed, the existence of forms of direct information on obtaining information regarding the agricultural or non-agricultural activity.

Research on the bank role in granting credit for rural development consider the credit role in rural development in Romania, one can say that fall new valences once with the E.U. entry. Knowing the credit Romanian institutions from 1944 and after, in the near post found the emergence of new dimensions of rural crediting, with particular reference to the transitional period with the market economy. For this reason the banking credit, implicitly at agriculture, have undergone significant qualitative changes (demonoplization, diversification, narrow specialization, improving banking instruments, etc).

Comparative levels are analyzed and implications of agricultural credits with the main economic indicators, appear to work and watch (between 2005-2009) by assessments of comparative levels associated with the pace of growth of GDP on agriculture, demographic indicators system and employment level of rural areas in Romania and correlations of credits granted to the wages of the agricultural production sector. It is emphasized an increase of successive appropriations of credits but within the agriculture it is showed a lower level for employment costs and higher expenses in total.

RESULTS AND DISCUSSIONS

Non-reimbursable funds research on budget and support for rural development, the EU context consider the meaning and allocation of credits influence on the main coordinated rural areas in Romania were shown by credit correlation coefficients of elasticity with aid. It showed that in the post revolutionary the credits granted in the agricultural/non-agricultural production in rural areas, although they had an ancestry tendency, they could not influence the level of demographic increases, income and labour costs, a situation which mean forms of a lock of influence (situation

which is reported for agricultural production and for investment tool).

The Guarantee Fund for Rural Credits is considered a financial instrument that enables investor's access to credit and to the other financing instruments, by granting financial guarantee ways to approach the leasing in the Agrarian sector/rural areas have emphasized the advantages related to particularities which manifest in this sector. The leasing market in the rural areas of Romania is a young market and it is in an early stage of regulations and the financing through leasing of farms is still considered at a modest level (functional sate of leasing companies is rendered by the type of the founding members falling into three categories: set-up the financial group established by producers or importers of certain categories of good independent leasing companies) [1].

Credit cooperatives in Romania are autonomous, which are as the main objectives providing banking services for their member. Each cooperative works within a given geographic area, within a county. There are units of high functional amplitude such as the Cooperative Bank, CEC and other forms of crediting rural. It can no longer add units such as: The house of Rural Credit for Farmers, The Country Credit, The Credit Agricover IFN, Non-Banking Financial Institution, Good bee Credit, House of Mutual Assistance. On financing for agriculture by IFN, it may cite other institutions which are employed at national level.

On the credit role in rural development Olt County, the study began with a geographic-territorial size knowledge and capital whose natural resources have significant economic social and ecological vacancies.

The demographic and occupational aspects in Olt county territorial range, especially point out the embossed trends on reduction of the total number of county population, phenomenon showed in rural areas, too.

Territorial rural structure is considered a resultant/influence of the crediting programmer on production/services. It should be observed an insufficient development and a high degree of usage of the physical infrastructure and that of the existing locality.

The potential of agricultural production has an influence in granting loans, constituting a strong impact on accessing credits in rural areas. Regarding the fund land it can be emphasized the upward trend in the arable land but also a decrease of the grown/cultivated land. On the value of agricultural production or busy man in agriculture, the basis for comparison of previous annual period's growth can be found. The forms of crediting for the agricultural production in Olt County are not yet known/agreate/accessible for legal form and the level of farms development in the analyzed period.

Subsidies granted and the banking credit in Olt county agriculture have been wrapped mainly in the standing possibilities of personal contribution of the recipient with reference to the existence or the form of procurement of such contributions. It has been found that individuals, associations and individual enterprises accesses timidly appropriations funds trough FEADR, an attitude which is due to financial situations. On this frame-work has formed an atmosphere of uncertainty in the refund loans and in some cases, even the existence of "unfriendly,, relations with the bank.

The influence of agricultural potential on agricultural area on a person agricultural production (value of agricultural production) has been analyzed helped by elasticity.

The forms in determining the dynamic (E, E', E'), which were made for the dynamic of period 2004 - 2008, watched as a basis for comparison to be rendered successively.

The interpretations on the level and meaning of agricultural land to avoid returns on a person set in rural areas and agricultural production value falls on a person set in rural areas and on the link between agricultural area lies on a busy man in agriculture and agricultural production value returns on a busy man in agriculture, showed a tendency to access bank loans. The territorial structure of credit applications has been expressed both in the number of applications and agricultural area held by applicants indicators which were presented by a location at six level local centers in the Olt county. The trend was split

by the number of request for whole county aid decreases, but the total area of farms covering the applicant farms increase.

The result of the general trend is avoided, even waive the accessing loans through:

a) the increase requests funds (the authorities and communal individuals);

b) decrease or even complete surrender of these requests from family association's individual enterprises and companies).

Significant are the requests for investments on rural development which is aimed at upgrading territorial infrastructure (roads, sewers water adduction, gas and electricity), but also the preservation and promotion of rural cultural heritage common (folk traditions on gag for example).

The credit structure accessed by the borrowed pursued by knowledge of the main aspects of separate rural financial market in Olt county . They spoke on the value of loans and volume of savings the rural population, the relations between suppliers and recipients of their financial services, forms of subsidy banking credits. A knowledge of the total volume and the structure of the agricultural production credits were rendered by the analysis of complementary indicators where it came out that the total level of the accessed credits record increases. The depth of this phenomenon through determination and the analysis of elasticity coefficients (E, E', E') emphasized the level and the elasticity sense given by the influence of agricultural credits granted on the value of agricultural production in Olt county.

They could deduce the existence the existence of a trend of the annual increases the value of agricultural production due to favorable influence on increasing crediting and on the other hand, the pace of growth of credit that is far greater than the rate of growth of agricultural production value.

CONCLUSIONS

While the forms of manifestation of the rural population of Olt county in allocating credits constitutes a problem expressed in the study and which was founded the methodology of

elasticity. They emphasized the following aspects:

−the existence of forms directly proportional to variations of agricultural area of the total allocation of credits and the same influence directly proportional to the increase credits on the value of production;

−the volume of credits allocated has a too low pace compared with the pace of decline in rural stable population (to the people working in agriculture the decrease occur at a pace more pronounced than raising the level of credit).

The knowledge potential/accessibility credits in rural areas in Olt county using questionnaires, watched aspects concerning crediting priority as a tool for rural development of the county rural area. Based on questionnaires it has been obtained identification information, but also in the knowledge of the trend at the prospect of demand/supply of credit of rural Olt county.

a) The application for credits displayed by interpreting the results of questionnaires for the credit applications obtained by farms in Olt county has been emphasized through the crediting interest and the credit accessibility for the households. The relevant facts resulting from answers concern: sources of obtaining the loans, the level and destination of these amounts, criteria structure for choosing the credit (costs, the type of security and the amount granted, the maximum repayment period of the credit). Of all items listed in the rural area of Olt county, it revealed the behavior shown by locals to take over loans, with insignificant differentiation between the range of assigned communities.

b) The supply of rural credit was summarized in the interpretation of questionnaires on the manifestations of banking institutions in Olt county. The granting of credits and rural effects only, the answers could be yielded by the main problems that resulted in the rural crediting: saving financial resources the system of acceptance the repayable loans and investments the need for some adjustments in applying the rural credit system.

Potential guidelines and demand supply of credit in the rural financial market in Olt county, in a past not too distant, has been engaged in the following trends:

a) Rural households who have run only after cash damages liquid;

b) Banking units have avoided relations with villagers, even operators serving in rural areas.

For perspective have been fully specific aspects of this rural crediting in this county. Expenses parameters and eligibility requirements for two projects to aid in the Olt county, they said the situation of a type of partly financed support, approved by the Agency for payments to Rural Development and Fisheries, the Olt county joint financing being carried out by FEADR (a project which is aimed at an investment represents a lairage of swine fattening and a draft of investment for upgrading activities related to processing vegetables). The two beneficiaries were headed to contact DADR in Olt county, the amplification support on the relationship beneficiary – bank:

a) to the negotiating loans (the grants) the bank creditor has not been easy for beneficiaries, especially because lack of experience; procedures cumbersome existing connection for drawing up the approval of the documentation; the situation in which beneficiaries operators, actually were not known on the market; lack amounts of money (an alternative financing total using bank was originally impossible because of lack of supply of securities); the existence of a long-term investments reason for the first years after it was necessary to take over the profits it has returned the destination depreciation investment.

To use the fund lending for investment, at the initial stage had an important role when he returned the knowledge use fund with credit for this reason it mattered the knowledge level of efficiency of expenditure.

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A NEW TECHNIQUE TO ENHANCE THE PERFORMANCE OF NOZZLE BOOM MACHINES

Asaad DERBALA

Tanta University, Faculty of Agriculture, 31527 Tanta, Egypt, Phone: +20 40 3455584, Fax: +20 40 3455570, E-mail: derbalana@yahoo.com

Abstract

Laboratory and field experiments were conducted during summer season of 2009 in Germany to evaluate and develop the performance of nozzle boom machines (NBM) vs. boom machine with drag hoses (BDH). Laboratory tests were carried out to investigate the performance of the drag hoses at four different levels of pressure. From these laboratory tests it was possible to choose the suitable hose size. Field experiments were conducted to evaluate the performance of boom sprinkler machines before and after modification. Using the boom machine with drag hoses mounted on the boom system at a medium or low pressure instead of the sprinklers can be an alternative to the use of boom systems in some crops and topographical conditions. The water loss can be minimized with this system. The results indicated that, the hose with orifice plate diameter of 4 mm was chosen at operating pressure ranged from 0.2 to 0.3 bar. Using boom with drag hoses after modification showed that the average water depth was about 13 mm and the highest value was measured directly under the hoses. The boom with drag hoses has very important advantages in comparison to nozzle boom or sprinkler machines. As a conclusion, the boom machine with drag hoses is suitable for using to improve the water relations and energy saving.

Keywords: boom, sprinkler irrigation, water distribution, pressure and uniformity

INTRODUCTION

The main objective of irrigation is to provide plants with sufficient water to prevent stress that may cause reduced yield or poor harvest quality. The water is poorly distributed under nozzle boom machines in windy conditions as shown in (Photo 1). Sprinkler irrigation systems can be adapted to many crops, soils and topographical conditions. Significant efforts in sprinkler irrigation system design and management are directed towards dealing with problems related to irrigation uniformity. On the other hand, the drip irrigation system is very famous in many parts of the world but it's very expensive.

Boom travellers are irrigation machines that usually use nozzles, require high operating pressure and can irrigate large areas. However, in windy conditions more or equal 3 m/s, these sprinklers can be characterized by low application uniformity because the amount of water loss by wind drift is very high. In some cases, the water at high application rates with large drops can damage plants, destroy soil surface structure and lead to an increase in runoff.

The nozzle boom machines have some disadvantages such as low distribution uniformity, need high operating pressure, distribute water with large drops and relatively high application rates [1], sometimes incompatible with soil intake capacity which leads to runoff problems. The impact of large water drops can damage the crop canopy and compact soil surface [2]. On the other hand, farmers, who own these systems, show only partial dissatisfaction with the system, which is mainly due to its lower cost, when compared with other sprinkler irrigation systems [3].

Photo 1. The water distribution manner using nozzle boom machine under windy conditions (Photo: Beinlich company)

Normally, wind conditions have a lesser effect on the smaller sprinklers, which can generate more uniform irrigation events. The most common option is the use of suitable emitters and the machine speed. However, in soils with low water intake rate, this can represent a problem. To improve the performance of some sprinkler irrigation systems, the conventional sprinklers can be replaced by a PVC tubes with emitters. These drag tubes with emitters were used under centre pivot systems at a low- or medium-pressure with good water distribution [4 and 5]. In comparison, the big gun sprinkler system with the boom nozzle machine, the water and energy can be reduced under boom system [6]. [7] compared the nozzle boom machine with sprinkler irrigation system. He found that, the water distribution was better as with sprinkler irrigation system and the uniformity coefficient (C_U) of the nozzle machine was 20% higher than the C_U value of sprinkler system. [8] compared the performance of the traveller machine using a line of four sprinklers and a gun-sprinkler at three different travelling speeds. They stated that, the line of sprinklers option has some management disadvantages compared to the gun-sprinkler option.

Laboratory tests and field experiments were carried out during the summer season of 2009 at Institute of Agriculture Technology and Bio-Systems Engineering, vTI, Braunschweig, Germany. The specific objective of this research was to study the performance of evaluate and develop the performance of nozzle boom machines vs. boom machine with drag hoses.

MATERIAL AND METHOD

The nozzle boom machine (Fig.1) is considered as one of the most famous type of irrigation machines, especially in Germany. The technical data for the machine before and after modification are indicated in (Table 1). The installation of nozzle boom machine with drag hoses is shown in (Fig. 2). Laboratory tests were undertaken to select the optimum discharge rate of hose and operating pressure.

Then, field experiments were conducted to investigate the water distribution under both boom machine with nozzles and the same machine using drag hoses. The experimental site located in Braunschweig city at a latitude of 52° 19´, longitude of 10° 33´ and altitude of 88 m. Field tests were done on field slopes ranged from zero percent to 3%, and the soil was prepared using a disc harrow to a working depth of 20 cm. The soil type was sandy and the mean infiltration rate was   50 mm/h [5].

Laboratory stage

In the first laboratory experiment, eight pressure levels were used (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7 and 0.8 bar). Also, three perforated metal parts with 2, 3 and 4 mm diameter were installed at front of the hose with only one water outlet at the end. The hose diameter was 16 mm and the length of each one was 1.5 m. In the second laboratory experiment, other pressure levels were used (0.2, 0.4, 0.6, 0.8 and 1 bar). Also, the hose length was 12 m and has perforated points; the distance between every two points was   0.5 m. Each point on the hose has 2 orifices and orifice plate of 4 mm diameter only used and installed at the front of the hose.

In both laboratory experiments, the operating pressure was controlled using a manometer with a reading accuracy of 0.1 bar. The water discharge of each hose was measured using a 2 L measuring cylinder with 20 ml accuracy. Time of the discharge was recorded by using a stopwatch (accuracy, 0.01 second). Three replicates were used in this stage for each treatment.

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In both laboratory experiments, the operating pressure was controlled by a manometer with a reading accurate of 0.1 bar. The water discharge of each hose was measured using a 2 L measuring cylinder 20 ml accurately. The time of the discharge was recorded by using a stopwatch (accuracy, 0.01 second). Three replicates were used in this stage for each treatment.
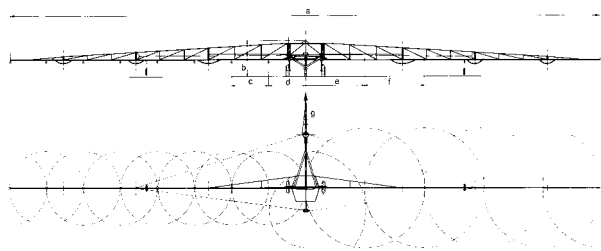
Fig. 1. The nozzle boom machine, symbols are indicated in Table 1

Table 1. The technical data for the machine before and after modification

Technical data	Nozzle boom
Nozzle type	Nelson R3000 Rotator
No. of nozzles	18
Sprinkler type	K1, Teso 8°
No. of sprinklers	2
Sprinkler diameter	10 mm
Pressure regulator	Nelson Hi Flo blue, 1.7 bar
Machine speed	25-30 m/h
Discharge per nozzle	2 m³/h
Nozzle diameter	6.3 mm
Machine width (a, Fig.1)	50 m
Machine height (b, Fig.1)	3 m
Direction of machine motion	(g, Fig.1)
Distance between nozzles (c) (d) (e) (f)	2.80 m 2.75 m 3.20 m 3.22 m
Height of the water tube (a, Fig.2)	1.5 m
The distance between hoses (b, Fig.2)	0.50 m

Fig. 2. The installation of nozzle boom machine with drag hoses (a=height of the water tube and b = distance
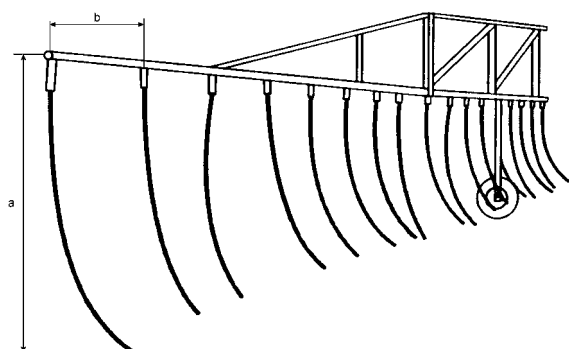
between hoses)

Field stage

The field tests were done in a field with a summer grass. The first field experiment was carried out to investigate the performance of nozzle boom machine before modification (NBM). The second one was carried out to investigate the performance of the machine after modification (boom with drag hoses).

To evaluate the water distribution uniformity for NBM, a line of catch cans one meter a part was installed in the field across the towpath in two locations 50 m a part. The catch cans were chosen according to [8] and were placed above the crop canopy using a one m height support. Uniformity was evaluated using the Christiansen Coefficient of Uniformity, C_u [9]:

$$C_u = \left(1 - \frac{\sum_{i=1}^{n} |D_i - D_c|}{D_c \cdot n}\right) \qquad [1]$$

Where: C_u is the coefficient of uniformity in %; D_i is the water depth collected in the individual catch can in mm; D_c is the average collected water depth in mm; and n is the total number of catch cans used in the evaluation. The average applied water depth was calculated according to [1] as follows:

$$D_a = \frac{Q}{w \cdot \upsilon_t} \qquad [2]$$

Where: D_a is the average applied water depth in m; Q is the flow rate in m³/h; w is the towpath spacing in m; and υ_t is the travelling speed in m/h.

To evaluate the water depth using BDH, a number of soil samples were taken from 5 positions between two hoses in different locations at 0.4 m soil layer depth. Then the applied water depth under the machine after modification can be measured.

RESULTS AND DISCUSSIONS

Laboratory stage

The laboratory experiments indicated that, when the pressure increased from 0.1 bar to 0.8 bar the water discharge increased for all treatments (Fig. 3). But in case of 4 mm

diameter, the highest water discharge recorded. At the same time, the lowest values observed using 2 mm diameter.
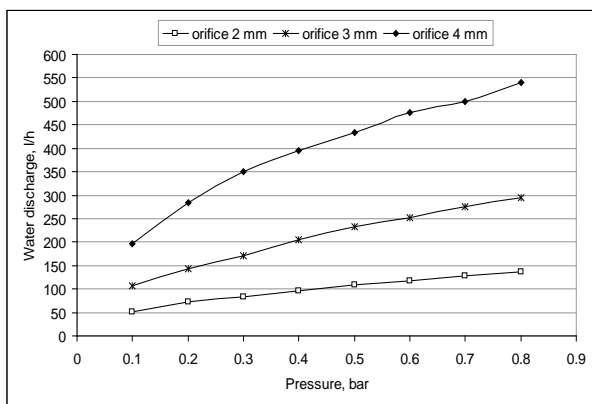
Fig. 3. The water discharge measured under different pressures and different perforate diameters

As a result from these experiments, the hose with orifice plate diameter of 4 mm was chosen at operating pressure ranged from 0.2 to 0.4 bar. Because in this case, the obtained water discharge ranged from 300 to 350 l/h and this is the required amount.

From the second experiment, the orifice discharge increased as operating pressure increased. The minimum value of water discharge (2 l/h) was obtained at 5 m distance from water inlet point using 0.2 bar. On the other hand, the highest orifice discharge value (76.60 l/h) was obtained at 0.5 m distance from water inlet point using 1 bar as shown in Figs. 4 and 5.
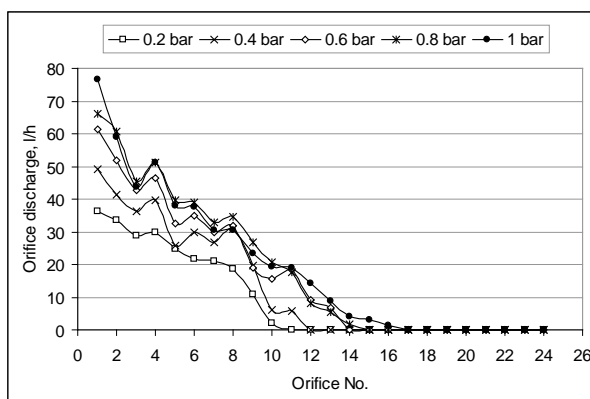
Fig. 4. Effect of operating pressure on the orifice discharge rate

Fig. 5. Effect or operating pressure on total water discharge

Field stage

The field experiments using nozzle boom machine (NBM) before modification, indicated that the maximum irrigated width was about 50 m. The average water depth was 20 mm. The experiments were conducted twice as illustrated in Fig. 6. The maximum values of irrigation depth were measured under the sprinklers in both experiments.
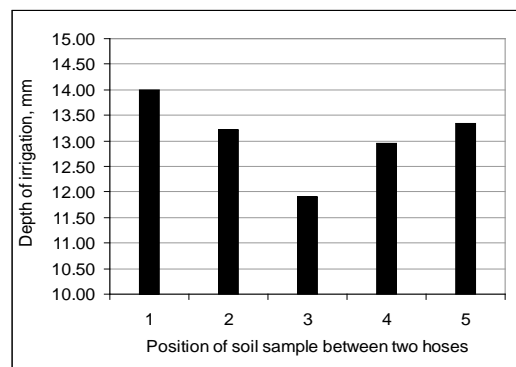
Fig. 6. The obtained depth of irrigation water using nozzle boom machine "before modification"
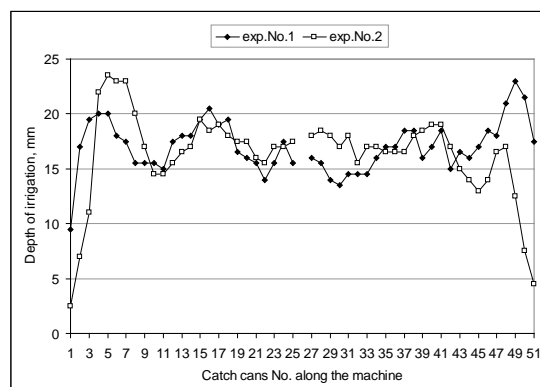
Fig. 7. The measured depth of irrigation water using boom with drag hoses "after modification"

As a result from field experiments using boom with drag hoses (BDH) after modification, the average water depth was about 13 mm and the highest value measured directly under the hoses was as shown in Fig. 7. At the same time, the minimum value of irrigation depth was observed between the hoses at the position of soil sample No. 3.

CONCLUSIONS

The results obtained in this study indicated that from the laboratory experiments, the hose with orifice plate diameter of 4 mm was chosen at operating pressure ranged from 0.2 to 0.3 bar. Because it will be suitable for the water discharge which needed from the machine. Only 2 m length of hose is enough with one orifice. In case of field experiments, the average of water depth was 20 mm and the maximum values of irrigation depth were measured directly under the sprinklers in both the first and the second experiments using nozzle boom machine. Using boom with drag hoses (BDH) after modification showed that the average of water depth was about 13 mm and the highest value measured directly under the hoses. At the same time, the minimum value of irrigation depth was observed between the hoses. The boom with drag hoses has very important advantages especially in windy conditions since the water losses and wind drift are minimized in comparison to nozzle boom or sprinkler machines.

ACKNOWLEDGEMENTS

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INCREASING WATER AVAILABILITY AND WATER USE EFFICIENCY IN SANDY SOILS THROUGH A GEOTEXTILE MATERIAL UNDER SPRINKLER IRRIGATION

Asaad DERBALA[1], Adel ELMETWALLI[1], Nabil MANSOUR[2] , Adel MADY[3]

[1]Tanta University, Faculty of Agriculture, 31527 Tanta, Egypt, Phone: +20 40 3455584, Fax: +20 40 3455570, E-mail: derbalana@yahoo.com
[2]Alex. University, Faculty of Agric., Damanhur, Egypt, Phone: +20 40 0180021886
[3]Institute of Water Management and Irrigation. Research, National Water Research Center, Giza, Egypt, Phone: +20 47 3242922

Corresponding author: derbalana@yahoo.com

Abstract

This experiment was undertaken in a newly reclaimed area at Badr district, Egypt to study the influence of a geotextile material under sprinkler irrigation on the availability of soil moisture content and salinity in the top 40 cm of the soil profile. The farm was planted by Navel orange from about ten years. To achieve the objectives of this research, the field experiment was carried out in order to measure soil moisture content, water distribution and different water relations (water application efficiency, water use efficiency and water stored efficiency) under sprinkler irrigation. The results indicated that the maximum fruit yield was obtained with mats placed at 20 cm depth whilst the minimum fruit yield was recorded with the control treatment. Mats at 20 cm depth increased the availability of soil moisture content in the root zone. The results further showed increases in water use efficiency and water application efficiency as a result of using the geotextile material. In addition, soil salinity in the root zone decreased as a result of increasing soil moisture content. As a conclusion, a geotextile mat is good and suitable for using under newly reclaimed areas to enhance the soil ability for catching of water.

Keywords: geotextile, sprinkler irrigation, moisture content, mulching

INTRODUCTION

Citrus in Egypt represents approximately 30% of the total area planted with fruit trees which is about 96432 feddans (1 feddan=0.42 ha). Therefore, the present work was carried out to study the influence of geotextile material on yield of *Navel* orange and water relations in newly reclaimed land conditions. Irrigation efficiencies vary with the type of irrigation system used and with other factors such as soil, crop and climatic conditions.

Newly reclaimed areas suffer from some problems including low soil fertility, high deep percolation losses as a result of their light texture, wind erosion and limited water resources. Therefore using limited water resources efficiently is very important to obtain the maximum productivity. Recently, considerable attention has been focused on the fact that our national water supply has become a seriously limiting factor in the field of agricultural expansion as a result of limited water resources. This emphasizes the importance of increasing the efficiencies of irrigation water. This goal could be achieved by minimizing water losses through different ways (e.g. using plastic sheets; adding clay, compost, and organic manure; using mulches and soil conditioners). Mulching reduces the surface evaporation and decreases the accumulation of salts in the root zone [1]. Mulching also reduces water evaporation and increases soil moisture content in the root zone [2].

[3] investigated soil water distribution pattern in an orange orchard under both trickle and mini-sprinkler systems and found that the best water distribution in the soil profile was found under drip irrigation system (two laterals of in-line emitter) whilst the mini-sprinkler irrigation system produced the highest yield of orange.

[4] evaluated the performance of a geosynthetics mat by plant growth and mock-up testing. They concluded that the use of mulching mats proved effective at physically

stabilizing slopes by preventing sediment movement, and they markedly contributed to the growth of plants.

[5] found that increasing the amount of irrigation water applied to apple trees tended to increase the soil moisture content and decrease the soil salinity for different depths and mulching types. Meanwhile, the highest value of field water use efficiency was obtained with 16.92 l/tree.day water applied and black plastic sheets. The lowest value of field water use efficiency of 1.29 kg/m^3 was obtained with applying 33.8 l/tree.day in the case of bare soil treatment. The results also demonstrated that mulching with cut grass and applying 25.4 l/tree.day can be used with no effect on soil physical and chemical properties.

[6] evaluated the effectiveness of adding Polyacrylamide to light-textured soils for increasing the availability of soil water and concluded that the application of Polyacrylamide increased both the availability of water and water use efficiency comparing with the control (without the material).

Under sandy soil conditions, the infiltration rate is remarkably high, which causes water losses and reduces water stored in the root zone. In this context, reducing infiltration rate in such soil type is crucial particularly in areas suffering scarcity of water. The objectives of this study were to:

- Study the influence of geotextile material under sprinkler irrigation on the availability of soil moisture content and salinity in the top 40 cm depth of the soil profile.

- Assess the effectiveness of geotextile material in increasing fruit yield and water use efficiency.

MATERIAL AND METHOD

The experimental work was carried out in a newly reclaimed area (sandy soil) located at Badr district, El-Tahrir during the 2009-2010 growing seasons. The distances between trees and rows are 5×5 m and the number of trees per feddan was168. The total amount of applied irrigation water was calculated for each treatment. The metrological data including maximum and minimum temperature, relative humidity, solar radiation, sun shine hours and wind speed were collected from Nubaria agricultural research station. The weather in this area is characterized by hot summers and mild winters which is suitable to grow both crops and trees. Different physical properties of the experimental site were determined according to [7] and [8] and are presented in Table 1. The bulk density (P_b) was determined by using the core method to a depth of 75 cm [9].

Table 1. Different physical properties of soil of the site, (soil and water laboratory, Fac. of Agric., Tanta Univ.)

Depth, cm	0-25	25-50	50-75
Sand, %	82.05	86.92	89.87
Silt, %	10.31	8.29	6.07
Clay, %	7.64	4.79	4.06
P_b, g/cm^3	1.40	1.52	1.56
Porosity, %	46.15	41.54	40.00
FC, %	14.00	13.31	12.05
Soil texture	sandy	sandy	sandy

Characteristics of geotextile material:

The geotextile material is a kind of geosynthetics used in geotechnical and civil engineering, which is made from continuous filament, by paving the filament net and concretion method, thus the fabric is produced. Its fibre is arrayed a three dimensional structure. Besides its fine mechanical characteristics, it has a chemical stability like fine drainage capacity in both directions, good capacity of elongation and high biology tolerance, alkali tolerance, acidity tolerance, weather resistance etc. Meanwhile, it has wider pore size, devious holes distribution, good permeability and filtration. The geotextile material is used for filtration purposes in water conservancy projects and slope protection projects as well as for the reinforcement and drainage in projects of earth slope and retaining walls. The geotextile material used in this research is shown in Photo 1 and different its specifications are listed in Table 2. This material was buried at two different depths (20 and 40 cm) in the root zone around the tree.

Water application efficiency:

Water application efficiency (E_a) was calculated for each treatment according to [10] using the following formula:

$$E_a = (w_s/w_f) \times 100 \qquad 1$$

Where:

E_a: irrigation application efficiency in %,

w_s: stored water within irrigation in mm and,

w_f: depth of water delivered to the area irrigated in mm.

Photo 1. The geotextile material

Table 2. Technical characteristics of the geotextile

Item	Technical Properties
Width, m	4
Mass, g/m²	150±10%
Thickness, mm	1.7
Tensile strength, kN/m	7.5
Tensile elongation, %	30-80

Water consumptive use:

Water consumptive use was computed as the difference between soil moisture content before and after irrigation according to [10] as follows:

$$C_u = [(\theta_2 - \theta_1) \times P_d \times D]/100 \qquad 2$$

Where:

C_u: water consumptive use in m^3/fed,

θ_2: soil moisture content (dry basis) after 24 hours, %,

θ_1: soil moisture content (dry basis) before irrigation, %,

P_d: soil bulk density, g/cm^3 and

D: soil depth, cm.

Reference evapotranspiration and crop coefficient:

It was estimated by using metrological data for the region of study. The modified Penman method was used to calculate the evapotranspiration (Etp) as follows:

$$Etp = c[(w \times R_n) + (1-w).f(u)(ea-ed)] \qquad 3$$

Where:

Etp: reference crop evapotranspiration in mm/day,

c: adjustment factor to compensate the effect of day and night weather conditions,

w: temperature related weighting factor,

R_n: net radiation in equivalent evaporation, mm/day,

f(u): wind related function and

ea - ed = the difference between the saturation vapour pressure of mean air temperature and the mean actual vapour pressure of the air.

Actual evapotranspiration was estimated as follows:

$$Etc = Etp \times k_c \qquad 5$$

Where:

Etc = actual evapotranspiration, mm/day.

Etp = potential evapotranspiration, mm/day.

k_c = crop coefficient, dimensionless.

Water use efficiency (WUE):

Water use efficiency was calculated as reported by [11] as follows:

$$WUE = Y/W_r \qquad 6$$

Where:

Y: yield, kg/fed and

W_r: water delivered to the field, m^3/fed

RESULTS AND DISCUSSIONS

Soil Moisture content:

The average values of moisture content in different treatments were calculated throughout the root zone. The results revealed that the maximum value of moisture content was achieved when the mat was placed at 20 cm depth in different irrigations whilst the minimum value of moisture content was recorded with the control treatment (without material). Broadly, the results showed an increase in moisture content in case of using mats. Data presented in Fig 1 shows that, the highest net soil moisture content of 9.10 % was obtained with the treatment of a mat depth at 20 cm in the second irrigation whilst the lowest percentage of 4.33 % was recorded with the control treatment in the second irrigation. The figure obviously demonstrates the effect of the geotextile material depth on moisture content at the first irrigation, second irrigation and third irrigation. This increase in water availability can fundamentally increase

crop productivity through decreasing soil salinity in the root zone.
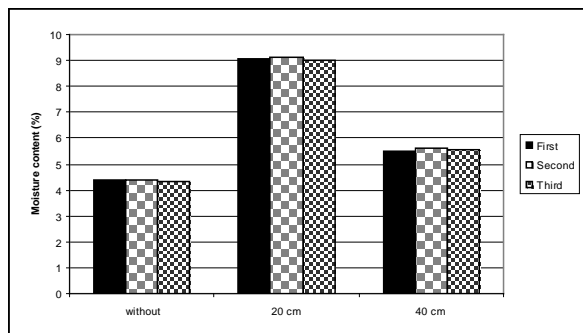
Fig. 1. Effect of using the geotextile material on soil moisture content in the root zone

Soil salinity

The average values of soil salinity were affected by the depth of the material under sprinkler irrigation as shown in Fig. 2. The average values of soil salinity were 0.60, 0.72 and 0.87 dS/m by using mats at 20, 40 cm depth and control, respectively with I_4 treatment. The maximum value of soil salinity of 0.87 dS/m was recorded in case of 40 cm depth with I_4 treatment while the minimum soil salinity value of 0.25 dS/m was obtained with the mat placed at 20 cm and 40 cm depth with I_1 treatment.
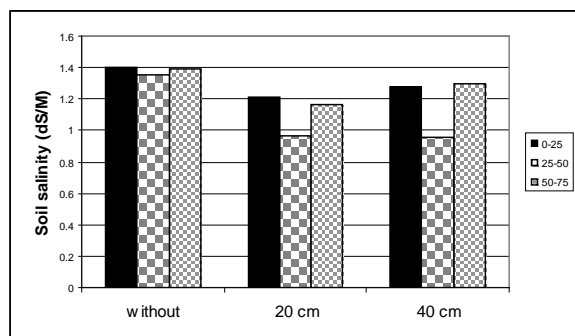
Fig. 2. Effect of using the geotextile material on soil salinity in the root zone

Application efficiency:

Application efficiency for the first, second and third irrigations, at different mat depths is depicted in Fig. 3. The highest value of application efficiency was 99.6% obtained using mats placed at 20 cm depth in the second irrigation while the lowest application efficiency of 94.7% was recorded with the control in the first irrigation. Generally, the highest application efficiency was recorded with mats placed at 20 cm depth in all irrigations. The higher application efficiency

may have been a result of higher availability of moisture content in the root zone.
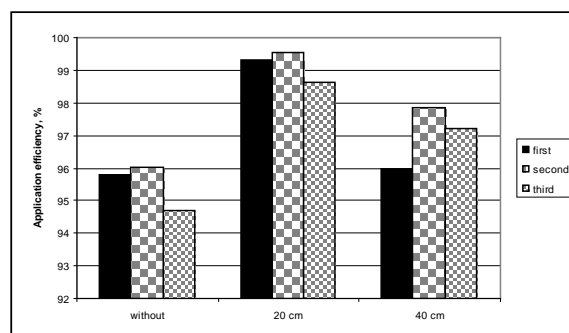
Fig. 3. Effect of geotextile material place on application efficiency of the irrigation system used

Yield and water relations

Data listed in Table 3 demonstrated significant differences between different treatments on the number of dropped fruits, where the greatest number of the dropped fruits per tree was recorded with the control treatment (121.64 fruit/tree), followed by the treatments of mats placed at 20 cm depth (85.12 fruit/tree), then mats placed at 40 cm depth (84.55 fruit/tree). This may have been attributed to placing the geotextile material at 20 and 40 cm depths which increased the availability of soil moisture content around the tree. Table 3 also details the yield in Mg/fed for different treatments. The fruit yield was 10.08, 11.59 and 11.26 for control, mats at 20 cm and 40 cm depth treatments, respectively. The highest fruit yield of 11.59 ton/fed recorded with mats placed at 20 cm may be due to the optimal soil temperature and soil moisture content. Broadly, placing the geotextile material at 20 cm depth, enhanced fruit growth rates compared with the other depth at 40 cm.

Water relations of orange as influenced by the geotextile material are presented in Table 4. It is obvious that water use efficiency (WUE) increased with using the geotextile material at 20 and 40 cm depth in comparison with the control treatment (without material). The highest WUE of 2.44 kg/m^3 was recorded with mats placed at 20 cm depth while the lowest WUE of 2.12 kg/m^3 was recorded with the control treatment. The increases in WUE were mainly due to offering the optimal growth conditions that directly increase the fruit productivity. Additionally, the water up

take by orange trees increased as well as water stored between soil layers. The obtained results are in full agreement with the findings of [12].

Table 3. Effect of the geotextile material on the number of dropped fruits and yield per tree of Valencia orange during 2010 growing season

Treatments	No. of dropped fruits/tree	Yield, kg/tree	Yield, Mg/fed.
20 cm depth	85.12b	68.9a	11.59a
40 cm depth	84.55b	67.0a	11.26a
without	121.64a	59.33b	10.08b
Significance	*	*	*

* significant at a 5% level by DMRT

Table 4: Effect of the geotextile material on water relations and water use efficiency

Treatments	Applied water, m^3/fed	Water stored, m^3/fed	E_a, %	WUE kg/m^3
20 cm depth	4755.84	3422.39	99.2b	2.44a
40 cm depth	4755.84	3511.39	97.0b	2.34a
without	4755.84	3785.68	95.5a	2.12b
Significance		*	*	**

* significant at a 5% level and ns: not significant

CONCLUSIONS

The obtained results from the present work could be summarized as follows:

- The growers of citrus trees must keep the geotextile material under the soil surface which led to increase the availability of soil moisture content around the tree trunk in the upper soil layer, as well as, to improve the productivity.

- Significant differences were observed when using the geotextile material at 20 and 40 cm depths on water use efficiency and crop yield, so 20 cm depth is practically reasonable in terms of the cost to bury the material.

- This material can decrease the losses by deep percolation of irrigation water in sandy soil, which leads to increase soil moisture content throughout the root zone of a tree. It can be concluded that the geotextile material is an effective way to decrease water losses and increase water productivity.

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ESTIMATION OF DROUGHT TOLERANCE OF LOCAL AND PIONEER TOP COMERCIAL CORN HYBRIDS TESTED IN DIFFERENT PEDO-CLIMATIC AREAS FROM SOUTH OF ROMANIA

Viorel DINCA[1], Gabriela-Mariana STOICA[2], Alexandru CHIPER[3], Gabriela VALSAN[1]**, Valentin MANDACHE**[1]**, Marina UBERTI[4], Anghelus FIERBINTEANU**[1].

[1]Pioneer Hi-Bred Seeds Agro SRL, DN2, km 19.7, Ganeasa-Sindrilita Commune, Zip code 077104, Ilfov County, Romania, Phone: +40213035307, Fax:+40213035341, Mobile: +40723613894
E-mail: viorel.dinca@pioneer.com
[2] University of Agricultural Sciences and Veterinary Medicine, 59 Mărăşti Boulevard, District 1,Zip code 011464, Bucharest, Romania, Phone:+40213182564, E-mail:gabriela_mary25@yahoo.com
[3] University of Agricultural Sciences and Veterinary Medicine, 59 Mărăşti Boulevard, District 1,Zip code 011464, Bucharest, Romania, Phone:+40213182564,Email:alexchiper@yahoo.de
[4]State Institute for Variety Testing and Registration, 61 Mărăşti Blvd., District 1, Bucharest, Romania, Zip code 011464. PO 32-35, Phone: +40213184380

Corresponding author: viorel.dinca@pioneer.com

Abstract

The purpose of the study was the estimation of the behavior of top commercial corn hybrids tested in 5 different pedo-climatic areas from drought tolerance perspective. The study was carried out in 2009, 2010 and 2011 in 5locations: Valu lui Traian,Constanta county; Sarichioi, Tulcea county; Fundulea, Calaraşi county; Cazasu, Brăila county and Caracal Olt county. These locations were selected as being representative for corn crop. Eight corn hybrids (F475M, Olt, Paltin, F376 from Fundulea Institute and PR35F38, PR37Y12 , PR36V74, PR37F73 from Pioneer) were tested using two level of water regime: irrigated with 800 ^{3}/ha and non-irrigated. The study showed that the 2009 was less favorable for corn crop in all testing areas, comparing with 2010 and 2011 which were favorable for corn crop. In the case of non-irrigated corn trials the yield was influenced by the climatic conditions of the year, while in the case of irrigated corn trials, the yield was much higher and stable. The hybrid PR36V74 had the highest yield in all irrigated and non irrigated testing areas. Average yield of the hybrids over three years were between 93.8 q/ha (F475M) and 130,3 q/ha (PR36V74)in non-irrigated condition, while in irrigated conditions average yield increased significantly by applying of 800 m^3/ha: between 101.2 q/ha (F475M) and 155,9 q/ha (PR36V74).

*Keywords***:** *corn yield, cropping areas, drought tolerance, irrigation, Zea mays L.*

INTRODUCTION

Corn (*Zea mays* L.) an outstanding generous species, by its yielding potential, large diversity of utilization as food and feed, and raw material for industrial processes, grown worldwide on large areas, as well as in Romania, occupies a primary place in creation and development of a modern and performing agriculture. Corn plant is the most surprising system present in nature for energy accumulation. From a kernel weighting about one third of a gram, a plant tall of two-three meters emerges and develops in approximate nine weeks, and after about eight following weeks this plant will produce 600-1000 kernels [1]. Market and consumer requirements lead corn breeding research towards more and more performing hybrids in terms of yielding capacity [4]. Till 2020, 20% from the total of the fuel used in European Union should be biofuel and the most important source from an economical point of view to achieve this objective is represented by corn crop. Thus, increasing of corn cropping area is stimulated [3].

Research on water consumption in connection with corn irrigation represents also a major

objective aimed to increase the contribution of corn to vegetal material supplying.

The objective of this study is to characterize eight top commercial hybrids grown in Romania in terms of yielding capacity parameters in connection with their water stress tolerance.

For South East Romania, an average irrigation rate of 800-1500 m^3/ha is recommended. If irrigation is not applied in the period of maximum water consumption of the corn plants, water deficit will affect significantly the grain yield [2].

MATERIAL AND METHOD

Research was performed in five locations in a factorial field trial, designed as split-split-plot with the following factor graduations:

Factor A – water stress level: a1-non irrigated (drought tolerance), a2-irrigated with a pedological rate of 800m^3/ha of water, using small sprinklers;

Factor B – hybrid: b_1 F475M, b_2 Olt, b_3 Paltin and b_4 F376 from Fundulea institute, the main local corn breeding company and b_5 PR35F38, b_6 PR37Y12 , b_7 PR36V74 and b_8 PR37F73 from Pioneer;

Factor C – pedoclimatic area: c_1 Valu lui Traian, Constanţa county, c_2 Sarichioi, Tulcea county, c_3 Cazasu, Brăila county, c_4 Fundulea, Calăraşi county and c_5 Caracal, Olt county, between 2009-2011.

The experiment was three times replicated in both irrigated and non irrigated conditions. Soils from all locations where the trials were performed are typical for corn cropping area from Romania.

In all three years, in graduation a2, an irrigation of 800 m^3/ha was applied. In 2009 due to abundant rainfall no significant differences were registered between irrigated and non-irrigated.

Grain weight was measured in each experiment plot and yield at 14% grain moisture was computed. ANOVA applied to a three factorial split-split-plot was used to process and interpret yield data.

RESULTS AND DISCUSSIONS

It is well know, that corn is affected by drought at anthesis-silking interval – beginning with the second part of July till towards the end of August. Additional irrigation water supplying in this period contributes to corn grain yield increasing.

Data from this study (ANOVA, not presented) showed that water stress levels represented by irrigated and non-irrigated testing conditions and genotypes represented by corn hybrids, as well as all possible interactions between the two factors and between experimental factors and environmental condition represented by years and locations produced significant variations of the grain yield. Specific hybrid reactions to water stress levels were noticed. The influence of the location on corn grain yield (averaged over years, water stress levels and hybrids), Fig.1, shows that the high yielding potential of the corn cropping from South-East of Romania, enhanced by irrigation, could satisfy the current increasing requests for agriculture products.
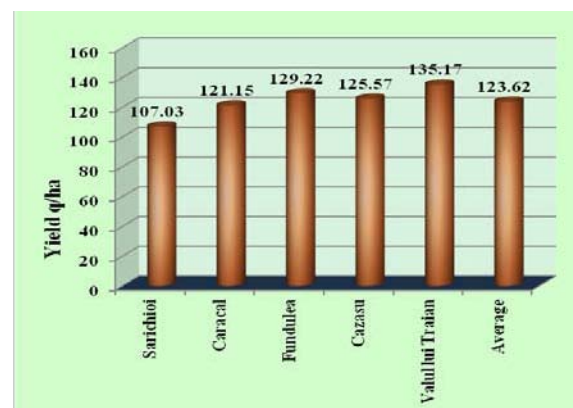
Fig.1 Influence of the location on the corn yield, averaged over 8 hybrids and 3 years

Thus, the influence of the irrigation regime on corn grain yield is presented in Fig.2 Application of irrigation resulted in a significant average yield increasing of 16.2 q/ha versus non irrigated conditions.
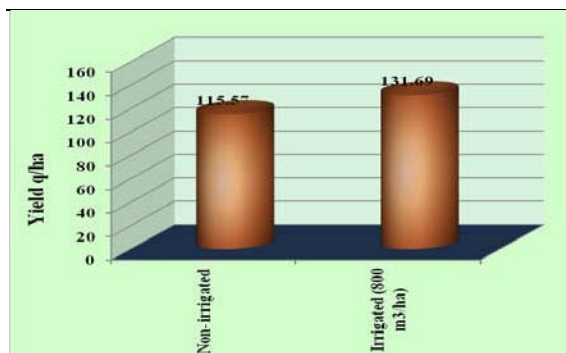
Fig 2. Influence of the irrigation regime on corn grain yield averaged over 8 hybrids, 5 locations and 3 years

Average grain yield of the tested hybrids varied between 107.7 q/ha (F475M) and 124.5 q/ha (PR36V74) in non irrigation conditions (Table 1).

Table 1. Influence of the hybrid on the yield in non-irrigated conditions, 2009-2011

Hybrid	Yield q/ha, Non-irrigated	Difference	Signification
(b)	(a1)		
b1 – F475M	107.0	-8.4	0
b2 - Olt	119.0	3.5	-
b3 - Paltin	117.4	1.8	-
b4 –F376	107.5	-7.9	0
b5 – PR35F38	119.1	3.5	-
b6 – PR37Y12	110.6	-4.9	-
b7 – PR36V74	124.5	8.9	**
b8 – PR37F73	119.1	3.5	-
Average (control)	115.5		-

DL 5% = 5.28 q/ha   DL 1% = 6.97 q/ha   DL 0,1% = 9.02 q/ha

The best performing hybrids in non irrigated conditions were Olt, PR35F38 and PR37F73 and particularly PR36V74 which significantly over passed the control represented by the hybrids mean (124.5 q/ha PR36V74 versus 115.5 q/ha hybrid mean).
Significant lower yield versus hybrid mean in non irrigation conditions were registered at F376 and F475M from Fundulea. PR37Y12 had also a lower grain yield but mostly due to its remarkable earliness. In irrigation conditions (Table 2) grain yield of the tested hybrids, averaged of over locations and years, varied between 119.7 q/ha (F376) and 145.2 q/ha (PR36V74). Similarly to non irrigated conditions, F376 and F475M had the lowest performances.

Table 2. Influence of the hybrid on the yield in irrigated conditions, 2009-2011

Hybrid	Yield q/ha, Irrigated	Difference	Signification
(b)	(a2)		
b1 – F475M	121.1	10.5	0
b2 - Olt	137.7	6.9	*
b3 - Paltin	130.3	-1.3	-
b4 –F376	119.7	-11.9	0
b5 – PR35F38	135.3	3.6	-
b6 – PR37Y12	128.2	-3.4	-
b7 – PR36V74	145.2	13.6	***
b8 – PR37F73	135.8	4.1	-
Average (control)	131.6	Mt	-

DL 5% = 5.28 q/ha   DL 1% = 6.90 q/ha   DL 0,1% = 9.02 q/ha

Irrigation produced a general significant grain yield increasing of 16.1 q/ha (average over hybrids); Olt had the best performance from local hybrids and PR36V74 gave the highest yield increasing in irrigated conditions versus non irrigated conditions (20.7 q/ha) (Table 3).

Table 3. Yield in irrigation and non-irrigation, conditions, average over years and locations

Hybrid	Yield q/ha, Irrigated	Yield q/ha, Non-irrigated	Difference	Signif.
(b)	(a2)	(a1)	(q/ha)	Dif.a2-a1
b1 – F475M	121.1	107.0	14.0	***
b2 - Olt	137.7	119.0	18.6	***
b3 - Paltin	130.3	117.4	12.8	***
b4 –F376	119.7	107.5	12.1	***
b5 – PR35F38	135.3	119.1	16.2	***
b6 – PR37Y12	128.2	110.6	17.6	***
b7 – PR36V74	145.2	124.5	20.7	***
b8 – PR37F73	135.8	119.1	16.7	***
Average (control)	131.6	115.5	16.1	***

DL 5% = 5.28 q/ha   DL 1%   = 6.97 q/ha   DL 0,1% = 9.02 q/ha

Hybrid mean grain yield averaged over environmental factors (year and location) and water stress levels (Table 4) outline several superior products for cropping area from South-East of Romania such as Olt from local hybrids and PR35F38, PR37F73 and PR36V74 from Pioneer.

Table 4. Influence of the hybrid on corn grain yield , 2009-2011 average

Hybrid	Yield		Difference q/ha	Semnif.
(b)	q/ha	%		
b_1 – F475M	114.0	100	-	-
b_2 - Olt	128.4	112.5	14.3	***
b_3 - Paltin	123.8	108.5	9.7	***
b_4 –F376	113.6	99.6	-0.4	-
b_5 – PR35F38	127.2	111.5	13.1	***
b_6 – PR37Y12	119.4	104.6	5.3	**
b_7 – PR36V74	134.9	118.2	20.8	***
b_8 – PR37F73	127.4	111.7	13.3	***

Dl 5%=3.37 q/ha   Dl 1%=4.45q/ha   Dl 0,1%=5.73q/ha

CONCLUSIONS

For specific conditions of the corn cropping area from Romania, obtaining of high and stable yield requires irrigation, particularly in the South of the country as one of the most important factors of corn cropping technology.

Results of this study underline also that irrigation is one of determinant factor of the expression of the high yielding ability of both local and Pioneer hybrids. In non-irrigated conditions, the local hybrid Olt and the Pioneer hybrid PR35F38 and PR37F73 and particularly PR36V74 had a better performance.

In irrigated conditions, both local and Pioneer hybrids could express better yield with Olt and PR36V74 performing outstanding in such favorable conditions.

Although, moderate to no stress occurred in the experimental years 2009-2011, the consisted yield differences obtained for all local and Pioneer hybrids in irrigation conditions versus non-irrigated proved the superiority of irrigated technology for reaching the outstanding yielding potential of modern corn hybrids.

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EVOLUTION OF ROMANIAN AGRICULTURE IN THE PERIOD 2007-2010

Carina DOBRE [1], Adina IORGA [2], Elena TOMA[3], Alexandra MUSCĂNESCU[4]

[1]University of Agricultural Sciences and Veterinary Medicine, Bucharest, 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 21 318 25 64/232, Fax: + 40 21318 28 88, E-mail: dobrecarina@yahoo.com, iorga_adinam@yahoo.com, elenatoma2011@yahoo.com

Corresponding author: dobrecarina@yahoo.com

Abstract

This paper aims to predict the evolution of post-accession Romanian agriculture based on statistics provided by the National Institute of Statistics for 2007 and 2010. The evaluation performed allowed us to established the following key areas: increasing the efficiency of agriculture, increasing labor productivity by 21.4%, number of farms decreased by 1.9%; decrease in the area cultivated with cereals, vineyards and orchards and a grow in the area cultivated with industrial plants and vegetables; increase of crop production (excluding potatoes and grapes); decrease of livestock and animal agricultural production obtained (except goats and bee families). In conclusion, Romania's agriculture after joining the European Union has evolved generally positive compared to 2007, due to improved climatic conditions in 2010 and less to the influence of the political and economic environment of the analyzed period.

Keywords: *agriculture efficiency, agricultural production, cultivated area, labour productivity*

INTRODUCTION

Romanian agriculture in the pre-accession period diminished its contribution to the overall development of economy, showing a low economic efficiency and significant differences from the other member states. EU accession in 2007 started with great expectations in restructuring the sector by implementing the Common Agricultural Policy, aiming to be an integration and an appropriation to the European agricultural model, even in the economic crisis. Although without establishing a direct connection between the evolution of agriculture and the benefits of membership, this paper aims to observe how agriculture responded to political and economic changes in the period 2007-2011 and especially at how Romanian agriculture evolved after integration in the single European market.

MATERIAL AND METHOD

In order to characterize the evolution of Romanian agriculture we selected a wide range of indicators from the period 2007-2010. The data, collected from National Institute of Statistics, have been statistically processed and interpreted and a brief evaluation was created.

RESULTS AND DISCUSSIONS

Agriculture global efficiency

Overall efficiency in the agricultural sector can be outlined by analyzing resulting indicators which are calculated by using the National Accounts NIS data, namely the value of production, gross added value and value of intermediate consumption. Estimated calculations for 2007-2009 (Table 1) reveal an improvement in agricultural efficiency shown by the declining share of intermediate consumption in production value, GVA growth in 1 Leu for intermediate consumption and GVA rate increase in production value as well as the increase of labor productivity in agriculture. Higher growth in real value of the production value rather than that of increase in intermediate consumption shows that farmers have been able to recover expenses incurred on account to the intermediate consumption due to sold production therefore increasing the overall efficiency in agriculture.

It can be observed that the economic crisis has had a direct impact on agriculture, in 2009 achieving a production value and gross added value of over 10% lower than in 2008.

Table 1.Production, intermediate consumption and gross value added in Agriculture, hunting and forestry – 2007 and 2010

Indicators	MU	2007	2008*	2009*	2009/2007
Production	Mill lei	52935.1	67943.1	59245.7	111.9
Intermediate consumption	Mill lei	28968.8	36300.6	30884.1	106.6
Gross value added	Mill lei	23966.3	31642.5	28361.6	118.3
Share of intermediate consumption in total production value	%	54.7	53.4	52.1	-
Share of Gross value added in total production value	%	45.3	46.6	47.9	-
Gross value added reported on total Intermediate consumption	%	82.7	87.2	91.8	-
Labor productivity, by employed person	lei/person	8448.7	11432.4	10260.3	121.4
Employees	thou	304.8	292.1	190.2	62.4
Self-employed	thou	2531.9	2475.7	2574	101.7

*constant prices of 2007, National Accounts

In the period 2007-2010 the value in real terms of production increased to 11.8% mainly due to increase in value of crop production by over 25%, representing 67.5% of all Romanian agricultural production. Animal production value has been declining mainly due to reduction of livestock, while the agricultural services sector decreased considerably (over 30%).

Table 2. Agricultural branch production – 2007 and 2010 (lei million constant prices)

Indicators	2007	2010*	%2010/2007
Total	47700	53348.9	111.8
Crop production	28723	35996.6	125.3
%	60.2	67.5	-
Animal production	18292	16891.2	92.3
%	38.3	31.7	-
Agricultural services	685	461.0	67.3
%	1.4	0.9	-

*constant prices of 2007

Agricultural farms

With the accession preparation and integration process it was intended to reduce the number of subsistence farms in favor of forming a viable business sector and economic diversification in rural communities. The small subsistence farm sector was very strong and survived the structure of old rural households.

Between 2002-2007 the number of farms under 5 ha fell by 568,400, but the reduction was insufficient and it was especially due to the physical disappearance of the owners and not as effect of surface concentration creating associative organization forms. Although after accession it was sought the further reducing in their number, the situation was reversed. Thus, the number of farms increased by 60,000, while farms with agricultural area between 5-50 ha decreased by 142 thousand, while those with more than 50 hectares increased by about 7000. If we follow the evolution of farms in parallel with the evolution of utilized agricultural area we emphasize the main causes of this situation the reunion of property and inheritance rights, the inclusion of agricultural land into commercial channels or lease / purchase of land by agricultural companies.

The decrease in the number of farms and utilized agricultural area induced that in 2010 the average size of a holding to be of 3.45 ha. Thus, individual farms had in 2010 an average territorial size of 1.9 hectares, and units with legal personality had 188.8 hectares, i.e. 15% and 32.9% less than in 2007.

Table 3. Agricultural holdings – 2007 and 2010

Indicators	2007	2010	Variation 2007-2010
Holdings - thou	**3931**	**3856**	**-75**
- Agricultural holdings with agricultural area < 5 ha	3531	3591	60
Share of total holdings	89.8	93.1	-
- Agricultural holdings with agricultural area 5-<50 ha	386	244	-142
Share of total holdings	9.8	6.3	-
- Agricultural holdings with agricultural area > = 50 ha	14	21	7
Share of total holdings	0.4	0.5	-
Holdings - thou	**3931**	**3856**	**-75**
- Single holder holding – thou	3914	3825	-89
- Legal entity or group holding – thou	17	31	14
Utilized agricultural area (UAA) - thou ha	**13753**	**13298**	**-455**
- Single holder holding - thou ha	8966	7445	-1521
- Legal entity or group holding - thou ha	4787	5853	1066
Average utilized agricultural area per holding – ha/holding	**3.5**	**3.45**	**98.60%**
- Average utilized agricultural area per Single holder holding – ha/holding	2.3	1.9	85.00%
- Average utilized agricultural area per Legal entity or group holding – ha/holding	281.6	188.8	67.10%

Source: Agricultural census, www.insse.ro

Cultivated area

The cultivated area increased in 2010 compared to 2007 by about 30 000 hectares, occupying about 83% of the country's arable land. An analysis of the cultivated area of 2010 reveals the following aspects: 64.6% is cultivated with cereals (27.7% to 26.9% with wheat and maize), 18.1% with oil plants (especially sunflower and rape), 10.9% with green fodder from arable land, 3.4% vegetables.

Table 4. Agricultural cultivated area – 2007 and 2010

Indicators	MU	2007	2010	%2010/2007
Arable area	thou hectares	9423.3	9405.0	99.8
Cultivated area	thou hectares	7777.2	7807.4	100.4
Organic crop area (fully converted area)	thou hectares	84.6	82.9	98.1
Cereals for grains	%	66.0	64.6	98.3
- Wheat	%	25.4	27.7	109.5
- Barley and two-row barley	%	4.7	6.6	141.8
- Maize grains	%	32.5	26.9	83.1
Dried pulses	%	0.6	0.5	86.0
Root crops	%	4.1	3.6	88.2
- Potatoes	%	3.4	3.1	90.0
- Sugar beet	%	0.4	0.3	76.7
Industrial crops	%	17.4	18.3	105.6
- Oilseed crops	%	17.2	18.1	105.2
Sunflower	%	10.7	10.1	94.6
Rape	%	4.7	6.9	147.2
Soya beans	%	1.7	0.8	48.0
- Other industrial crops	%	0.2	0.3	154.1
Tobacco	%	0.0	0.0	136.4
Medicinal and aromatic plants	%	0.1	0.2	214.9
Vegetables	%	3.3	3.4	103.7
Green fodder from arable land	%	9.9	10.9	110.8
Bearing vineyards	%	2.4	2.3	94.3
Fruit orchards	%	2.0	1.86	92.8
Uncultivated area	thousand ha	1646.1	1597.6	97.1
Share of uncultivated area in total arable area	%	17.5	17.0	-

Source: www.insse.ro, EUROSTAT

Organic farming has a low importance, only 1.06% of the cultivated area is represented by the land cultivated in organic system.

The largest increases were recorded for barley, canola, tobacco, medicinal and aromatic plants, in part because of the implemented subsidies system and agricultural policy.

Due to the very good price for wheat in 2007, and also to the national grant, the area cultivated with wheat increased. Areas cultivated with wheat and corn, occupy over 50% even when declining by about 1% of the area planted with corn.

Livestock

In terms of livestock, except for goats and bee families, in the period under review, their decrease had continued. Bad weather conditions and increasing fodder prices led to massive slaughter of the animals. In several areas of Muntenia, Moldova and part of Transylvania, farmers were faced with selling their animals at a quarter of the normal market price, the most affected area is the south (Ialomita, Constanta, Dolj and Olt) where many producers with two or three cows sold their animals at extremely low prices, or in many cases they were killed. As a result, the breeding livestock (cows, buffaloes and heifers), decreased significantly with over 25%.

Table 5. Livestock – 2007 and 2010

	MU	2007	2010	%2010/2007
Cattle	thou heads	2819	2001	71.0
-Cows, buffalo cows and heifers	thou heads	1732	1299	75.0
Pigs	thou heads	6565	5428	82.7
Sheep	thou heads	8469	8417	99.4
Goats	thou heads	865	1241	143.5
Horses	thou heads	862	611	70.9
Poultry	thou heads	82036	80845	98.5
-Adult laying poultry	thou heads	45208	44504	98.4
Bees	thou families	982	1275	129.8
Cattle	heads/100 ha	21.4	14.6	68.2
Pigs	heads/100 ha	75.7	59.3	78.3
Sheep and Goats	heads/100 ha	70.9	70.5	99.4

Source: www.insse.ro

Goat population has increased due to the support as complementary national direct payments (CNDP) and increasing interest for goat cheese dairy market.

Vegetal and animal production

Vegetable production in our country is heavily dependent on climatic conditions. This situation affects the comparison of 2010 to 2007 as cultivated land and production in 2007 were affected by drought. In this context, the natural conclusion of the analysis, namely the increased yield per hectare and total production for most crops (except potatoes and grapes) is inconclusive.

Evolution of animal production on the other hand reveals a decrease in yield per animal, including goat herds where growth was above 43%.

Table 6. Vegetal and animal production – 2007 and 2010

	MU	2007	2010	% 2010/ 2007
Vegetal production				
Cereal for grains	thou tonnes	**7814.8**	**16712.9**	213.9
- Wheat	thou tonnes	3044.5	5811.8	190.9
- Barley and two-row barley	thou tonnes	531.4	1311	246.7
- Maize grains	thou tonnes	3853.9	9042	234.6
Dried pulses	thou tonnes	**36.2**	**61.3**	169.3
Root crops	thou tonnes	4461.2	4121.8	92.4
- Potatoes	thou tonnes	3712.4	3283.9	88.5
- Sugar beet	thou tonnes	748.8	837.9	111.9
Industrial crops	thou tonnes	1056.6	2402.1	227.3
- Oilseed crops	thou tonnes	1046.6	2377.7	227.2
Sunflower	thou tonnes	546.9	1262.9	230.9
Rape	thou tonnes	361.5	943	260.9
Soya beans	thou tonnes	136.1	149.9	110.1
- Other industrial crops	thou tonnes	10	24.4	244.0
Tobacco	thou tonnes	1.1	3	272.7
Medicinal and aromatic plants	thou tonnes	2.9	15.8	544.8
Vegetables	thou tonnes	**3116.8**	**3863.6**	124.0
Green fodder	thou tonnes	**9552.7**	**13016**	136.3
Grapes	thou tonnes	**873.2**	**740.1**	84.8
Fruit	thou tonnes	**1085.8**	**1419.6**	**130.7**
- Plums	thou tonnes	372.6	624.9	167.7
- Apples	thou tonnes	475.4	552.9	116.3
Animal production				
Beef - live weight	thou tonnes	333	205	61.6
Pork- live weight	thou tonnes	642	553	86.1
Mutton and goat - live weight		110	100	90.9
Poultry - live weight	thou tonnes	416	446	107.2
Cow and buffalo milk	thou hl	54875	42824	78.0
Sheep and goat milk	thou hl	6173	6170	100.0
Hen eggs	mill pcs	6226	5951	95.6
Extracted honey	tonnes	16767	22222	132.5
Fish	tonnes	15106	15184	100.5

Source: Tempo-online, https://statistici.insse.ro

Workforce in agriculture

In the case of agriculture, employment continued to decline during 2007-2010, just as the civil population employed in agriculture (all persons who held an income generating social or economic activity in agriculture). On the merits of this decline, but also of production value growth there was seen an increase in labor productivity in the sector. Increased productivity is much lower if the value of production related to the population employed in agriculture according to agricultural censuses. It increased by over 10%, exceeding the year 2010 figure of 7.4 million people.

Table 7. Labour productivity in agriculture, forestry and fishing

Indicators	MU	2007	2010*	% 2010/ 2007
Production Value	Mill lei	47700	53348.9	111.8
Civil employment	thou	2465	2440	98.9
Employees	thou	125	95	76.0
Persons occupied in agriculture**	thou	6468	7159	110,7
Labor productivity				
Civil employment	Lei/person	19343	21864	113.0
Employees	Lei/person	381600	561567	147.2
Persons occupied in agriculture**	Lei/person	7375	7452	101,0

Source: Romanian Statistical Yearbook, National Institute of Statistics
*constant prices of 2007
** Agricultural census

CONCLUSIONS

Romania's agriculture after joining the European Union has evolved generally positive compared to 2007, actually due to improvement of climatic conditions in 2010 and less to the influence of political and economic environment of the analyzed period. Thus, in 2010 compared to 2007, leading indicators have evolved as follows: increasing labor productivity by 21.4%, the loss of agricultural holdings by 1.9% decrease area cultivated with cereals, vineyards and orchards and an increase in THE CULTIVATING area of industrial plants (especially herbs and aromatic plants) and vegetables; increase of crop production (excluding potatoes and grapes); decrease of livestock and obtained animal agricultural production (except for goats and bee families).

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TRENDS IN AGRICULTURAL DEVELOPMENT IN BUZAU COUNTY

Draghici MANEA[1], Valentina TUDOR[1], Raluca NECULA[1]

[1]University of Agricultural Sciences and Veterinary Medicine, Bucharest, Marasti Blvd, no. 59, sector 1, 011464, Romania Tel: +40 21 318 25 64/232, 0745100937,
E-mail: dmprofesor@hotmail.com

Corresponding author: dmprofesor@hotmail.com

Abstract

The most general formulation of a problem approximations requires, based on a function f (t) defined on a particular area, to determine another function F (t), with a more simple form, to approximate as better the function f (t) over the whole definition. Interpolation can be made by approximation using the method of the smallest squares. The method of approximation by interpolation causes approximate function F (t) imposing the condition to coincide with the approximate function f (t) in all nodes of interpolation. Thus, the curve associated function F (t) is forced to follow a path interpolation required by the nodes position. This criterion is however less efficient for a large number of interpolation nodes, because determining the coefficients of the polynomial approximation requires a large amount of calculation and there is risk of oscillations between nodes. Thus, a method is required, quadratic regression, to determine the "best" function to minimize the mean square deviations between f (t) and F (t) at all points in the original function value is known. Approximation of least squares criterion determines a function F (t) which passes through points of definition, but among them, so that the sum of squares of deviations between the functions F (t) and f (t) in these points is minimized. To formalize this criterion, consider the function in a table with n measurements (y1, y2, y3, yn) affected by the errors inherent aimed at inducing an approximation function F (t), defined such that the sum of quadratic deviations in the points definition is minimized: $\sum(yi\text{-}Yi)^2 = Minimum$.

Keywords: quadratic regression, square standard deviation, agricultural production, agricultural services

INTRODUCTION

Production scheduling is an essential element in the strategy of agricultural areas. The purpose of this paper is to highlight a relatively simple method of programming and production to highlight the oscillations is relatively high for a longer period of time, nine years, in Buzau County.

MATERIAL AND METHOD

Programming methods are multiple. In this analysis we used the quadratic regression equation and extrapolating the calculated equation for the next period [3]. In interpreting the trend was calculated innervated reliable probabilities between 60% -80% (value tp = 0.889; GL = 8) and between 80% and 90% (value tp = 1.397; GL = 8) (1)
For the square standard deviation =

$$\partial x = \sqrt{\frac{\sum(\bar{x} - xi)^2}{(n-1)}} \text{ , where:}$$

∂x = Square standard deviation, the confidence limits for certain levels of risk $= \bar{x} \pm \partial\bar{x} * tp$,

where tp = tabular values based on probability and number of observations (in this case the number of years)
For the confidence limits for a given risk:
X+/-δx*tp, where:
X= the arithmetic average; ∂x = the square standard deviation;
tp = the value table for the transgression probability (risk)
The amplitude of oscillation of the confidence limits = ((X+δx*tp - X-δx*tp)/(X))*100

RESULTS AND DISCUSSIONS

The total area of Buzau county is 610,255 ha, and comprises mostly agricultural land (65.8% - 65.9%.) [2] . The structure of the agricultural categories of use the arable land is predominantly (the percentage towards the total agriculture 42.3% -42.4%), followed by the pastures and hayfields (the proportion

being 14.6% and respectively 4.7%). Favorable conditions existing in this county have created the possibility of livestock development, noted by cattle, pigs, sheep and poultry.

The trends of agricultural production is done for Buzau County is related by the evolving knowledge about the total agricultural production (f), continued with the forms of the same vegetal key sectors development (f_v), animal (f_a), services (f_s). (Tables 1 to 6). Based on the actual level achieved of these productions in the dynamic period 2001-2009, by extrapolating the quadratic regression equations it was determine the prognoses level of each year from the dynamic(F_t, F_v, F_a, F_s).

Quadratic regression equations are presented in the following form (t = years):

F.total. prod. → agric. F_t (x) $=490421,48+246146,45t-15257,49t^2$;

F.prod. veg→ f_v (x) $=308173,81+155028,33t-9906,24t^2$;

F.prod. → anim. f_a (x)$=170872,59+92264,29t-5437,33t^2$;

F.prod. serv. → f_s (x)$=11375,183-1146,21t+86,08409t^2$.

Based on the actual level achieved in the dynamic period 2001-2009, by extrapolating the quadratic regression equations it was determined the predicted level of the each year from the dynamic revealing the following:

- An oscillation level of the vegetal crops, livestock and services, are therefore falling over the total output [1].

- Considering the adjusted values by the quadratic regression equations, it concluded that there is still a stagnation slight increase, but also oscillating of the level of agricultural total production, vegetable, animal and agricultural services;

Table 1. The development trend of the vegetal agricultural production

| Year | Vegetal | |
	fv(x) (thousand lei)	Fv(x) (thousand lei)
2001	478097.6	453295.9
2002	332214	578605.51
2003	848412.8	684102.63
2004	1111460.7	769787.26
2005	725575	835659.41
2006	722525	881719.07
2007	644442	907966.25
2008	1191468	914400.94
2009	872365	901023.14
2010		867832.86

Source: Processed by: INS, Statistical Yearbook of Buzau County

Calculated by extrapolating the quadratic regression equations
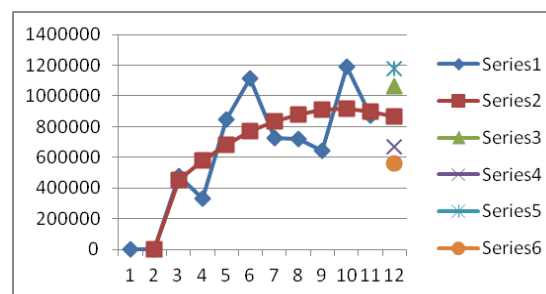
Fig. 1. - The trends of the agricultural production plant in Buzau County on the period 2001-2009.

Table 2. The trend of the agricultural animal production development,

| Year | Animal | |
	fa (x) (thousand lei)	Fa (x) (thousand lei)
2001	244937.5	257699.55
2002	344239.5	333651.84
2003	389626	398729.46
2004	482580.3	452932.42
2005	486552	496260.7
2006	555598	528714.32
2007	502964	550293.28
2008	548204	560997.56
2009	585405	560827.17
2010		549782.12

Calculated by extrapolating the quadratic regression equations
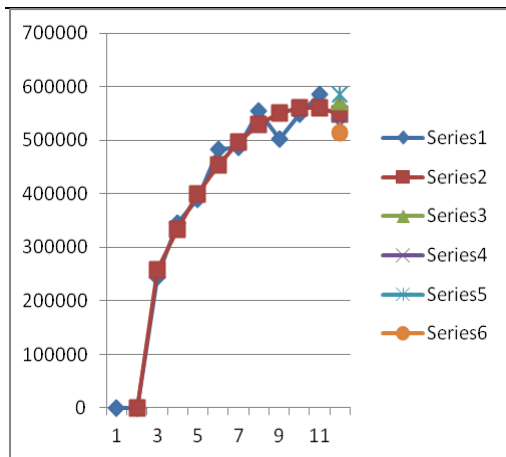
Fig. 2 - Trends of agricultural animal production development in the period 2001-2009 in Buzau County.

Table 3. The trend of agricultural production services development,

	Services	
Year	fs(x) (thousand lei)	Fs(x) (thousand lei)
2001	11847.1	10315
2002	7820.8	9427
2003	7144.7	8711
2004	8953.3	8168
2005	7735	7796
2006	10052	7597
2007	7049	7570
2008	6095	7715
2009	8634	8032
2010		8521

Calculated by extrapolating the quadratic regression equations
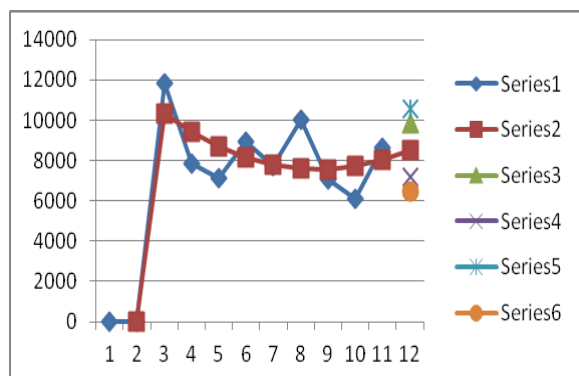
Fig. . 3.Trends of agricultural production services development in Buzau County in the period 2001-2009.

Table 4. The trend of total agricultural production development,

	Total	
Year	ft(x) (Thousand lei)	Ft (x) (thousand lei)
2001	734882.1	721310
2002	684274.3	921684
2003	1245183.5	1091543
2004	1602994.3	1230887
2005	1219862	1339716
2006	1288175	1418030
2007	1154455	1465829
2008	1745767	1483113
2009	1466404	1469882
2010		1426136

Calculated by extrapolating the quadratic regression equations
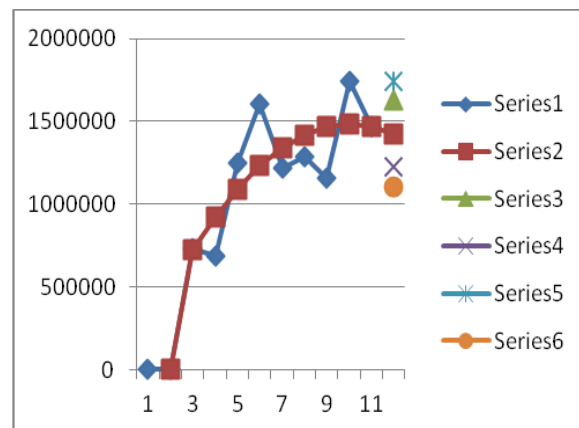
Fig. . 4 - Trends of total agricultural production development in Buzau County on the period 2001-2009.

Table 5. Total and relative deviations in the probability between 60% and 80%

		p=60% -80% (risk=40%- 20%)	
Production	ðx	X+/-ðx*tp,	%
Vegetal	227979.4	(+/-) 202674	(+/-) 14,21%
Animal	220668.3	(+/-) 196174	(+/-) 22,61%
Services	25153. 1	(+/-) 22362	(+/-) 4,07%
Total	1470.0	(+/-) 1307	(+/-) 15,34%

Table 6. Total and relative deviations in the probability of 80% and 90%

		p=80% -90% (risk=20%- 10%)	
Production	ðx	X+/-ðx*tp,	%
Vegetal	227979.4	(+/-) 318487	(+/-) 22,33%
Animal	220668.3	(+/-) 308274	(+/-) 35,52%
Services	25153.6	(+/-) 308274	(+/-) 6,39%
Total	1470.0	(+/-) 2054	(+/-) 24,10%

CONCLUSIONS

The structure of the agricultural production value reflects an annual increase. The prevalence is increased for the vegetal production; its share of the total is between 55.8% and 68.2% annual rate rhythm is oscillating. The animal production by the percentage level from the total of 31.3% and 39.9% plays the same aspect of the annual variations. The agricultural services recorded the lowest rate, 0.4% and 1.6%.

Thus, the relative deviation for all productions are considered lower for the probability interval of 60% -80% (risk 40% -20%) than between the probability interval of 80% -90% (risk 20% - 10%) as follows:

-Vegetal production (+ / -) 14.21% compared with (+ / -) 22.33%

-Animal production (+ / -) 22.61% compared with (+ / -) 35.52%

-Services (+ / -) 4.07% compared with (+ / -) 6.39%,

-Total production (+ / -) 15.34% compared with (+ / -) 24.10%

The trend analysis according to the adjusted values by the quadratic regression equations, it concluded that there is still a stagnation→ slight increase, but oscillating total production of the level of the agricultural, vegetable, animal and agricultural services total production.

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EFFECT OF PHENOMENON XENIA ON TRAIT SEED OF MAIZE SUB-SPECIES CROSSES

Mohammed Dhary Yousif EL-JUBOURI

University of Agricultural Sciences and Veterinary Medicine, Bucharest, 59 Marasti, sector 1, 011464, Bucharest, Romania, University of Baghdad, College of Agriculture, Irak, Phone:0735979905, E-mail: mdhj1965@yahoo.com

Abstract

To investigate the effect of phenomenon xenia in maize seeds, five genotypes were intercrossed. One genotype of each of (Zea mays L.) sub-species (Everta, Indurata, saccharata, Indentata and the white endosperm Denprofeski were crossbred. F1 and F2 seeds were investigated .The results showed that hybrid vigor or dominance were controlling seed trait. The gene (Y) of yellow kernel was dominant over white (y) with possibility of modifying gene sharing action on this trait. Reciprocal gave 1:3 ratios. That was a clear cut of dominance and not xenia. However, other traits of seed were controlled by female nuclei indicating the effect of two nuclei of female genes on one nucleus of male pollen. Seed weight showed hybrid vigour in F1 kernels (64%), and that seed weight could be increased in F1 seed and again in F2 seeds (on F1 plant) via hybrid vigour. Shape of dent was also controlled by female nuclei, and dent shape was dominant over flint when dent was female, and vice versa. Saccharata seeds gave dented shape when used as female while it gave flint shape or mid – parent when used as male. Seed shape was controlled by female nuclei, and saccharata seeds had triangular shape recessive to round shape. However, xenia per se was not exist, but it was dominance or hybrid vigour controlling on seed traits in maize.

Keywords : *Phenomenon Xenia, Zea mays L., Maize*

INTRODUCTION

Conducted many researches on the phenomenon of genetic called (Xenia) was the first reference to it by [10] appeared the first published research on this phenomenon has accomplished all of [6] was defined for this phenomenon as: impact direct of pollen grain on the colour of maize grain, which has remained to this day prevails in most of the references. Newly defined [2] as of this phenomenon: the impact of pollen in grain or fruit, and this definition is close to the first definition of this phenomenon and does not add anything new to him genetically. The results which were presented by many researchers support the existence of the phenomenon of Xenia in the trait of a grain trait, while the results confirm the impact of the mother at the same trait. Which makes it confusing to the reader, the basis for that remained this phenomenon of inaccurate expression and is it actually exist or is it an act of Heterosis in the grain the first generation, and given the importance of the phenomenon of xenia, the dimensions of genetic and the

functional governed by the still inaccurate and need to deepen. Held [4] search on this subject and confirmed that the hybrid vigor or the overcome are the ones who govern the traits of grain maize hybrids and he excluded the colour White in his search because it not unavailability in this time. The purpose of conducting this research to know whether the phenomenon of xenia is affecting the traits of a grain of maize or is it hybrid vigor or overcome, and whether the father, which contributes to -2 nucleus of the pollen or the mother that contribute to three nucleus (2 nucleus polarity + nucleus of the egg) are affecting the traits of more grain and how and why?! By conducting reciprocal crosses of sub-species of structures from maize.

MATERIAL AND METHOD

Prepared a piece of land in the field of Agronomy Department at the Faculty of Agriculture / University of Baghdad for the purpose of cultivation in successive seasons, spring and autumn 2005. Were plowed and divided the ground according to the experimental units and the way genetic material used is described later.

Spring season;

We do the initialize and planted the seeds of five genotypes are:

1.(Zm2) represents the (Zea mays L. Indentata).

2.(Zm19) represents the (Zea mays L. Indurata).

3.(P 8) represents the (Zea mays L. Everta).

4.Hybrid U.S. (Royal Flag) represents the (Zea mays L. saccharata). Because we don't have sugar strain in this time.

5.Type (Denbrvski) represents the white grain.

Service operations conducted for the plants until they reach the stage of hybridization and conducted reciprocal crosses were obtained for 20 hybrids.

Notice:

We obtained only 18 hybridization of out of 20 because of the failure of two of the crosses. We have to encode genotypes that have been used (Zm2, Zm19, P8, Royal Flag, Denprofki) by the symbols (2, 19, P, S, Dp), respectively.

Autumn season;

Planted the seeds of hybrids (20 hybrids) were planted as parents (5 parents) for comparison at the first and to get the grain F2 at the second.

Were harvested at maturity ear and dried with air to reach humidity standard. Recorded by the data for the study (grain shape, grain colour , the average weight of grain, the rate of embryo weight proportion to the endosperm and weight grain) and that was for both seasons, spring and autumn.

RESULTS AND DISCUSSIONS

Grain shape:

Appeared that the grain shape governed by the mother in seeds of (F1) , as in hybrids (Dp x P) , (Dp x 19) and (2 x 19) (Table 1) either when we reflects the hybridization the grain shape it gave average between the parents. Table (1) some grains traits of parents and hybrids of Two generation (F1& F2) for sub-species maize.

There is an exceptional case of the dynasty saccharata (S) as the grain shape curly and hybrids were triangular if it has been crossbred with dynasty with a grain of triangular or square, as in the hybrid (S x 19) and (S x Dp)

Table (1) some grains traits of parents and hybrids of 2 generation (F1& F2) for sub-species maize

Parents		Shape of Grain		Shape of Dent	
Denprofski (Dp)		Square (SQ)		Dent (D)	
Saccharata (S)		Shrunken (Sh)		Shrunken (Sh)	
Everta (P)		Tipped Round (TR)		Flint (F)	
Indentata (19)		Triangular (T)		Dent (D)	
Indurata (2)		Round (R)		Flint (F)	
♀x♂	F1	F2		F1	F2
Dp x S	T	SQ(70):Sh (22): T(8)		MP	All(D)
S x Dp	T	SQ(52):Sh (31):T(17)		D	Sh(31):D (69)
Dp x P	SQ	TR(49):SQ (51)		D	F(83):D(17)
P x Dp	MP	TR(14):MP: (86)		F	All(F)
Dpx19	SQ	All (T)		D	All(D)
19xDp	MP	All (MP)		D	All(D)
P x S	MP	Sh(16):T:(84)		F	MP(57): F(35): Sh (8)
S x P	TR	Sh(12):T: (88)		D	Sh(12): D (65) :F (23)
P x 2	MP	TR (48) : R (52)		F	All(F)
2 x P	R	TR(47):R(53)		F	All(F)
P x 19	MP	Sterile		F	Sterile
19 x P	T	All (MP)		D	All(D)
2 x 19	R	T(80):R (20)		MP	MP(38): D(42):F(20)
19x 2	MP	All (T)		D	MP(82): D (18)
S x19	T	Sh(18):T(82)		D	Sh (22 : D (78)
19 x S	T	Sh(30):T(70)		MP	Sh(30):D (70)
S x 2	R	Sh(22):R(8) : T (70)		D	Sh (22 : D (70) : F(8)
2 x S	R	Sh(27):R (10): T(63)		F	Sh (26 : F (11) : D(63)

It seems that the grain shape of saccharata is a triangle (T) originally but it seems curled because of fullness with sugar instead of starch [4] while it appear a spherical (R) if hybridization with parents spherical grain as in the hybrid (S x 2) or spherical tapered (TR) if hybridization a fathers grains spherical tapered as in the hybridization (S x P). This may be due to overcome father genes (spherically) to the mother genes (triangular), that maize saccharata (S) in which have two pairs of genes curling (sh2) and sugar (su1) and both recessive affecting work are complementary and do not appear unless you were in the pure state [11]. The nature of the endosperm traits affected by a large number of genetic sites and thus the endosperm clearly has a role these qualities and there are at least 350 locations (Loci) affected by genetically different the nature of the endosperm [11]. From the above, the genes of endosperm in father or mother that govern the shape grain in the first generation and not xenia as mentioned in the results of [1, 5, 7, 9, and 12]. In the second generation (F2), we find that isolation clearly show origin grain shape of dynasty saccharata(S) is (triangle shape) (T) as in the crosses (Dp x S), (P x S), (19 Xs), (2 x S) and the inverse of their and this confirms that the shape of grain in dynasty saccharata(S) is triangle but they already wrinkled due to grain filling with sugar instead of starch [4]. The grains in isolation (F2) of the dynasty saccharata , all given grains curled from the normal rate of isolation of grains because of the accumulation of starch and sugar transformation to starch because of the activity of enzymes and the efficiency of the downstream [3]. Moreover, the dynasty crosses dynasty saccharata (S) with the rest of the dynasties of grain spherical, triangular and square and gave the in the isolation of second generation grains triangular shape (T) which indicates that the origin dynasty saccharata (S) is a triangle shape (T)at all. Dent shape:
 Overcame the mother to the father in this trait, as is clear from (Table 1) that the genotype of grain Dent (D) overcome to the Flint shape (F) in case of use it a mother and vice versa, due to the double dose of genes from the mother endosperm who participates in which 2 nucleolus against the nucleolus and one from the father, And differs the situation in dynasty sugar (S) as it gives the grain shape (D),If use it as mother, regardless of the father, whether (D) or (F) as it gave the crosses (S x 2), (S x 19), (S x P) grains Dent (D). But if were used dynasty saccharata (S) as a father. They give a grains flint (F) or an intermediate state between the parents (MP). For example hybrid (S x 19) gave us grains dent (D) but when we already opposite hybrid (19 x S) it gave us the average parent (MP). This is true for the rest of the crosses shown in (Table 1). And confirms once again that the effect of Heterosis or to overcome is the ones who govern the traits of grain maize in hybrids so-called error (Xenia). In the second generation, we find that the form of Dent in the grains under the influence of the mother as well, as we find that the hybrid (Dp x P) and already opposite (P x Dp) gave grains Flint shape (F) in both cases, which confirms the mother overcome in the transfer of this trait. The isolation of grain to dynasty saccharata (S) we find that the hybrid (S x 2) has given the grains in (D) either already opposite (2 x S) has given the grains in the average parent (MP), to confirm that the dynasty saccharata (S) if used a mother it gives us the grains dent shape (D), but if the father gives us grains average parent (MP). The foregoing confirms that the influence and overcome or the hybrid vigor are the ones who govern this trait.

The colour of grain:
 The use of product Denprofski (Dp) White grain in this research had explained the impact the colour of grain by the host gene (Y) when we use(Dp) as a mother with the other genotypes it gave us light yellow grains (Yyy) because of the influence of doses the host gene (Y) father of yellow grain (Table 2). This indicates that the white recessive and yellow is the Overcome it. According to this, the dynasty saccharata (S) gives the grains.
Mother or a father with the rest of the dynasties for two reasons, first the cover of endosperm grain saccharata curled scalable to fullness starch from father, which reduces the

degree of yellow colour, and the second is that the dynasty saccharata if contained one allele of the gene (Y), the grain became yellow, but because of the curly look dark yellowish because of its higher concentration of sugar instead of starch, and he also said that the colour of Aileron Layer and the cover of grain is governed by at least 20 different genes loci responsible for Anthucyanin pigment [11].

Table (2). Colour of grain of Parents and hybrid of two generation (F1&F2) with Percentage of colours isolation on grain (F2)

Parents		Grain s colour
Dp		Weight (W)
S		Dark yellow (D Y)
P		Light Yellow (L Y)
2		Dark yellow (D Y)
19		Light Yellow (L Y)
♀x ♂	Grain of generation (F1)	Grain of generation (F2) with Percentage of colours isolation
Dp x S	LY	LY(55):W(28):Y (17)
S x Dp	LY	LY(30):Y(17):W(53)
Dpx P	LY	LY (75) : W (25)
Px Dp	LY	LY (45) : W (55)
Dpx1 9	LY	LY (77) : W (23)
19x Dp	LY	LY (63) : W (37)
P x S	LY	LY (87) : Y (13)
S x P	LY	LY (81) : Y (19)
P x 2	DY	LY(23): DY (77)
2 x P	DY	LY (67): DY (33)
P x 19	LY	LY (48): DY (52)
19 x P	LY	All (LY)
2 x 19	DY	All (DY)
19 x 2	MP	All (DY)
S x 19	LY	LY (81): Y(19)
19x S	LY	LY (65) : Y(35)
S x 2	LY	LY (70) : Y (30)
2 x S		LY (70) : Y (30)

In the second generation (F2), the isolation of light yellow colour in the hybrid (2 x P) and many other hybrids, the most common, while the dominant colour in the hybrid (P x 2) is dark yellow, and by 3:1 and this indicates the role of the nucleus the Father in the transfer of the colour of grain and the impact overcome. In the hybrid (2 x P) gave almost the opposite ratio 1:3 as well as in the rest of the crosses. The grains hybrid (19 x P) under the influence of the rule of light yellow colour because of the parents carry the genes originally light

yellow colour. The hybrid (19 x 2) and already opposite (2 x 19) was there the rule of yellow dark with different parents, and this confirms the fact that the impact to overcome in this capacity, as was mentioned [8]and for the granting the nucleus of the father and the mother of alleles (y) or (Y) during fertilization.

Weight grain:
Was the case in this trait explained in terms of the act to overcome and the hybrid vigor (Table 3), we find for example in the grains the first generation (F1) was the weight of a grain of hybrid (2 x19) 228 mg which is similar to the weight of a grain of Mother 232 mg in what was already opposite (19 x 2) 196 mg which is similar to the weight of lower parental 200 mg, as well as in crosses (Dp x P), (19 x P), (S x 19), (S x 2) are all given the hybrid vigor and clear in the weight of grain in each of the first generation (F1) The second generation (F2).

This result is of great importance in the production of hybrids by adopting the dynasty with the weight of heavier use of the grain in order to give the hybrid vigor in this trait, in the first generation or second or both. the rate of embryo weight proportion to the endosperm:
Is clear from the results of this research as having four cases of embryo weight in these crosses: either similar or lower to the top of the parents or the presence of a hybrid vigor is positive or negative hybrid vigor (Table 3). In hybrid (DP x S) to show hybrid vigor positive 34%, while in the already opposite (S x Dp) amounted to 7% and this indicates that the hybrid vigor show off the grains first generation which carried on the mother dynasty, this result of great importance in the activity of seedling resulting, and similar to the trait appeared in the rate of grain weight. In the second generation (F2), the weight of the embryo and the endosperm increases more than it is in the grains the first generation (F1) because the grains (F1) being carried on the mother plant (weak dynasty), while the grains (F2) carried on the hybrid plant.

Table (3) some grain traits for parents and hybrids generation (F1&F2) and the Percentage Embryo and endosperm and the hybrid vigor to the highest proportion of parents.

Parents	Rate of Grain weight(mg)	% of embryo/ endosperm	Hybrid Vigor %		
Dp	294	16	% Hybrid vigor		
S	114	17			
P	162	16			
2	232	21			
19	200	16			
Hybrids	F1	F1	F2	Embryo	endosperm	F2
Dp x S	288	24	22	34	- 7	341
S x Dp	160	38	29	7	-54	260
Dp x P	320	24	22	51	HP	385
P x Dp	171	21	18	MP	LP	251
Dpx19	298	21	20	27	HP	325
19xDp	255	22	21	12	-17	280
P x S	165	23	21	41	HP	318
S x P	185	19	19	36	11	253
P x 2	140	24	19	MP	-41	240
2 x P	151	18	16	LP	-33	292
P x 19	160	20	St.	MP	-22	St.
19x P	328	18	17	78	61	357
2x 19	228	26	21	20	Mp	307
19x 2	196	19	18	MP	-14	232
S x 19	280	21	19	75	34	312
19x S	235	28	22	82	7	344
S x 2	285	11	17	MP	33	298
2 x S	118	17	16	LP	-47	287

CONCLUSIONS

Based on the results of this research, the phenomenon of Xenia were not responsible never about the traits of grain in the maize used in this research. But the hybrid vigor or overcome is the governing the traits, especially grain colour trait.

1 – Grain colour is subjected to a single pair of genes with three alleles and whenever allele (Y) repeat this allele, increases up the yellow colour and the grade of colour . Do not rule out the presence of (modifying gene) is working along with the gene (Y) in some genotypes.

2 - The grain shape was governed by the impact of a pair of genes at least, according to the nature of the genotype, for example where the maize saccharata gene curly (sh2) and gene Sugar (su1).

3 - Weight grain can show increased twice the highest value for the parents, once overcome the influence or the hybrid vigor in (F1) which carried on the mother plant and the other by the impact overcome in the hybrid (F2) hybrid which carried on the hybrid plant.

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IMPORTANCE OF MAIZE CROPPING

Mohammed Dhary Yousif EL-JUBOURI

University of Agricultural Sciences and Veterinary Medicine, Bucharest, 59 Marasti, sector 1, 011464, Bucharest, Romania, University of Baghdad, College of Agriculture, Irak, Phone: 0735979905, E-mail: mdhj1965@yahoo.com

Corresponding author : mdhj1965@yahoo.com

Abstract

The Corn, wheat and rice together are the main crops. It is a plant that responds well to chemical and organic fertilization and the irrigation. But compliance is sensitive to optimum sowing time and integrated control of weeds, pests and diseases (2). The maize is the most important plant product, from the point of view commercially and is used primarily as fodder. The maize is an important source of vegetable oil and has many applications in industry, the manufacture of diverse items: cosmetics, explosives.

Keywords **:** *corn, maize ,production , important*

INTRODUCTION

The maize is one of the most valuable cultivated plants, both because of high productivity and various uses of its products in human nutrition in animal husbandry and food industry. The animal nutrition grain maize is the main component of feed grain group, which is 82% in recent years. The difference is covered by barley 13%, 1% oats, wheat feed and others 4%[7].

By-products remaining after harvesting the grain used in feed or manufacture of cellulose. The maize achieved high yields, is resistant to drought and heat, is attacked by a relatively small number of diseases and pests[3].

Can be grown in very different climatic conditions are suitable for monoculture for a period of several years. It is a good run for a large number of crops, makes a better use of organic and mineral fertilizers; , Responds well to irrigation can be planting as a second crop, forage and grain even after which liberates early land plants, has a high breeding ratio, requiring a part-time from sowing seed, in that it produces large amounts of pollen, the maize is also required as an important medicinal herb and honey, has a high breeding ratio (150-400), culture is 100% mechanized, well recovered organic and mineral fertilizers and irrigation water [2] . It is considered that the ancient peoples of America cultivated maize 7000 years ago. In Europe, corn was brought to the first expedition of Christopher Columbus (1493), was first grown in Spain, then to Italy.

Table 1. Top 10 ranking countries according to maize production quantity and value during 2000-2009.

Nr rang	2000		Nr rank	2009	
	Value	production		Value	production
	mil USD	mil tone		mii USD	1000 t
1 USA	14587	251852	1	28384	332549
	100	100		194.6	132
4 China	1488	106178	2	8287	164108
	100	100		556.8	154.6
9 Brazil	621	31879	3	2382	50720
	100	100		383.7	159.1
8 Indonesia	931	9677	4	1696	17630
	100	100		182	182.2
7 India	1065	12043	5	1670	16680
	100	100		156.8	138.5
2 Argentina	2010	16781	6	1492	13121
	100	100		74.2	78.2
6 South Africa	1120	11431	7	1171	12050
	100	100		104.5	105.4
5 France	1474	16018	8	1068	15288
	100	100		72.5	95.4
3 Mexico	1666	17557	9	986	20143
	100	100		59.2	114.7
10 Nigeria	396	4107	10	820	7339
	100	100		207.2	178.7

FAOStat,http://faostat.fao.org/site/339/default.aspx[6]

The maize is grown up to 58 ° north latitude in Canada and Russia and up to 42-43 ° latitude in New Zealand.

The maize up to 3900 m altitude in the PoValley, northern Spain, northern Portugal-vast, south-eastern France and Austria[1].

MATERIAL AND METHOD

Through comparative analysis, qualitative and quantitative we have watched description of indicators (variations) on the importance of the culturing of maize. In this paper i have been using content which give the qualitative and quantitative indicators in nutrients in corn which it uses in different economic sectors and manufacturing, importation and exportation of corn[1;7]. The benchmarking and indicators of produced quantity which were used expressed to take (tonnes) as a value per dollar (tonne /dollar USD). The statistic analysis was carried out in 2000-2009 by the dynamics of the indicators give the value in physical units, and considered percentage of the year 2000[6]. Methods and tools for information search, sorting information and evaluation of information were found on the Internet was made based on total corn production, imported and the exported of them[5]. The hierarchy of importing and exporting areas maize was made in function of the amount of produce ,imported or exported the corn in value thousand USD.

Comparing the first 10 countries producing, importing and exporting maize,in 2000 in function, and the progresses in 2009, for the three indicators look at the total production, imported and the exported of production .

RESULTS AND DISCUSSIONS

The importance of maize, in terms of agriculture, is motivated by several features, such as: have a large production capacity, with about 50% higher compared to other cereals, has a high ecological plasticity, which allows a wide range spread, giving high yields and relatively constant, less influenced by deviations climate supports monoculture years [4] .

The importance of maize is due to the following features and agro aerobiological: resistance to drought and drop in some diseases and pests, mechanization and agro total harvest work, a better use of organ mineral fertilizers and irrigation water, etc.

Table2. Ranking the top 10 countries exporting maize in 2009

Nr rang	country	amounts tons	value thousands $	Price $/ton
1	USA	47813400	9086410	190
2	France	6733150	1847590	274
3	Argentina	8535940	1612530	189
4	Brazil	7781900	1302150	167
5	Ukraine	7178630	1012750	141
6	Hungary	4176160	849909	204
7	India	2600820	527884	203
8	South Africa	1659660	453462	273
9	EU(27)	1207070	350843	291
10	Romania	1686410	347678	206

FAO-Stat, http://faostat.fao.org/site/339/default.aspx[6]

The animal feeding grain maize is the main component of feed grain group, which is 82% in recent years.

The difference is covered by barley 13%, 1% oats, wheat feed and others 4%. The animal feeding the maize is used in various forms, concentrated berries, green feed or silage, hay, straw.

Because the protein composition of maize lacks some essential amino acids (tryptophan, lysine), hybrids have recently created a gene that causes synthesis of these amino acids (Opaque 2), and their use in food animals leads to spectacular results.

Using maize silage, considered winter pasture, the animals are the most efficient feeding of calves between having a high degree of expendability.

Data from Table 1, shows the top 10 corn-producing countries worldwide in 2009 compared to 2000.

Thus in 2009, the first three positions were occupied

U.S., China and Brazil, and 8.9 and 10 places France, Mexico, and also Nigeria. We find the United States maintain its leadership that China is now the second in 2009 after he was in fourth place in 2000, while Brazil moved into third place in 2009 after he was in ninth place in 2000.

Table3. Ranking the top 10 countries importing corn in 2009.

Nr rank	country	counters tons	Value thousands $	Price USD/ tons
1	Japan	16192600	3709510	229
2	South Coreea	7334320	1637990	223
3	Mexico	7260620	1436750	198
4	China	4676032	975989	209
5	Spain	4049130	930467	230
6	EU(27)ex.int	2829792	874600	309
7	Egypt	1935440	833724	431
8	Olanda	3146330	770131	245
9	Columbia	3245040	671171	207
10	Iran	3735010	652278	175

FAO-Stat, http://faostat.fao.org/site/339/default.aspx[6]

Referring to the value of output and find that the first three countries recorded large increases. Thus the United States, production increased from 251,852,000 tons to 332,549,000 tons (132.0%) and production value of USD 23,384 14587 million dollars (194.6%).

Referring to the top 10 exporting countries according to the value of exported corn, is found first is United States with a value of 9.08641 billion USD, followed by France and Brazil 1,847,590,000 USD 1,302,150,000 USD. Export price limits ranged from $ 141-167 / t (in Ukraine and Brazil) and $ 274-291 / t (in France and the EU-27). It is also noted that the volume of corn exported from the United States is greater than total production of the nine countries on places 2-10.

Romania ranks first in Europe and 10th worldwide in terms of area planted to corn (2338.6 thousand ha in 2009). In terms of yield per unit area, number 12 in a ranking of 16 large countries growing corn.

Referring to the top 10 importing corn, depending on the value of imports, in 2009, it shows that the first three places were located USD 3,709,510,000 Japan, South Korea and Mexico U.S. $ 1,637,990,000 1436750 thousand USD, and the place was occupied Netherlands 8.10 to U.S. $ 770.131 million, Columbia and Iran USD 671.171 million to 652.278 million dollars.

The production of corn imported the highest prices they paid Egypt ($ 431 / t), EU-27 ($ 309 / t) and Netherlands ($ 245 / t), lowest prices for imports were made by Iran ($ 175 / t), Mexico ($ 198 / t) and Colombia ($ 207 / t).

CONCLUSIONS

-Corn (Zea mays L) is one of the most valuable cultivated plants because high productivity and multiple uses of its products in human nutrition, in animal husbandry and industry.

-They are used in large measure in human food in various forms (cornmeal cake, and baked corn, popcorn, chips, etc.) as well as raw material for important industries (starch, sugar, alcohol and oil), from remaining residues (bran, cakes) used in animal feed.

-The most important countries in growing corn in 2009 are U.S.A, China and Brazil. Countries importing the largest quantities of corn are Japan, South Korea, Mexico and China.

-The production of maize imported the highest prices they paid Egypt ($ 431 / t), EU-27 ($ 309 / t) and Netherlands ($ 245 / t), lowest prices for imports were made by Iran ($ 175 / t), Mexico ($ 198 / t) and Colombia ($ 207 / t).

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UTILIZATINON OF SELF-PROPELLED HARVESTER AND SHREDDER MACHINES FOR REMOVING SOME FIELD CROP RESIDUES

M. M.ELTARHUNY[1], Tarek FOUDA[2]

[1]Training High Institute, Farm Mechanisation Department, Libya, Phone number:00218913724584, E-mail: mm.tarhuni @ yahoo.com
[2] Tanta University, Faculty of Agriculture, Farm Mechanization Department, Egypt, Phone:+20403455584,Fax +20403455570, E-mail tfouda@yahoo.com

Corresponding author :m.m.tarhuni@yahoo.com

Abstract

Machines performance was evaluated in terms of field capacity and field efficiency, cutting height and cutting efficiency added cutting energy. The performance of some different machines(self-propelled harvester and shredder machine) used in clearing land from residues of some field crops (corn stalks and barley straw) was experimentally investigated as a function of change in machine forward speed. The experimental results reveal that the energy requirements was in the optimum range under the following conditions(a)The use of shredder machine in removing corn, and the self-propelled harvesting in removing barley straw;(b)Working at a forward speeds between 3 to 5 km/h, and 2 to 4km/h for removing barley straw and corn stalks respectively.

Keywords **:** *machine, residues, cutting, efficiency, energy and speed*

INTRODUCTION

Remove the crop residues from soil one of the serious problems facing the agricultural producer is to , especially after harvesting long-stalk plants. The efficiency of machines depends upon the removed plant, plant conditions (density and moisture content), machine type and machine forward speed. (1) reported that the field efficiency decreased by increasing forward speed, so the field efficiency is the ratio of the productivity of a machine under field conditions to the theoretical maximum productivity. Baiomy (2) designed and evaluated a shredder with a trailer. It was found that the least height of corn stubs was 15 cm, and forward speed 2.8 km/h. (3) developed and evaluated small agricultural residue-choppers for removing som field crop residues . (4) reviewed suitable technologies for retrieving and handling of crop residues from the field and for investigating their recycling to animal fodder, fuel composting, biogas production, and hardboard industry, with environment-friendly view point. They concluded that the estimated numbers of eminent machine requirement for Egyptian residues management are about

8600 balers, 5150 shredders, and 5200 choppers. (5) used rolling cutting coulters to cut plant residues, left on the soil surface, so as to facilitate the work of tillage tools in reduced tillage or direct tillage practices. The results showed that the toothed coulter performed adequately in cutting the residues. They also stated that the vertical load necessary for soil penetration disc coulter varied between 1.5 to 2.1 kN.
(6) stated that the shredder machine is recommended to be used in removing residues of both cotton and sunflower stalks, while self-propelled harvester is recommended in removing rice straw. The forward speeds between 4 to 5.5 km/h, 2.8 to 4.8km/h and 2.1 to 3.2 km/h are recommended for removing rice straw, cotton stalks and sunflower stalks respectively
So, removing field crop residues must be given the necessary attention, taking into consideration the direct benefit of quick clearing of soil for the next crop which may add a significant increase to the intensification ratio of the Egyptian agriculture.
The objective of this investigation is to evaluate the performance of some different machines used in clearing soils from residues

of some field crops to select the proper one with respect to field capacity and field efficiency and cutting efficiency added to both energy requirements.

MATERIAL AND METHOD

The field experiment was conducted at El-Zhara,Tripoli, Libya at 2010. The crop residues were used to be removed in this study corn stalks at 54% moisture content and barley straw at 18 % straw moisture content.
Field experiments were carried out in privet farm to evaluate the machines used for cleaning soils from residues of some field crops. The experimental area was about one hectar divided into two plots .One of the plots was seeded with corn, the second with barley. Each plot was classified into four subplots. The removing machines was used in this experiments were the self-propelled harvester with a cutting width of 1.25 m. made in Italy and the shredder machine with a cutting width of 1.5 m. made in Romania
The previous machines were operated under various forward speeds as follows (1, 2 ,3, 4, 5 and 6 km /h) for removing barley straw and corn stalks.
 Evaluation of the above mentioned machines was carried out taking into consideration the following indicators:
-**Effective field capacity** is a function of field speed, machine working width, field efficiency, and unit yield of the field. Field efficiency for each operation was calculated as follows:

EF = EFC/ TFC x 100 (%)

Where: EF is field efficiency, decimal; TFC is Theoretical field capacity (ha/h)
EFC is Effective field capacity (ha/h) = 1/ Teff, Teff = Effective total time
-**Cutting efficiency** (η_c) was estimated using the following formula (7)

$$\eta_c = \frac{A - B}{A} \times 100$$

where A-The height of standing plants above the soil before cutting, cm; B- The height of standing plants above the soil after cutting, cm,
-**Energy requirements** can be calculated by using the following equation:

Energy requirements (kW.h/ha) = power required (kw) / Effective field capacity (ha/h). Estimation of the required power to operate each machine was carried out by accurately measuring the decrease in fuel level in the fuel tank immediately after executing each operation .

The required power was calculated by using the following formula:

(8). $\quad p(hp) = w_f \times c.v. \times \eta_{th} \times \dfrac{427}{75}$

where W_f – rate of fuel consumption (kg/sec)

C.V–calorific value of fuel in kcal/kg. (C.V. of solar fuel is 10000 kcal / kg) 427-thermo – mechanical equivalent , kg.m/kcal.

η_{th}-thermal efficiency of the engine (for diesel engines about 30%).

RESULTS AND DISCUSSIONS

The discussion covers the results obtained under the following headings:
-**Effect of machine forward speed on field efficiency**
The effect of forward speed on field efficiency of different removing machines is shown in figs.1and 2 for barley straw and corn stalks. Results obtained for all removing machines show a remarkable drop in the field efficiency with a consequent sharp rise in the field capacity as the forward speed increased. Increasing forward speed from 1 to 6 km/h, during the removal of barley straw, the field efficiency decreased from 86 to 70%,. The same trend was noticed while removing corn stalks. Increasing forward speed from 1 to 6 km/h, decreased field efficiency decreased from 8o to 67%. For the above mentioned removing machines, the major reason for the reduction in field efficiency as the forward speed increased is due to the less theoretical time consumed in comparison with the other items of time losses.

-Effect of machine forward speed on cutting efficiency

Figs.3 and 4 show that cutting efficiency vary with the forward speed. Results obtained for all removing machines show that the cutting efficiency decreased as the forward speed increased. Concerning the removal operation of barley straw, increasing forward speed from 1 to 6 km/h, cutting efficiency decreased from 95.15 to 90%.
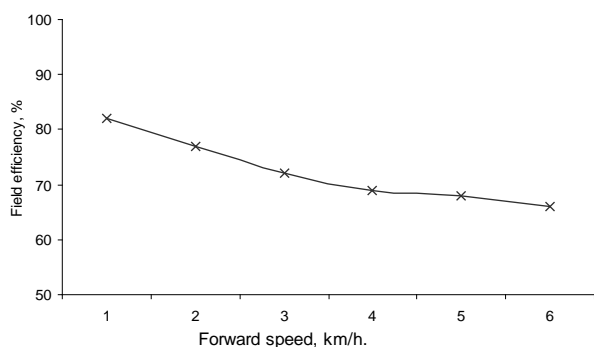
Fig. 1: Effect of machine forward speed on field efficiency for removing barley straw at Mc=18%
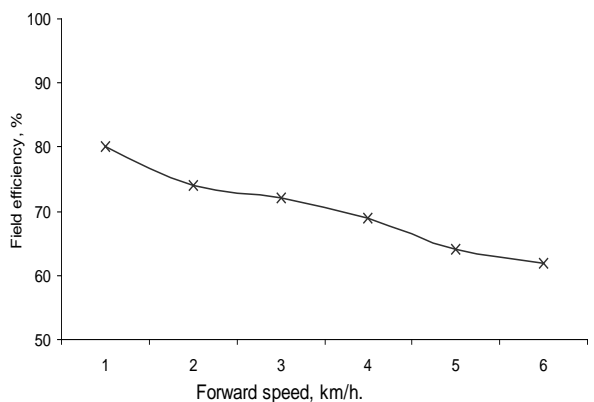
Fig. 2: Effect of machine forward speed on field efficiency for removing corn stalk at Mc=54%

The same trend was noticed while removing corn stalks decreased cutting efficiency decreased from 8o to 67%,from 95.3 to 92.5%, from 94.7 to 92% and from 95.9 to 93.5% under the same previous conditions. Therefore, low forward speeds are preferred to produce clean cut with a high cutting efficiency. This is because at low speeds, the cut was perpendicular to the stalks, while at high speeds, forward deflection occurred, which affects stalks to bend as a result large variations in cutting height will be expected.

-Effect of forward speed on energy requirements

Eenergy requirements are highly affected by both removing machine and its forward speed. Figs.5 and 6 show a remarkable drop in energy requirements as the forward speed increased.
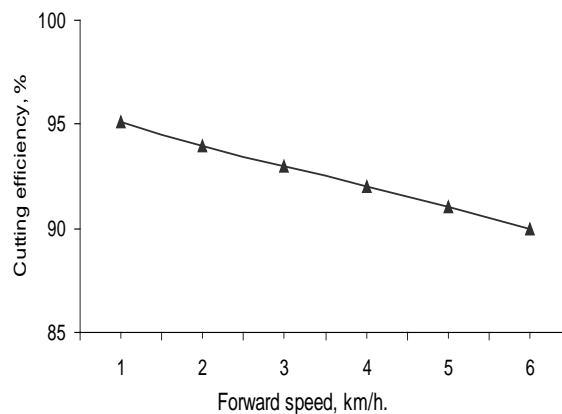
Fig. 3: Effect of machine forward speed on cutting efficiency for removing barley straw at Mc=18%
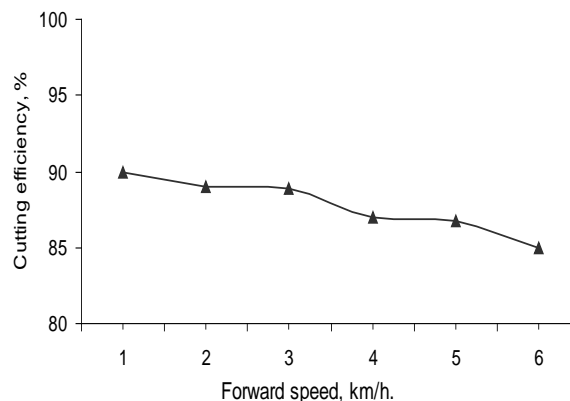
Fig. 4: Effect of machine forward speed on cutting efficiency for removing corn stalks.at Mc=54%

Concerning the removal operation of barley straw, increasing the forward speed from 1 to 6 km/h, decreased energy decreased from 41.60 to 27.10 kW.h/ha. The same trend was noticed while removing corn stalks decreased energy decreased from 67.80 to 44.90 kW.h/ha
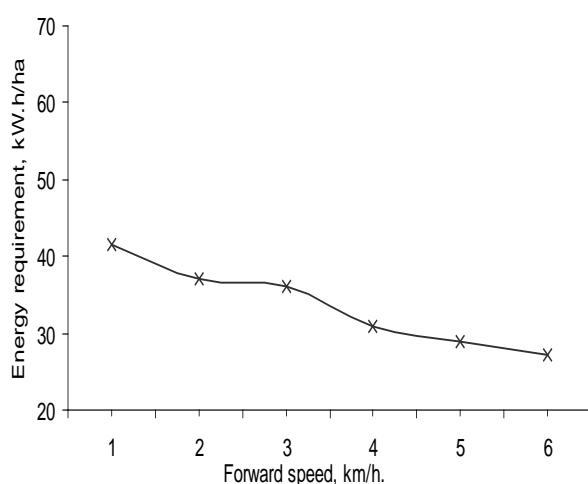
Fig. 5: Effect of machine forward speed on energy requierment for removing barley straw at Mc=18%.
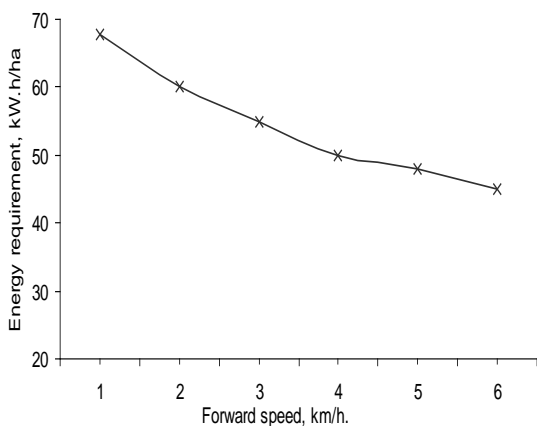
Fig. 6: Effect of machine forward speed on energy requierment for removing corn stalks.at Mc=54%

CONCLUSIONS

Shredder machine is recommended to be used in removing residues of corn stalks, while self-propelled harvester is recommended in removing barley straw.
Forward speeds between 3 to 5km/h, and 2 to 4km/h are recommended for removing barley straw and corn stalks.

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MINMIZE ENERGY REQUIREMENT FOR HEATING BROILER HOSUING

Tarek FOUDA[1], Mohamed DARWESH[1], Mohamed GHONMAE[1]

[1]Tanta University, Faculty of Agriculture, Egypt, Phone: +201228476266, Fax: 0020403455570,
E-mail: tfouda@yahoo.com and rmdarwish@yahoo.com

Corresponding author: tfouda@yahoo.com

Abstract

Bird's age is a governor factor to determine the heating load for broiler housing especially in winter season. Forced air heating system should be put the broiler in thermal comfortable zone to obtain the higher production. Therefore, using perforated poly ethylene duct to improve this heating system may cause better thermal conditions inside broiler housing. So that the experiment was conducted out in private broiler house on winter 2011, (latitude and longitude angles are 30.67°N and 30.98°E, respectively) in Egypt. The obtained results showed that using perforated poly ethylene duct increase average house temperature throughout the bird's life, save gas consumption by 32.6%, reduce litter moisture content from 41.5 to 32.8 %, reduce supplementary heat from 45.72 to 32.4 kW and increase feed conversion efficiency from 60.4 to 62.2 at the end of birds life.

Keywords **:** *broiler, temperature, energy, burner and duct*

INTRODUCTION

Broiler production industry is one of the most important sources that can be produced cheap protein. They have a higher marketable competition ability comparing with other sources of protein such as beef, buffalo, cheap and goat, because their high feed efficiency and short period of capital cycle. In Egypt the total numbers of active broilers houses was 21218 houses in 2008, the actual production 34.2287 million broilers [1].

[2]brooded chicks at starting temperatures of 35, 32.2, 29.4, or 26.7°C, then decreased brooding temperatures by 2.8° C each week for three weeks. After three weeks temperatures were held constant at 21.1° C. At three weeks of age body weight and feed conversion were better for the chicks brooded at the warmer temperatures. [3] indicated that in the first week of chicks life, the chicks are small and need only one-fourth of the space market –sized broilers. So, only one –quarter of the house must be heated in the first two week of the brooding period and one –half of it the second two weeks .These strategy saving a 40-45% in supplementary heating fuel energy [4] told that, the dominant source of heat is the birds themselves, and as a

slaughter weight of 2 kg is approached they each produce about 10-15 Watts of heat. [5] reported that the ventilation system should exhaust the right amount of air from brooder house to maintain proper air quality and not waste energy, so the minimum ventilation rate should be increased from 0.17 m^3 /h for each bird in the first week to 1.36 m^3 /h for each bird over an 8 week**.** From the previous sections indicate that temperature according age is the most important environmental factors. As it is well known that is a thermo-neutral (comfort) zone for first term of breeding process. Therefore, an environmental control system may be needed to provide and maintain the required comfort zone within broiler housing. From the viewpoint of thermal factors, an environmental control system may be used as an auxiliary system to control the temperature within the comfort zone via heating process. The forced air furnace is one of the common ways that can be used to heat ambient air temperature around broiler chickens. But, when used a forced air furnace a stratification phenomena will be appeared this phenomena can caused non uniformity temperature distribution in whole place breeding. To solve this problem

can be used the perforated poly ethylene duct connected with forced air furnace

[6] stated that the relative humidity inside a broiler house should be kept between 50 and 70 % to keep litter moisture content in the range of 25 to 30 % (w.b), consequently to avoid excessive dust from dry litter or ammonia release from wet litter.

[7] concluded that the optimum broiler house orientation under the Egyptian conditions is the one oriented East -West (orientation angle is 0°) or in other words is the one whose long axis oriented East-West

-The objectives of the present work were
(1) Providing better thermal environment
(2) Reducing heating energy requirements and (3) maximize meat production.

MATERIALS AND METHODS

Experimental work was conducted to investigate the potential of using perforated poly ethylene duct connected with forced air heating system to save energy and increase feed conversion efficiency inside broiler housing.

Materials:
The main experiment were carried out in private broiler house on winter 2011 at Babel , Menofia Governorate were located at
(30.67° "N and 30.98° "E) ,Egypt.
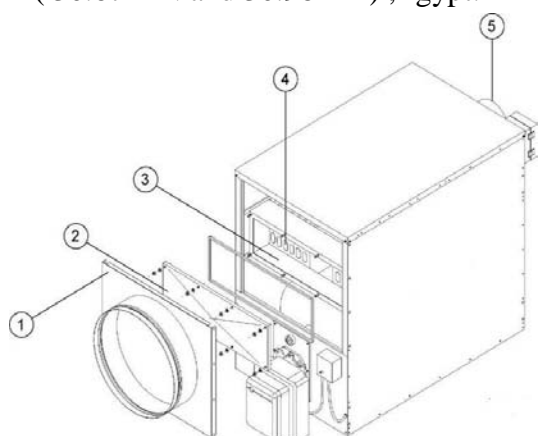
Fig.1. Forced air furnace
1- Removable air outlet   **4- Oval heat exchanger tube.**
2- Exchanger. Inspection door   5- chimney tube
3- Front chamber

Forced air furnace E120 BABYSER consists of (furnace, counter flow heat exchanger ,

axial fan 75 cm taken motion directly from electric motor 3 phase with 1.5 kW in power). The fan air displacement is 11000 m^3. /h. and electric control box.

Gas burner
Gas burner model CIB UNIGAS (ITALY) S10 model, LPG fuel, Gas flow rate min. - max Stm^3/h 6.9-12.7

Perforated poly ethylene duct
Poly ethylene duct with diameter of 0.61 m and 0.240 mm in thickness was punched off-center (in "4 o'clock" and "8 o'clock" positions) with Aperture coefficient 1.7.

House specification
Broiler house having gross dimensions of 35 m long, 15 m wide and 3.1 m height. The house is East – west oriented. The vertical walls were built using red bricks (0.1m) and the ceiling was covered by reinforced concrete of 0.15 m thick.

Chick
The broiler housing occupy 5000 chicks that have one day age. The hybrid (Cobb) was used in this experiment.

Methods:
The experiment's data were collected in two stages through two production cycle. First stage using forced air heating system without any modification. Forced air heating system with polyethylene duct used in second stage.

Measurements
Two data loggers were 16 channels for each other which connected by the sensors constructed from therimstors to measure inside air temperature at 30 points in two levels one at height 0.25 m of floor and a height 0.1 m of ceiling. One sensor was placed outside the broiler housing to measure outside air temperature. Then the temperature averages were taken in calculations

Supplementary heat
The forced air heating system adds heat inside broiler housing. This heat can be calculated as follows:

$$Q_{add} = m \, Cp \, (T_o - T_i)$$

Where:
m = mass flow rate of air, kg/s.
Cp = specific heat of inlet air, J/kg. ºC.
T_o = outlet temperature of hot air, ºC.
T_i = inlet temperature of cold air, ºC.

Litter moisture content

The litter was put in the oven at 105 °C for 24 hours. The following equation was used to calculate litter moisture content as *follows*:-

$$MC.(\%) = \frac{W_m - W_d}{W_m} \times 100$$

MC: Moisture litter content, %;   (w.b)

W_m: Moist weight, kg;

W_d: Dry weight, kg;

Feed conversion efficiency (F.C.E)

Broilers feed conversion efficiency was calculated by using the following relation:

$$FCE = \frac{W_b}{F_c} \ x \ 100$$

Where:

F.C.E = Feed conversion efficiency, %

W_b = Broilers body mass, kg

F_c=Broilers feed consumption, kg

RESULTS AND DISCUSSION

1-Effect of using perforated poly ethylene duct on House temperature

The relationship between inside air temperature and broiler age, using forced air heating system with and without duct inside broiler housing is revealed in Fig. 2.
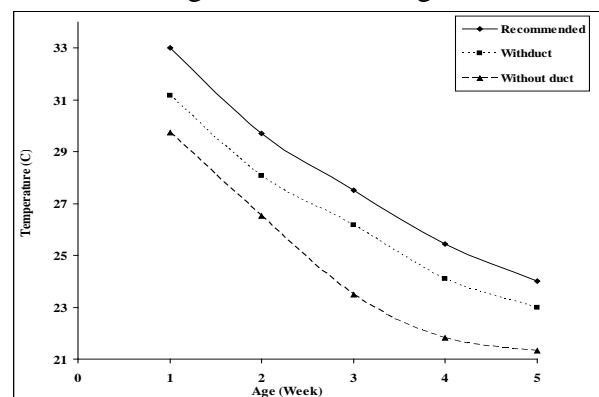
Fig.2. Weekly house temperature with and without duct

When broiler age increased, the temperatures decreased through the age of birds. Due to this the brooding temperatures, dependent on broiler age especially in the two first weeks or so their body temperature, metabolic rate, body mass to surface area ratio, insulation from feathering and thermoregulatory ability

Heating air system

are all relativity low. Also, Fig.2. showed that in the 1st week of age, average house temperature was 29.7 °C and reduced to be 21.3°C at five weeks of age when heating broiler house without using duct. But, using perforated duct for heat distribution, the average house temperature was 31.2 °C at the first week and reduced to be 23 °C at five weeks of age. So the perforated duct help in temperature distribution inside the house, increasing house temperature and enhancing feed conversion efficiency.

Standard deviation is used to know deviation both of average temperature values with and without perforated duct from recommended temperatures as shown in Table (1).

Table 1. Average air temperature inside house and

No	RT	TWP	TWP T	SDW	SDWT
1	33.0	31.2	29.7	1.3	2.3
2	29.7	28.1	26.5	1.1	1.1
3	27.5	26.2	23.5	0.9	1.8
4	25.4	24.1	21.8	0.9	1.6
5	24.0	23.0	21.3	0.7	1.1

standard deviation (SD) during the experiment period for both with and without perforated duct.

No: Number of weeks, RT: Recommended temperature values, (°C), TWP: Temperature values with perforated duct (°C), TWPT: SDW: Standard deviation with perforated duct and SDWT: Standard deviation without perforated duct

Lower standard deviation values indicated in Table 1 and belonging to use perforated duct confirms the previously mentioned result of the better environmental control level in heated air temperature using perforated duct connected with heating air system. Furthermore, the minimum SD (0.7 °C) value with perorated duct observed in the fifth week it is may mean that the ability of the modification system close to recommend limits.

2-Influence of using perforated poly ethylene duct on supplementary heating add

At first of chick's life the require temperature inside the house is relative high and sensible heat from birds in this period is low because, birds body mass is low. So, Supplementary heat add to the house is too high. As increase

birds in age, supplementary heats add decrease, where inside temperature decrease, in other hand sensible heat from birds increase. The previous relation depends on outside air temperature, building materials, building volume and bird's kind. Fig .3. showed that when using forced air heating without duct the supplementary was54.97kW and reduced until third week of age to be 35.88 kW and increased after third week to reach 45.72 kW because of transforming from partial to whole house brooding and while using perforated duct for heat distribution the supplementary heat add decreased with increased birds in age ranged between 54 to 32.4 kW.

hot air at the ceiling and cold air at the floor. Second, furnace heat does not allow chicks to select a comfort zone due to the accumulation of warm air near the ceiling and heating system keep adding heat to the house until the house floor become warm which increase gas consumption. But when using perforated duct for heat distribution gas consumption reduce with increase birds in age and ranged between 3.79 to 1.86 kg/hr. Because, it direct hot air down to warm the floor not the ceiling which make heating system heat the floor in a short time and save fuel. The same trend noticed in Fig. (3) and Fig. (4) Because the gas consumption is function of supplementary heat added.

Fig.3. Supplementary heating with and without duct
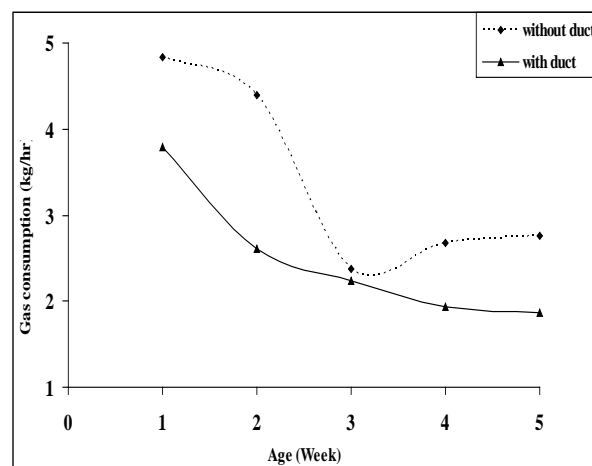
Fig.4. Gas consumption with and without perforated duct .

3-Interest of using perforated poly ethylene duct on Gas consumption

The values of gas consumption with bird's age recorded in Fig. 4. When using Forced air heating system with and without perforated duct .Data revealed that gas consumption during heating the house without duct reduced from 4.8kg/hr at the first week until reach 2.38 kg/hr at third week of age. After that gas consumption begun to increase until reach 2.75kg/hr at five week of age. This result due to convert from partial to whole house brooding .In addition to, forced air furnace is more difficult to manage for two primary reasons. First, furnaces produce warmth by producing heated air. This means that the floor must be warmed from hot air, which can require a long period since hot air rises, and temperature stratification can develop with

4-Effect of using perforated poly ethylene duct on litter moisture content
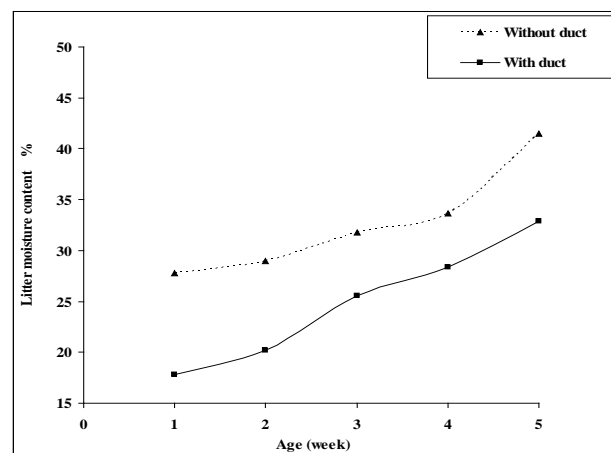
Fig .5. Litter moisture content with and   without duct

5-Effect of using perforated duct on feed conversion efficiency

Litter moisture content is an important factor which effect on broiler performance. Increasing litter moisture content increases ammonia emission. If litter was too dry, excessive dust will produce. Fig.5. illustrated that the relationship between litter moisture content and age. Litter moisture content decreased with increased broiler in age. Litter moisture content ranged between 27.7 to 41.5% when heating house without using perforated duct. But, when using perforated duct in heat distribution litter moisture content ranged between 17.8 to 32.8%. In first case litter moisture was too high because air temperature underneath the ceiling was high which mean it is a dry air and the air near the floor was cold so, it holds moisture which causes litter moisture increasing. While using perforated duct for heat distribution it brings the hot air down to the floor which evaporated the moisture from the litter which exhausted by ventilation system.
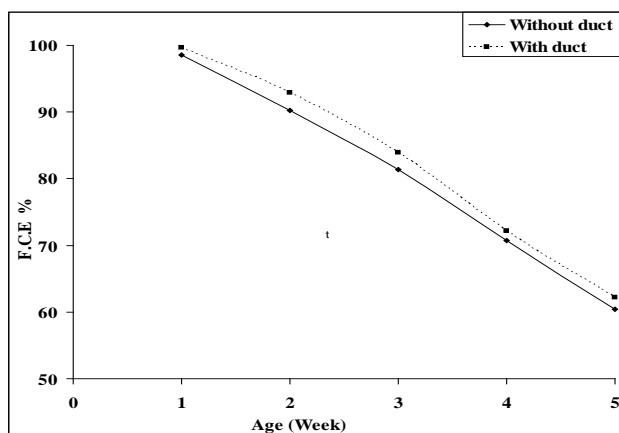
Fig (6) Feed conversion efficiency with and without duct

Feed conversion efficiency affected by temperature distribution inside the house. The relationship between the feed conversion efficiency and broiler age when heating broiler house with forced air heating system with and without duct revealed in Fig (5). Feed conversion efficiency decreased as the age of birds increased. Therefore, the feed conversion efficiency was 98.56% in the first week of age and reached to 60.4% at the five week of age. When using forced air heating system without duct, but using forced air heating system with perforated duct the. Feed conversion efficiency ranged between 99.6 % on the first week of age and reached to 62.2% at the five week of age. Data showed that feed conversion efficiency increased when using perforated duct in hot air distribution because, in the first case the air come out from heater rise up to the house ceiling and let the birds zone cooler which made birds huddling to gather in groups and most do not seek out feed or water which adversely affected in feed conversion efficiency. But, when using perforated duct to distribute hot air, the mean temperature in the bird's zone was close to the goal temperature. So, birds were more comfortable and theses help in increasing feed conversion efficiency.

CONCLUSIONS

The main results of the present research can be summarized as follows:
-Using perforated duct for heat distribution increase house temperature to be near the goal.
-Using perforated duct for heat distribution help in gas consumption reduction by 27.07%.
-Using perforated duct for heat distribution help in Supplementary heating reduction by 15.35 %
-Using perforated duct for heat distribution help in litter moisture content reduction by 20.39% at the end of life.
-Using perforated duct for heat distribution help in increasing Feed conversion efficiency by 3%.

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RESPONSE OF POTATO TO NITROGEN AND WATER DEFICIT UNDER SPRINKLER IRRIGATION

Tarek FOUDA, Adel ELMETWALLI, Eltaher, ALI

Faculty of Agriculture, Tanta University, Tanta, Egypt , Sebrbay Complex, Tanta, Egypt, 31527; phone: +20403455584, Fax: +0403455570, e-mail: adelra99@yahoo.com

Corresponding author:adelra99@yahoo.com

Abstract

Obtaining the maximum yield of different crops mainly depends on the proper agricultural practices especially irrigation and fertilization. This research aimed to investigate the response of potato crop (Sponta variety) to water and nitrogen deficiency. A field experiment was undertaken to investigate the effects of water and nitrogen deficiency on potato properties including tuber yield, chlorophyll concentration, and water use efficiency (WUE). The experimental design was set up as a split plot design with three replicates. The obtained results demonstrated that both water and nitrogen fertilizer significantly affected potato productivity. The amount of irrigation water and nitrogen had positive significant effects on yield and chlorophyll. The highest potato yield and chlorophyll of 11.56 Mg/ha and 48.9 respectively were recorded with the treatment received 1.25 ET$_c$ seasonal water and 200 kg N whilst the lowest ones were observed with the treatments received 0.50 ET$_c$ seasonal water and 0 kg N. The amount of irrigation water had a negative significant effect on water use efficiency. The highest level of irrigation produced the lowest water use efficiency. The greatest WUE obtained among all treatments was the one received the lowest amount of irrigation water. The results therefore showed that under sprinkler irrigation potato yield can be maximised by adding the optimum levels of both irrigation regime and nitrogen fertilization.

Keywords **:** potato, water, nitrogen deficiency, stress

INTRODUCTION

There is a growing awareness of increasing demand for good quality water resources worldwide particularly in arid and semi arid regions. Libya is one of the countries facing a big problem having very limited fresh water resources including ground water supply. This problem is increasing and become more problematic with increasing population growth. Despite the huge efforts made by the Libyan Government, Libya still faces serious water deficits due to continuous increase of water demands. Low water application efficiency of irrigation systems at the field level must be enhanced through efficient systems such as sprinkler irrigation. Improvements in application efficiency can reduce many problems such as water logging, salinity, runoff losses and deep percolation losses. These improvements can help managing limited water resources more productivly.

Potato (*Solanum tubersum*) is an important crop for people worldwide and can be cultivated in different soil types and climatic environments. Water and nitrogen deficit are considered the main limiting factors of crop production for most agricultural crops. Depending on the environment the potato crop evapotranspiration ranged between 30 and 70 cm [1]. [2] Studied the interaction of water and nitrogen fertilizer on potato crop under different irrigation methods. They used two levels of irrigation regime (100 and 150 % evaporations from the class A pan). They concluded that the maximum tuber yield was recorded with drip irrigation at 150% ET$_c$. [3] investigated the effect of irrigation rate (60 and 80 % ETc) on potato tuber yield (var. *Russet Burbank*). They reported that the total yield of potato decreased fundamentally when deficit irrigation was applied during early mid and mid late bulking. [4] evaluated the effects of drip irrigation regime (0.25, 0.50, 0.75, 1.00 and 1.25 % Ep) on potato tuber yield. They found that total fresh tuber yield

increased with increasing amount of irrigation water and the highest potato yield was recorded with the treatment received 1.25% Ep. [5] investigated the effect of drip line depth (5, 10, 15, and 20 cm) and watering level (100, 80 and 60% ETc) on potato yield and concluded that potato yield was higher with subsurface treatments than surface treatments and maximum yield was obtained when placing drip line at 10 cm depth. They also found that potato yield decreased with decreasing amount of irrigation water.

Other studies investigated the effect of nitrogen fertilization on potato productivity. For example, [6] reported that nitrogen deficiency can substantially reduce potato yield, whereas excessive N application can delay tuber maturity and increase the nitrate contamination of surface and ground water. Production of different crops in light textured soils such as sand and sandy loam soils depends mainly on watering and nitrogen fertilization levels. Using efficient irrigation systems to irrigate crops will maximize the return of different crops. Many studies showed the significance of water regime applied through different irrigation systems on water use efficiency. For example, [7] studied the effect of sprinkler irrigation, surface drip and subsurface drip irrigation with different water regimes on potato yield and water use efficiency (WUE). They demonstrated that the potato yield increased by decreasing the value of soil moisture depletion and therefore WUE increased as the value of soil moisture depletion decreased. The overal aim of this research was to investigate the relationship between potato crop properties and both watering and nitrogen fertilization levels under sprinkler irrigation.

MATERIAL AND METHOD

A field experiment of potato was conducted at the farm of the agricultural research station, Agricultural Research Institute, Alzahraa, Libya (latitude of 42.47 and longitude of 52.17) during the winter season of 2010-2011. Potato tubers were planted on 1st September 2010. The soil of the experimental study site was a sandy loam (Table 1 shows different properties of the experimental soil). A potato variety (Spunta) was used in this research. The distance between rows and plants on the same furrow was 60 and 30 cm respectively. A one meter distance was left between different treatments to avoid overlapping between different treatments. Different agricultural practices were performed as recommended. Irrigation water samples were collected during the growing season and the electrical conductivity was measured every time then averaged (1.03 dS/m). Phosphor fertilizer in the form of super phosphate and potassium were applied during soil preparation.

Table (1): Different chemical properties of the experimental soil

Depth, cm	EC, dS/m	pH	Cations, meq/l				Anions, meq/l			
			Na	Mg	Ca	K	Co_3	$H Co_3$	Cl	So_4
0-30	0.40	7.8	0.96	1.20	1.20	0.12	0.0	2.80	0.56	0.12
30-60	0.34	8.0	1.01	1.20	1.20	0.14	0.0	2.00	0.56	0.99

Table (2): Different chemical properties of the irrigation water used

EC, dS/m	pH	Cations, meq/l				Anions, meq/l			
		Na	Mg	Ca	K	Co_3	$H Co_3$	Cl	So_4
1.13	7.2	4.6	2.8	4.0	0.15	0.0	2.80	3.6	5.15

Fixed sprinkler irrigation system used

The sprinkler irrigation used was tested prior the growing season. It consisted of a centrifugal pump operated by an electrical engine. The main line of 4" diameter made from steel was buried at 0.5 m depth. The sub-main and lateral lines of 3" and 2" diameter respectively were installed on the soil surface. Rain Bird sprinklers were used for this system and the riser height was 0.75m. The sprinklers were fitted on the lateral lines at 10m spacing and the distance between laterals was also 10 m. The sprinkler system was operated at a pressure of 200 kPa with a discgarge rate of 35 l/min. The sprinklers were arranged in squared layout as recommended in this study site.

Irrigation water requirements for the fixed sprinkler irrigation system was calculated based on the meteorological data collected from Alzahraa weather station which is next to the experiment. Irrigation water requirements were based on the calculation of potential evapotranspiration using FAO Penman-Monteith equation modified by [8] as follows:

$ET_c = kc\ ET_o$

Where:

ET_c is the irrigation water requirements, mm/day

kc is the potato crop coefficient

ET_o is the reference evapotarnspiration, mm/day

Crop coefficient was calculated according to FAO method. In this method, potato growing season is divided into four stages and depending on the environmental conditions of the study area. The coefficient of crop was taken 0.5, 0.7, 0.9 and 1.15 for the primary, median, bulking and final stage respectively.

Distribution uniformity

The distribution uniformity (DU) was calculated according to [9]

$$DU= [Z_{iq}/Z_{av}] \times 100$$

Where:

DU = the distribution uniformity in %,

Z_{iq} = the average of catch cans depth in the low quarter of the field in mm and

Z_{av} = the average of catch cans depth in the entire field in mm.

Water use efficiency

The water use efficiency (WUE) was determined according to [10] as follows:

$$WUE = Y / V$$

Where:

Y is the tuber yield, kg/m^3

V is the seasonal applied water, m^3

Experimental design

The experimental design was set up as a spilt plot design with three replicates. The irrigation treatments were assigned to the main plots while the nitrogen fertilization rates were assigned to the sub-plots. 12 different treatments were used to subject plants to different levels of watering and nitrogen deficiency stress including: four watering levels of 1.25, 1.00, 0.75 and 50 ET_c and three nitrogen fertilization rates of 0, 50 and 200 kg/ha and different combinations of both watering and nitrogen levels were also used. To avoid overlapping between different treatments a boarder of 1m between different plots was left without plants. Nitrogen fertilizer was added in the form of nitrate and applied in two equal doses; the first one at 25 days after planting and the other at 55 days after planting. The experimental plot area was 100 m^2 (10 m*10 m).

Statistical analysis

Minitab v15 was used to perform one and two way analysis of variance (ANOVA) to establish significant differences in potato response to moisture and nitrogen deficiency stress. Nitrogen, moisture and the interaction were used as predictor variables, and yield data as the response variable. Data were checked for normality using Anderson-Darling method with a 95% significance level.

RESULTS AND DISCUSSIONS

To evaluate the performance of the sprinkler irrigation system used the uniformity distribution was used as an indicator of irrigation distribution efficiency. The square layout of sprinklers was chosen as recommended with distances of 10 * 10 m. the results obviously demonstrated that the highest distribution uniformity of 88% was recorded at 200 kPa operating pressure and 75 cm riser height.

Effects of watering and nitrogen deficiency on potato tuber yield

The analysis of variance was performed to assess the effects of both watering and nitrogen deficiency on potato tuber yield. The results are depicted in Fig (1). Both nitrogen deficiency and moisture significantly affected potato tuber yield. Water stress strongly reduced tuber yield. The highest potato yield of 11.56 Mg/ha was recorded with the control treatment while the lowest tuber yield of 6.55 Mg/ha was recorded with the treatment received 0.50 ET_c watering regime and 0 kg N. Nitrogen deficiency also significantly affected potato tuber yield. Significant decreases in potato tuber yield were observed with increasing nitrogen deficiency levels (Figure 1). The tuber yields fell to about 0.56 of the maximum value for potato when subjected to the lowest watering regime and the highest nitrogen deficiency level.

The regression analysis showed a significant linear relationship between potato tuber yield and watering regime ($R^2 \geq 0.77$). This indicates that yield reductions were highest in treatments with the lowest watering regimes (0.50 ET_c). A further significant linear relationship was found between potato tuber yield and nitrogen deficiency levels ($R^2 > 0.78$) indicating that tuber yield reductions were greater at the highest nitrogen deficiency levels (zero nitrogen). The results therefore demonstrated that multivariate regression analysis showed significant relationships between potato tuber yield and both moisture and nitrogen deficiency for all trails. The results of this research are similar to those obtained by [11] and [12] who documented the significance of watering regime when increased from 0.25 to 1.25 Ep on potato yield.

Effects of watering and nitrogen deficiency on the chlorophyll content of potato

The results listed in Table 3 demonstrate the effect of water and nitrogen levels on the chlorophyll content of potato. The results obviously show a significant effect of both parameters on the chlorophyll concentration.
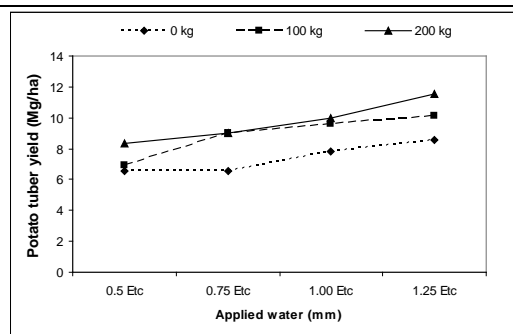
Fig. 1 The relationship between potato tuber yield and both water and nitrogen deficiency
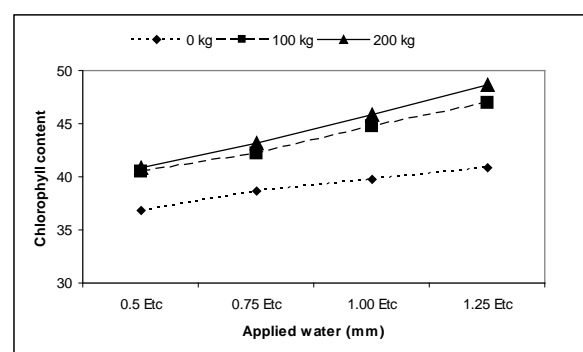
Fig. 2 Effect of water applied and nitrogen fertilization on chlorophyll content of potato

The highest concentration of chlorophyll was recorded with the treatment received the highest levels of watering regime and nitrogen fertilizer (1.25 ET_c and 200 kg N) whilst the minimum concentration of chlorophyll was recorded with the treatment received the lowest levels of watering regime and nitrogen fertilizer (0.50 ET_c and 0 kg nitrogen). Similar results were obtained by [11].

Effects of water and nitrogen deficiency on WUE of potato

The association between WUE of potato and both investigated parameters is illustrated in Fig (3). The results demonstrated that both parameters significantly affected WUE. The highest WUE was recorded with the treatment received the lowest levels of watering regime and the greatest nitrogen fertilization rate (0.50 ET_c and 200 kg nitrogen) whilst the minimum WUE was recorded with the treatment received the greatest level of watering regime and the lowest nitrogen fertilization rate (1.25 ET_c and 0 kg N). Increasing nitrogen fertilization from 0 kg N

to 200 kg N increased the chlorophyll concentration by 25% which leads to higher vegetation and therefore higher tuber yield.
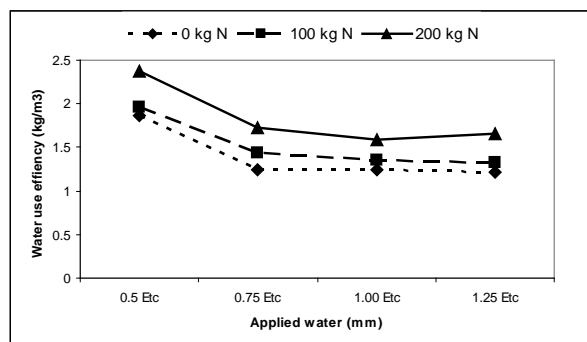
Fig. 3 The relationship between water applied and water use efficiency of potato

CONCLUSIONS

The effects of water and nitrogen deficiency on potato tuber yield, chlorophyll content and WUE were investigated in this research. The results clearly demonstrated that potato tuber yield and chlorophyll content were highly affected by the deficiency of both stressors. WUE had the opposite trend as it decreased with increasing the amount of irrigation level. Higher nitrogen fertilization rates increased both tuber yield and chlorophyll content of potato. The highest yield and chlorophyll content of 11.56 Mg/ha and 48.9 respectively were obtained with 1.25 ET_c watering regime and 200 kg N treatment. In conclusion potato productivity can be maximized if the proper irrigation system, optimum water regime and nitrogen fertilization rate are identified.

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RURAL DEVELOPMENT AND ECOTOURISM

Teodora IVASCU

[1]Institute of Research in Agrarian Economics and Rural Development 61, Marasti, 011464, Bucharest, Romania, 0040213181686

Coresponding author : teodoraivascu@yahoo.com

Abstract

Starting from the concept that "sustainable development of viable and ecologically sustainable is considered that development that meets present needs without compromising the ability of future generations to meet their own needs", tourism, and especially rural tourism, that economic activity is included in the scientific approach and should work with other industries and economic activities to ensure environmental quality, resource base and its survival. Especially, co-participation is necessary to this end, the central and local authorities, local communities, with tourism service providers and related services, environmental advocates and, last but not least, the tourists who enjoy touristic environmental quality and favorite tourist destination.

Keywords : *development, tourism, rural tourism, sustainable development*

INTRODUCTION

Evolution of the countryside is one of the important problems of mankind as it requires a balance between the requirement of conservation of rural economic, environmental and social with logical trend of modernization of rural life. Rural developments in these coordinates is influenced by urban sprawl, industrialization sometimes aggressive, the lack of a permanent and consistent environmental health.[2]

Applying ecotourism development model for sustainable tourism, especially in protected areas but in others with a fragile environment, and its principles, has a dual purpose: on the one hand, to fully and natural resources and cultural improving quality of life in local communities and, on the other hand, motivation and satisfaction of tourists in accordance with requirements and resource conservation for future generations.[6]

Maintaining and preserving the national character of space and rural culture are major targets of interest for any nation.

MATERIAL AND METHOD

For sustainable development of rural tourism and hence the necessary programs are serious, systematic, integrated development, balanced and long term throughout Romanian countryside.[5] Facts show that in areas with good agricultural production conditions, are increasing and upgrading processes, specialization and integration in the market economy and population exodus released land holdings are processed remaining active.[4] Thus, an important part of agricultural and food is provided by the representative farm size increased. Within several generations, agricultural and non-traditional activities in rural areas were viable in ensuring ecological balance motivation, production and sustainability of the welfare population.

It should be noted that the current economic outlook is putting too much emphasis on farm profitability, as well as those of other rural areas, without regard to economic and social costs borne by society as a whole and each individual part, by attempting to balance quality and environment.

The European experience and, especially, German, Austrian Swiss and French, it is noted that the rural tourism component to "agritourism", are defined as organizing and promoting local, regional and national policy generally fall within the European Union planning and rural development and support of people in this area.[7]

Also in agrotourist activity involving communities and local authorities, other

associations, companies and physical persons compete for tourism activity in rural areas, each with a financial contribution to the development and promotion.

Rural tourism and agritourism fall within the scope of sustainable tourism by complying with the environmental protection of natural and humanized, tourism based on ecological principles.[3]

Sustainable human development can not be conceived but outside human settlements development with a viable economy and a diverse social life in a healthy environment, secured the respect of cultural and historical heritage of society. Unfortunately, development of rural areas generally marks a clash with the country's overall economic development in terms of:
•the wage in agriculture and its related sectors;
• basic comfort facilities housing;
• social and administrative infrastructure;
• ways and means of communication;
• level of civilization, culture and education;
•low level of technical equipment of settlements;
• poorly diversified economic activities, etc.

The concept of sustainable development was based on the recognition bowing limits growth. Need addressing problems of economic development in the context of correlation and their natural environment, technological, social, political and cultural in recent decades has become a goal of studies on human evolution on earth. It was found that different models of economic growth can have negative consequences in terms of long-term human needs.[1]

In time, more and more experts have warned of the danger of exponential growth, the application of techniques and technologies without worrying about maintaining balance with the environment and hence the preservation of life on earth.

Ecotourism requires leadership, organization and development of tourism activity in order not to disturb or destroy the natural balance, natural environment with tourist resources and cultural values, historical or technological content and to realize their sustainable exploitation.

Ecotourism, as most specialists and tour organizers, is a means of saving natural habitats and historical and cultural values threatened with degradation and destruction by intensive tourism, mass tourism or sales.

Developing ecological tourism is centered on four areas:
•Sustainable exploitation of tourism resources and natural and built environment;
•Protection and conservation of tourism resources and ecosystems that circumscribe their;
•Protection and economic development and socio-cultural communities in that area or near its traditional economy and increase employment;
•Sources of funding for environmental protection, natural and constructed habitats and communities.

The concept of ecotourism, space is viewed as dual aspect, namely: a quantitative, by "the capacity of the land" which may be natural or man-made and qualitatively, through work or tourist value of the land, natural or created. Both sides are part of the overall policy approach to sustainable tourism economy.

RESULTS AND DISCUSSIONS

Sustainable rural development must consider primarily the activities taking place in rural areas, from agriculture, the main activity. The concept of sustainable agriculture must adapt to social and economic context to apply and scale of application, a variable has a strong plot, the entire firm, from an ecosystem in a river basin, by region to another, etc..

Tourism development is required a focus on environment and development through measures to protect its quality and resources in areas entered in circuit touristic or prospects for recovery through tourism, and control the consequences of this activity in order to capitalize on tourism potential optimal .

In everyday language, rural and agrarian notions are confused, often considered synonymous. The term rural is but a very

large in scope that includes the notion of agriculture. In some areas, the most important component of the countryside is agricultural space, and the most important and are more rural agricultural activities. Even so, the two notions can not be confused.

To implement sustainable agriculture agricultural policy must address the following issues:

•To regulate the legal basis for sustainable agriculture resources, especially land quality;

•Establish technical and scientific instruments, political and financial to ensure optimum energy and material flows in the major cycles of the biosphere;

•To promote integration of crop production with animal production and related activities;

•To discourage intensive livestock production separation plant;

•To determine the company to accept reimbursement of expenses for the readjustment of agriculture (pricing policy).

These conditions aim to ensure the basic requirement of the company, namely: food security, as a component of global human security.

Agricultural production know different forms of agriculture that have some common characteristics: organic agriculture, alternative agriculture, regenerative, biodynamic, organic, etc.. Each of them respond in some way to environmental protection requirements but does not mean that they necessarily sustainable.

Sustainable agriculture encompasses these variants agriculture by combining traditional techniques with new ones, using modern equipment, allow the use of chemicals, but expected some of their management, along with special care to protect and conserve the environment.

A sustainable agriculture can be practiced without pay particular attention to organizational reform and accelerating the consolidation of holdings by association for the formation of large farms, competitive. Most agricultural activities is designed to ensure family subsistence, very little population is oriented industrial processing or marketing of the products obtained. Also in the non-agricultural activities, focused on practicing various trades including local or specific services are still underdeveloped.

Agritourism can be an adjacent and complementary agricultural activities that contribute to the improvement Romanian rural households, but also in the process of rural development.

In the EU, rural tourism market is estimated at more than 370 people million and 25% of European tourists spend their holidays in the countryside. However, European statistics show that 57% of those who spend their holiday in rural areas had no source of information for this purpose, showing the possibility of such a holiday party is very little known in European Union countries.

In Romania, the eco-tourism principles should be based on the Romanian legislation and other regulations or directives in the field of European Union countries or world organizations supporting these efforts and that will harmonize future.

Were adopted, such a series of laws, some organic, concerning environmental protection, urban planning and land-use planning, and planning regulations on documentation, system of protected areas and natural monuments, the human and cultural heritage, issuing environmental permits for urban and regional planning.

CONCLUSIONS

If the vast majority of human society Romanian analysts solution to overcome the current crisis moment is agriculture and services, and among them especially tourism, those who intend to obtain economic results of tourism activity areas have all the cards in their hands.

Resulting need for a scenario, adopting a strategy, outline a policy touristic product and price, finding markets and penetration, promoting and organizing local and national, European and global networking system.

In our country, are provided a legislative ecotourism development in the strict sense of exploitation of protected areas and tourism in general, which must take place on ecological

principles in the context of sustainable economic development in general and activities tourism in particular.

Romania has been part of many world and European organizations and conventions and has signed a series of documents that provides protection of nature, human habitats, ecological tourism development on the main. Protected natural areas and natural monuments of national interest have a purpose and management, and management and use are established by regulations and their protection and conservation plans approved by national scientific and administrative ability.

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ASPECTS OF DEVELOPMENT OF SERBIAN AGRICULTURE IN THE CONTEXT OF THE GLOBAL ECONOMIC CRISIS

Marko JELOČNIK, Bojana BEKIĆ, Jonel SUBIĆ[1]

[1]Institute of Agricultural Economics Belgrade, 15 Volgina Street, 11060 Belgrade, Serbia, phone/fax: +381 (0)11 297 28 58,E-mail: marko_j@iep.bg.ac.rs, bojana_b@iep.bg.ac.rs, jonel_s@iep.bg.ac.rs

Corresponding author: marko_j@iep.bg.ac.rs

Abstract

Since autumn 2008 has started deep world economic crisis, which does not pass by Republic of Serbia, so during the last few years, came first to the stagnation and then to fall of most of the economic activities. Statement that agriculture is an economic backbone of some nation especially is expressed in Serbia, where it is considered as one of the basic economy branches, important creator of GDP and user of scientific-technical progress. Its importance could be recognized also in fact that besides military industry it is only one economic sector which has constant foreign trade exchange surplus. Based on that we must agree that strengthening of national agriculture in synergy with the food industry in general is a great opportunity for Republic development, especially in the period when world food prices have an upward trend. Due to above mentioned, in paper is presented condition of selected elements of Serbian agriculture throughout period 2009-2011.

Keywords: Serbia, agriculture, global economic crisis

INTRODUCTION

In all countries of contemporary world, even in those that do not have favourable conditions for undisturbed conduction and development of agricultural activites, in forefront appeare primary function of agriculture i.e. providing of certain level of food security for citizens. As one of the main branch of national economy and significant factor in creation of Gross Domestic Product, agriculture has important place in Serbian economy, so it could be rightfully labeled as economy branch with strategic importance. Although carried out in naturaly suitable conditions with firm reliance on tradition, available land and human resources, as well as scientific-technical progress, unfortunately, under affects of world economic crisis, present level of its development did not fit to potential expectations and capacities' real possibility.

MATERIAL AND METHOD

Main goal of this paper is to present some characteristics of Serbian agricultural during the last three years period, as well as potential strength of this economy branch in overcoming of world economic crisis issues. Research was based on data available, mainly from publications of Statistical Office of the Republic of Serbia for certain years (Statistical Yearbooks and Bulletins). Method used was desktop study, and most important indicators were presented by tables.

As aggravating factors of valid estimation of the crisis impacts in such a short period there are some specificities of agricultural production, before all longer production cycle and much higher dependence on weather conditions, often inability in demarcation of level of external influences (global, regional or national) and determination of cross-sectoral impacts.

RESULTS AND DISCUSSIONS

a) Production - Utilized agricultural land, as one of capacity elements of Serbian agro-complex, takes around 5.051.000 ha (3.295.000 ha is under arable fields and gardens), what is little more than 57% of total area. As economic units appear family agricultural husbandries and companies /cooperatives.

In Serbia there is by last census more than 750.000 family husbandries, but according to Directorate for agricultural payments only 278.351 of them were renewed their registration within 2011.

On other hand, in compare to previous year, in 2010 were came to decrease of total number of entrepreneurs within agro-complex (from 6.771 to 6.674), or for 1,5%. Also came to reduction of number of employed persons within this sector for 7,3% (from 114.344 to 106.559). Despite mentioned it came to increase of gained income (in total) within this companies for around 5%, what could be marked as effect of rise of agro-food products prices on the world market.

For years, agriculture has been characterized by some limitation, such like that husbandries in average dispose with small estates and atomized parcels, chronic shortage of financial assets and lack of stronger governmental support, unsolved issues about agricultural land ownership, obsolete mechanization and equipment, inadequate use of agro-technical/chemical measures, lack of irrigation systems in function, often incorrectly conducted privatization of former large agricultural combines, disunity of producers and lack of real cooperative farms, disturbed price parities, broken supply /reproductive chains, etc.

During observed period production parameters, within certain production lines, had non-negligible oscillations, affected not only by climate conditions (Table 1.).

Table 1. Production indicators of selected agricultural products within the period 2009-2011.

Agricultural products		Harvested area (in 000 ha)			Production (in 000 t)			Yield (t/ha)		
		2009	2010	2011	2009	2010	2011	2009	2010	2011
Cereals	Wheat	567,6	484,2	492,9	2.067,5	1.630,4	2.093,2	3,6	3,4	4,2
	Barley	95,4	84,2	77,6	302,5	244,3	279,2	3,2	2,9	3,6
	Corn	1.208,6	1.229,6	1.260,5	6.396,2	7.207,2	6.463,2	5,3	5,9	5,1
	Oat	35,4	34,2	31,6	73,6	67,6	71,3	2,1	2,0	2,3
	Rye	5,2	4,9	4,5	12,7	10,5	11,6	2,4	2,2	2,5
Industry plants	Rapeseed	18,1	12,0	*	44,3	24,4	*	2,4	2,0	*
	Sugar beet	61,4	66,4	55,6	2.797,6	3.324,8	2.816,9	45,6	50,0	50,6
	Sunflower	157,3	169,4	174,5	377,5	378,4	433,2	2,4	2,2	2,5
	Ind. paprika	4,4	4,6	*	11,5	12,9	*	2,6	2,8	*
	Soy bean	144,3	170,2	165,3	349,2	540,9	436,9	2,4	3,2	2,6
	Tobacco	6,1	5,8	6,5	9,8	10,4	10,4	1,6	1,8	1,6
Vegetable	Potatoes	78,2	76,7	78,3	898,3	887,4	902,9	11,5	11,6	11,5
	Beans	21,2	20,3	19,6	46,3	43,2	39,5	1,2	1,2	1,2
	Tomatoes	19,9	20,2	*	189,3	189,4	*	9,5	9,4	*
	Cabbage	20,8	20,9	*	326,2	336,6	*	14,2	14,5	*
	Paprika	18,5	18,5	*	171,4	154,9	*	9,2	8,4	*
Forage crops	Alfalfa	188,0	187,1	183,4	1.114,8	1.104,8	985,4	5,9	5,8	5,3
	Clover	116,9	118,9	119,5	543,8	556,5	492,7	4,5	4,5	4,0
	Corn for silage	26,8	27,5	*	586,9	657,2	*	21,9	23,9	*
	Meadows	613,6	590,9	*	1.126,2	1.214,6	*	1,8	2,1	*
	Pastures	810,9	659,4	*	471,0	509,6	*	0,6	0,8	*
Fruits	Apples (mil trees)	15,6	15,9	16,0	281,9	239,9	265,7	18[1]	15	17
	Plums (mil trees)	41,6	41,2	40,8	662,6	426,8	593,9	16	10	14,5
	Cherries (mil trees)	8,7	8,4	8,4	105,3	66,2	90,6	12	8	11
	Grapes (mil vines)	291	292	275	431,3	330,1	330,1	*	*	*
	Raspberries (in ha)	14.957	15.171	15.354	86,9	83,9	89,6	5,8[2]	5,5	5,8
Livestock products[3]	Cow milk (in mil l)		1.534			1.478			1.462	
	Eggs (in mil pcs)		1.204			1.026			1.219	
	Wool (in t)		2.596			2.403			2.461	
	Honey (in t)		2.561			4.577			4.479	
	Meat (in t) Beef		99.000			100.000			96.000	
	Sheep		23.000			25.000			23.000	
	Pork		266.000			252.000			269.000	
	Poultry		75.000			80.000			84.000	

Source: Statistical office of RS, Belgrade, Republic of Serbia

[1] kg/tree
[2] t/ha
[3] Data for 2008, 2009 and 2010.

In Serbia, according to data from 2009, about 230.000 ha of total land are certified or in the process of certification (this area includes land used for harvesting wild berries, mushrooms and medicinal herbs). Arable land makes about 8.500 ha i.e. 3,5-4% of this area. In the structure of certified agricultural areas the largest areas are under perennial crops (apples, plums, strawberries, raspberries, cherries), while lesser part is under annuals crops (maize, soybean, wheat, vegetables) and grassland. In 2010 there was obvious increase of total certified area and area in the process of certification on 826.000 ha. However, total agricultural arable land under organic crops remained on about 8.500 ha. In compare to 2009, in 2010 there was a change within the structure of areas under organic crops (it come to increase of areas under grassland and annuals, while areas under perennials were reduced), Table 2. Total value of organic plant products in 2009 was approximately 20-25 million USD and over 90% of products were exported.

Table 2. Agricultural land organically certified by crops

Category	2009		2010	
	Area (in ha)*	Share in total area (in %)	Area (in ha**)	Share in total area (in %)
Annuals	1.240	15	1.383	16
Perennials	4.970	58	3.452	40
Grassland	2.290	27	3.800	44
Total area	8.500	100	8.635	100

Source: *Organic agriculture in Serbia at a glance, 2011
**Organic agriculture in Serbia at a glance, 2012

Although Serbia possesses favourable natural conditions for development of live stock breeding production, this branch of agriculture for years is in a state of crisis. Observed period was also characterized by decrease trend of total number of livestock (during the last decade number of livestock was decreased by average annual rate of 2-3%). Situation was particularly unfavourable within cattle, pigs and sheep breeding (Table 3.). Current situation is primarily a consequence of disturbed price parities, reduction of export market, non-customs limitations on export of fresh meat and meat products, life standard decreasing, disturbed system of financing and support, broken supply chains, etc.

Table 3. The number of livestock within the period 2009-2011. (in 000)

Date	Cattle	Pigs	Sheep	Goats	Horses	Poultry	Beehives
1st Dec 2008	1.057	3594	1605	154	17	17188	298
1st Dec 2009	1.002	3631	1504	143	14	22821	302
1st Dec 2010	938	3489	1475	129	14	20156	320

Source: Statistical yearbook 2011, Statistical office of RS, Belgrade, Republic of Serbia

Decrease trend of livestock fund and destabilization of national milk market (it is characterized by monopolistic market structure) were caused in observed period small oscillations in meat and cow milk production.

b) *Share of agriculture within GDP and agricultural budget* – According to official data of the Statistical Office of Republic of Serbia, during the previous period primary agriculture and food industry had share in total GDP in a range of around 15% (contribution of processing industry was approximately 4,5%). Despite the relatively high participation within total GDP, potential issue that has to be solved in next period is initiating of increase of share of food industry (higher valorisation of primary agriculture through the processing industry). Mentioned could be supported by the previous statement of WB officials that the strengthening of national agriculture in synergy with the food industry in general is a great opportunity for development of Serbia, especially in the period when world food prices have an upward trend.

Global economic crisis affected on the size of the national budget and budget expenditures directed to the Ministry of Agriculture, Trade, Forestry and Water Management. In Table 4 could be noticed, unfortunately restricted, official budgetary support to agriculture in observed period. It was in range of around 3,5% of total budget expenditures, what did not meet all needs of national agriculture in crisis period.

Table 4. Share of agricultural budget in total budget of Republic of Serbia (in mil RSD)

Year	Total budget expenditures	Agricultural budget (I+II)	Assets from budget (I)	Expenditures from additional incomes (II)	Share of agricultural within total budget (in %)
2009.	748.652,9	25.616,4	20.502,7	5.113,7	3,42
2010.	762.971,0	25.621,8	19.907,9	5.713,9	3,36
2011.	846.919,9	32.593,8	22.033,8	10.560,0	3,85
2012.	940.157,5	49.485,5	22.858,4	26.627,1	5,26

Source: Law on budget of Republic of Serbia for certain years

Despite the budget restriction, the agriculture achieved more than satisfactory results during the 2011, perceived through sufficient quantum of food products for the domestic market and export. Encouraging is the fact that the adopted budget for 2012 awards to agriculture significantly more financial assets compared to previous period. All announcements from competent Ministry say that priorities of agricultural policy, during this year, will be before all investments in development of livestock breeding and irrigation systems.

According to most agricultural producers and experts, considering the current state (strength), strategic importance and participation of agriculture within the total GDP and foreign trade exchange, if rapid and comprehensive development of agriculture (all production /processing lines and elements of rural development) is expected, taking into account the effects of economic crisis, the agricultural budget in the coming period should be increased to the level of participation of agriculture in total GDP, or even up to 20% of total budget expenditures.

c) Foreign trade exchange - For years, Serbian agriculture and food industry traditionally has realized foreign trade surplus. It is importance to notice that in observed period it increased more than twice (Table 5.). The most significant foreign trade partners within primary agriculture and processing industry Serbia found into EU countries (preferential status) and WBC (CEFTA), so in the structure of total export, common share of EU and CEFTA countries amounts with more than 90%.

Table 5. Foreign trade exchange of agriculture and food industry (in mld USD)

Year	Export	Import	Balance
2009.	1,94	1,31	0,63
2010.	2,24	1,04	1,2
2011.	2,80	1,45	1,35

Source: Chamber of Commerce of Republic of Serbia

If it is analyzed export/import structure of agricultural and food products in observed period, it could be noticed that in all years in total export cereals dominated. According to the available data from Directorate of Custom, among top 5 export products were mercantile maize (as trump card of national agriculture corn reached in 2011. record export in amount of around 423,8 mil USD, what represent increase of almost 40% in compare with previous year), refined sugar, mercantile wheat, edible sunflower oil and frozen raspberries.

At other side, in total value of imported agro-food products dominated traditionally uncompetitive products such like raw coffee, tobacco and products and tropical fruits (fresh bananas and oranges).[4]

CONCLUSION

According agricultural land capacities, large share of agriculture population in the total population, share of agriculture within GDP and achieved surplus in foreign trade exchange, Serbia could be defined as predominantly agrarian country, where agriculture and agro-food industry are still capable to produce larger volume of quality food than alimentary needs of its population.

Despite adopted belief that the national agriculture is accustomed to function in crisis situations with minimal consequences, in previous years can be felt relatively strong influence of the global economic crisis on some of its production elements (especially in livestock breeding), before all caused by reduction of agricultural budget and decrease of credit and investment activity.

[4] Increase of value of imported coffee in 2011 for almost 35% was more consequence of price jump on world market than growth of imported quantity.

It seems that starting from this year is adopted a general recommendation that only by stronger budgetary support in crisis period could be reduced/eliminated negative trends in agriculture, which would allow the growth of producers /processors incomes and new investment cycle. In other words, supported strengthening of national agro-complex, with retaining old and finding new export markets, in general could still be a great opportunity for development of Serbia, especially in situation when world food prices have constant upward trend. Certainly, it should take in consideration fact that inflation in Serbia is very sensitive to food prices trends, due to high oscillation of certain commodity groups' prices, as because of their high share within the CPI.

ACKNOWLEDGEMENTS

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NATURAL CHARACTERISTICS OF VEGETABLE PRODUCTION IN SOMBOR

Nataša KLJAJIĆ[1], Zorica SREDOJEVIĆ[2], Slavica ARSIĆ[3]

[1] Institute of Agricultural Economics, Belgrade, Volgina 15, Belgrade, Republic of Serbia, Phone: +38111 2972-858, Fax: + 381112972858, E-mail: natasa_k@iep.bg.ac.rs
[2] University of Belgrade-Faculty of Agriculture, Institute of Agroeconomy,
Nemanjina 6, 11080 Belgrade-Zemun, Republic of Serbia, E-mail: zokas@agrif.bg.ac.rs
[3] Institute of Agricultural Economics, Belgrade, Volgina 15, Belgrade, Republic of Serbia, Phone: +38111 2972-858, Fax: + 381112972858, E-mail: slavica_a@iep.bg.ac.rs

Corresponding author: natasa_k@iep.bg.ac.rs

Abstract

The work shows climatic parameters analysis, pedological characteristics and water potential on the territory of Sombor municipality aiming to estimate their influence on the production of some vegetables. This production is mostly outdoors, while the production in a confined space is far less. The research show inadequate rural development in Sombor municipality. Concidering that agriculture has been the dominant economic activity in this municipality, slow development of truck farming and therefore of agriculture in general is the reason for slow rural development, which is confirmed by the fact that young generations of villages show tendency to migrate from villages to the city of Sombor, or to other municipalities, as well as to foreign countries.

Key words: Sombor, climate, soil, water, production of vegetables, rural development.

INTRODUCTION

Awareness of climatic characteristics, soil characteristics and water resources is an important fact on which the economy of an area could be based, together with agriculture with all its branches. Climate is a result of a complex climate system and affects growth and return of agricultural crops per unit area. On the other side, *soil*, as a natural resource which is renewable and improvable, but due to irrational use could also be susceptible to negative changes, with its potential production capacity and in accordance with the way of use, mostly affects agricultural production of an area. *Water* also, being one of growth and development regulators of all plants and initiator of all physiological functions of plants, is a very important factor in intensification of agricultural production [2].

MATERIAL AND METHOD

Specific characteristics of Sombor area regarding climate were analyzed through average monthly climatic parameters for the period from 1981-2010 characteristic for this area. The data are related to weather station "Sombor'' and acquired from the Republic Hydrometeorological Service of Serbia. Soil and water characteristics of this area are taken from literature related to marketing projects written for Sombor municipality.

The data about beans and potato for the period from 2005-2010 were acquired from the Republic Bureau of Statistics.

RESULTS AND DISCUSSIONS

Research results were given through an analysis of natural characteristics of the area (climate, soil, water) where the the production of beans and potatoes were analyzed as vegetable crops, then through the analysis of the production of vegetable crops during the last 6 years and through the survey of problems and the ways to overcome those problems.

Natural specific characteristics

There is a natural climate variability about which we find out directly, through meteorological data, or indirectly using other methods. Climatic parameters for Sombor area are shown in the Table 1.

Table 1. Average climatic parameters for the period from 1981-2010. for Sombor area

Climate parameters	Months											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Tmax (°C)	13,7	15,0	22,0	25,3	30,4	33,3	35,4	34,7	30,9	26,7	20,0	13,9
Tmin (°C)	-13,0	-11,7	-6,16	-1,0	4,4	8,04	10,3	8,83	4,8	-2,5	5,7 2	11,1
Tsr (°C)	0,0	1,4	6,2	11,6	17,1	20,2	21,9	21,3	16,5	11,3	5,5	1,2
RH (%)	83,7	77,6	70,4	66,4	63,8	61,7	63,9	65,8	71,2	74,7	81,8	85,5
n (čas)	62,2	97,5	147,6	191,8	244,1	259,5	290,3	274,3	197,1	152,5	80,4	53,0
V (m/s)	2,2	2,5	2,8	2,7	2,3	2,1	1,9	1,7	1,7	2,0	2,3	2,4
P (mm)	37,3	29,9	36,4	45,3	60,0	81,5	66,2	53,2	54,4	47,3	54,0	47,5

Source: The data acquired from the Republic Hydrometeorological Service of Serbia for the period from 1981-2010

According to the data from the table, it is obvious that the highest **air temperatures** are in July and August, while the lowest are in January and February. Average monthly air temperatures range from 0,0 ºC in December to 21,9 ºC in July. **Insolation** ranges in intervals from 53,0 hour (December) to 290,3 hour (July).

The values of **air humidity** are in intervals from 61,7% to 85,5%.

The **wind speed** ranges from 1,7 m/s (August and September) to 2,8 m/s (March). Percentage of windy days per year is 883‰, and percentage of quiet weather conditions is 117‰. Most common winds are from the north (173‰) and northwest(175‰), and most uncommon ones are from the south (70‰) and southwest (75‰).

Average annual **rainfall** (often taken for effective rainfall like in this case) during the period of research was 613,0 mm. During vegetation period average rainfall was 360,6 mm [5].

Average annual **reference potential evapotranspiration** was 888,72 mm, while during vegetation period it was 688,58 mm [4].

Sombor area is characterized by large number of soil types and subtypes. Most common is chernozem with its subtypes (carbonated and non-carbonated, sandy, degraded, salted and chernozem poor in salt) cover the biggest part of municipality area. After chernozem, most common soil type is *meadow carbonated dark soil* with subtypes: degraded, carbonated etc. The third type is *swampy noncarbonated dark soil*, *slatine* (solonec, solonchak and solod), *alluvial soil*.

Main hydrographic characteristic of Sombor municipality is the Danube, with its meanders, numerous river branches, swamps, islands and marshes, then smaller rivers like The Plazović

and The Mostonga and canals of the Danube-Tisa-Danube Hydro System. Canal system is divided in relation to the surface into river basins and in relation to the function into several categories (main and II and III category).

The Danube affects positively economic development of the area regarding river traffic, melioration, hunting, fishing, tourism etc. But it represents potential danger which could appear because of floods.

Density of canals depends of the height and pedologic characteristics of the area. Drainage is organized on lower and degraded soil which enables better soil use on this area. Contrary to drainage, irrigation hasn't been developed, so it is necessary to develop it through a plan [3].

Production of vegetable crops

Production of vegetables in Sombor municipality is on a very high level. The data related to beans and potatoes for the analyzed period are shown in Table 2.

Table 2. Survey of the production of vegetable crops in Sombor area

Year	Beans				Potato			
	Total production (t)	Chain index (%)	Base index (%) 2005=100	Production in Kg/ha	Total production (t)	Chain index (%)	Base index (%) 2005=100	Production in Kg/ha
2005	333	-	-	1.443	13.552	-	-	15.906
2006	296	11,1	11,1	1.440	13.070	3,6	3,6	15.862
2007	171	42,2	48,6	874	8.794	32,7	35,1	11.332
2008	243	42,1	27,0	1.335	13.435	52,8	0,9	16.305
2009	258	6,2	22,5	1.391	17.111	27,4	26,3	19.118
2010	305	18,2	8,4	1.607	778	95,4	94,3	6.175
Prosek	267,7	-	-	1.348,3	11.123,3	-	-	1.5704,6

Source: Based on the data from the Republic Bureau of Statistics-Municipalities in Serbia for analyzed years

Total production of beans for the period from 2005-2010 ranges from 171t (realized in 2007) to 333t (realized in 2005).

Production in 2007 was 42,2% less in relation to the previous, but in relation to 2005 it was 48,6% less. During the next 2008, the production was 42,1% increased in relation to 2007 and 27,0% increased in relation to 2005. In relation to 2009 certain increase in production was noticed in relation to the previous 2008 – 6,2%, but in relation to 2005 it was 22,5% less. In 2010 also, the production was 18,2% increased in relation to the previous 2009, but it was 8,4% less in relation to the base 2005.

In 2010 the production of beans in the Republic of Serbia was 43.237 t and return was 1,2 t/ha, while the share of Sombor

municipality in the production of beans in the Republic of Serbia was 0,7% - 305 t and its share in the production of beans in AP Vojvodina was 3,2%.

The production of potato, as well as the production of beans in Sombor municipality wasn't significant. During the observed period, the greatest production was realized in 2009 (17.111 t), and the least production was recorded in 2010 (778 t).

So, the production varied from year to year. In 2006 the production was 3,6% less than in the previous 2005, which was taken as base year. In 2007 more significant drop in production was noticed. The production was 32,7% less in relation to the previous year and 35,1% in relation to the base year. Then in 2008, the production was increased again – it was 52,8% more than in the previous year, and 0,9% in relation to the base year. The next, 2009 was characterized by an increase in the production of potato, it was 27,4% increased in relation to the previous and 26,3% increased in relation to the base year. The following, 2010 was characterized by a sudden drop in the production which was 95,4% in relation to the previous year and almost the same in relation to 2005.

In 2010, realized production of potato in the Republic of Serbia was 887.363 t and realized income was 1,4 t/ha, whereas the share of Sombor municipality in the production of the Republic of Serbia in the same year was insignificant - 8,8% and 0,3% in the production of AP Vojvodina.

Possible directions for future development

Generally, Sombor municipality has favorable natural conditions for the development of the production of vegetables. First of all, weather conditions are favorable, except for sudden oscillations in temperature which cause stress among plants. This problem could be solved by selecting adequate types and kinds of vegetables and by applying irrigation as a hydroamelioration measure.

Physical, mechanical and chemical properties of soil are favorable. In places where it is not the case, the problem could be solved through quality soil tilling and applying adequate equipment for different soil types, as well as applying certain agrotechnical or chemical amelioration measures. Problem is the fact that in this municipality there is no organized supervision of soil quality and soil pollution. Studies that are being carried out are periodical and are not detailed enough and are being carried out only for the purpose of selecting kinds, seeds and fertilizers. The use of fertilizers and chemicals (pesticides, insecticides and funghicides) for the protection of plants has rarely been controlled and has rarely been planned.

There is enough water for irrigation. However, although there are sources for irrigation like canals and wells, water has not been used sufficiently and its quality has not been controlled.

Vegetables are mostly produced by small holders, who are not market oriented. Some of the basic problems that they have to deal with are: product placement, weak producer organizations, old-fashioned agricultural machinery, in average 15-20 years old etc.

Therefore, there is the need for organization so that the producers could adopt and apply new technologies and additional education systems related to production (through universities, expert services or private advisors).

There is a long tradition of vegetable crop production in our country. Storage capacity has been more and more taken over by private sector which is a positive fact. The problem is that the existing capacities are inapropriate with old-fashioned methods of preservation and without air-conditioning which results in great losses. There is a possibility for revitalization of the existing warehouses through credit loans, as well as the possibility for building new warehouses.

Regarding assortment, vegetable crops have strong market position and keep pace with Europe. Faults are great oscillations in quality and return. There is an occurrence of seasonal surplus. There are also oscillations in prices from year to year, as well as changes in the purpose of production capacities. It is considered that one of the faults of vegetable crops production is that there is no purpose production of vegetables for the food

processing industry (for example growing potatoes for crisps production).

Vegetable crops suffer from similar problems as well as most of other branches of agriculture in Serbia. There is a lack of experts in the production of vegetables. There is an unfavorable age structure. Producers are not really interested in the improvement of production. Education of producers and advisory services are the fastest way to improve production.

It is possible to improve production through joining land, on which, after machinery and technology improvement, it could also be possible to apply irrigation. It is necessary to focus the production in certain area and introduce organic and integral production through constant promotional activities and to educate producers by supplying them with quality written material, brochures, educational TV broadcasting etc.

Some of the possibilities for improvement in the production of vegetables are:
- to expand assortment,
- to improve technology and machinery,
- to intensify irrigation,
- to join land and organize producers,
- educate producers through improvement in advisory service and university,to enable more favorable credit terms for producers and other measures to stimulate producers etc [1].

CONCLUSIONS

Sombor municipality is characterized by favorable geographical location which includes vicinity of the EU market, quality soil suitable for agricultural production, the existance of canal system which could satisfy the needs in water for the purpose of irrigation.

Since agriculture represents dominant activity in settlements and on farms, exactly that is the reason of inadequate rural development on the territory of Sombor municipality. The problem is in migrations of young generations from villages to the city of Sombor and other municipalities in the Republic of Serbia and to foreign countries. Also, there is a low educational structure of the population, relatively restricted possibilities to educate

them, move them and inform them. Problems of rural development are actual for a long time and it is necessary to prepare a strategy for finding solutions for improvement of community infrastructure in villages, to raise the level of health protection, as well as to support development of agricultural production and development of so-called eco and rural tourism as well.

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AGRICULTURAL MARKET AND INVESTMENT IN THE ROMANIAN AGRICULTURE

Mihaela KRUSZLICIKA[1], Vergina CHIRIȚESCU[1], Sia SĂRARU[2]

[1] Romanian Academy, Institute of Agricultural Economics, 13, Calea 13 Septembrie st., 5th district, Bucharest, Zip code 050711, Romania, Tel. / Fax. + 4.021.318.24.11, Mobile: + 4.0744.818.086, E-mail: kruzli@yahoo.com and v.chiritescu@yahoo.com
[2] Bioterra University, 81, Gârlei st., 1st district, Bucharest, Postal code 013724, Romania, Tel./Fax: + 4.021.490.61.29, E-mail: sia_ion@yahoo.com

Corresponding author : v.chiritescu@yahoo.com

Abstract

In the current context of economic - financial crisis, climate change, the ever increasing world population and a growing food crisis provided many specialists, studying agricultural market and investment in agriculture is timely and useful. The importance of agricultural market lies in the very definition of agriculture as the work to "increase all types of commercial crops, including seed storage and the quantities required." Investments in Romanian agriculture have risen in recent years, despite the current economic crisis. Thus, in Romanian agriculture have invested millions of euros largest manufacturers of agricultural machinery, seeds and seedlings, chemical fertilizers, etc. These investors rely on both the growth and development of local farming and the export potential of Romania. Do not forget that Romania has one of the largest in Europe in terms of area. In addition, investors in our country believes that labor is cheaper and better prepared. Opinion of many investors, but also to many experts, is that Romania has the chance to be one of the most important agricultural countries in Europe, because the land is good, so rarely met in other European countries. Romanian agriculture is a key factor in the economy, which can really help the country out of economic crisis, financial and social.

Keywords: agricultural market, investment in agriculture, agricultural potential, Romania.

INTRODUCTION

The general objective of the paper is Romania's agricultural market research and investment in the agricultural situation in Romania made lately. In the study of agricultural markets will be analyzed: agricultural market functions, factors influencing the agricultural market, the factors determining the demand for agricultural products and food, Romanian agricultural market structure, etc. The research was conducted by studying the literature cited in references, and by making a documentary on the Internet. Main source of statistical information was used.

MATERIAL AND METHOD

Work methodology and research methods used in preparing this work was composed of:

• studying the many specialty papers, which are found in the bibliography;
• studying the many specialized sites on the Internet;
• direct observations made on site and field studies;
• analysis of statistical data and data held by local agricultural units;
• official sites consultation bodies with responsibilities in agriculture (Ministry of Agriculture and Rural Development).
As *research methods* were used:
- analytical methods that rely on mathematical tools by which to obtain optimal solutions to the various objectives set, depending on the parameters taken into account;
- statistical methods that are used in the analysis of sets of data, they characterized the evolution of effective demand expressed by consumers in certain periods of time;
- normative methods that are based on the use of "rules" consumer driven, usually,

statistically, and refers to the volume and market structure.

RESULTS AND DISCUSSIONS

The importance of agricultural market lies in the very definition of agriculture as the work to "increase all types of commercial crops, including quantities required for storage and sowing" (defined in Order MAPAM no. 49/2004). [8]
Agricultural policy regulations, including those related to the common agricultural market, are contained in the Treaty of Rome (1957), as amended and supplemented by the Treaty of Amsterdam (1997) and refers to the fact that:
-agricultural products circulate freely within the EU single market principle;
-is favored consumption of agricultural products originating in the European Union of, by imposing higher prices of imported products to the domestic production, according to the principle of Community preference.
The main **functions of the agricultural market** are:
A.Providing people with agricultural and food products. To fulfill this function, agricultural market must be a subsystem consisting of inputs (local production, own consumption, imports, national reserves and foreign aid), the subsystem actual market (supply and demand confrontation), and the output subsystem (domestic household consumption, raw material processing industries, etc.). [9]
B.Ensuring national reserve of agricultural products and food;
C.Ensuring the availability for export of agricultural and food products.
The main *factors* influencing the agricultural market are:
a.local agricultural production, which determines the size of agricultural supply and market supply and tacitly as full satisfaction of consumer demand;
b.imports of agricultural products and foodstuffs;
c.the income, that influence agricultural market through product demand;

d. size of agricultural and food prices, the impact on people's purchasing power.
Demand for agricultural products and food consumption has certain peculiarities and classified according to certain *criteria*: [1]
A. After showing how the time:
- daily (current), the basic foods such as bread, milk, meat, eggs, potatoes, etc.;
- regular (seasonal) products appearing on the market at certain times of year, as is the Easter lamb, various fruits (strawberries, cherries, plums, etc.), wool from sheep shearing occurs after application, vegetables, fruits to preserve for winter (cabbage, pickles, compotes, jams, etc..)
- rare, appears to produce not play an important role in household consumption (flowers, certain alcoholic beverages, herbs);
B. Depending on how the purchase decision making process:
- firm (constant) in the case of current consumer purchase decision is taken prior to the acts of sale - purchase;
- spontaneous, the purchase decision is taken on the spot in the store, the buyer is attracted to a variety of a product (cheese, meat, wine, juices, ice cream, etc.);
C. Depending on its intensity, the application may be constant, increasing or decreasing:
- the constant demand manifests food that meet vital human needs (food first order);
- increasing demand for food increases the household income and consumption tends to be optimal;
- decreasing demand for certain food categories with food changing population structure, it reduces demand for energy products (bread), low quality products;
D. Depending on the stability of human needs:
- actual, that manifests real market is solvent, the carriers they are actually consumed;
- potential, which can be solvent at the time of the market, but lack products are unknown or insolvent enterprises today, but will become solvent in subsequent periods, when they increase household income.
Factors influencing demand for food products is a complex, dynamic consist of the demographic, economic, geographical,

biological, social, psychological, etc. circumstances. Among these factors, it highlights: [1]

a - *demographic factors* - refer to: changes in population, age structure, sex, socio-professional type, number and size of households, population density, geographic area, the urban population and rural;

b - *economic factors* - refers to the overall situation of national economy is assessed with indicators expressing GDP growth, labor productivity growth, unemployment, income growth rate, inflation rate, indicators that directly affect people's income and selling prices of products;

c - *geographic and social environment factors* (urban, rural);

d - *psychological and social factors* - is exhibited in the demand for food consumption according to the complexity of man as a being with rational thinking and behavior. Each individual has certain preferences for consumption are determined by the unit's physical, mental, his level of education, social environment, the degree of responsiveness;

e - *circumstantial factors* - refers to various natural or social phenomena. Natural disasters (drought, hail, floods, fires, etc.) and regional conflicts (wars, etc.) increases the demand for food, people acting in the formation of stocks to ensure consumer needs.

Agricultural markets in countries operating under open exchange competition, specific regulations and different interventions to support farmers and consumers, border protection and enforcement of international agreements that are part.

Agriculture has peculiarities and difficulties coping with demand because of choice and that can generate surpluses or shortages of goods of first necessity to the population. To ensure market balance, interventionist policies practiced world countries and different regulation mechanisms in time and space. mechanisms operating in developed markets were targeted protection and fostering internal competition, providing domestic and international balances of agricultural products. ***Demand for agricultural products*** of first necessity is less elastic to prices in the short

term as population growth and changes in food consumption patterns are not edifying than the long term. Demand for agricultural commodities in the world is relatively stable if there are no increases in income or population explosions. The geographical spread, especially in developing countries, demand for staple foods vary depending on demographic developments quantity and quality depending on income level. Demand specific qualitative developments are especially developed countries, where income level is that it is often flexible on the price, such as certain foods (exotic fruit, developed superior products). The developed countries assures a high level of food self-sufficiency in basic products, nationally and in the European Union countries.

Similar to other sectors and industries, and the rural economy is a fundamental institution of market economic system. Currently in Romanian agriculture and in the broader context of the rural economy as a whole, to the role which it is naturally a competitive market is severely restricted by a set of factors and unfavorable *conditions*, among which stand out: [2]

• persistence of obstructed communication channels between supply and demand;

• the imbalance widened in scope potential demand and competition between carriers of the offer. Increased fragmentation of land property and exploitation which accompanied the systemic and structural reforms of the Romanian agriculture is at the basis of a profound imbalance in the competitive potential of the carriers supply over demand that the carriers;

• crisis institutional environment is one of the prominent characteristics of current rural markets. Illustrative of this is underdeveloped agricultural markets contractual relations to which adds the weak enforcement mechanisms contractual discipline;

• improving market function of producers uncompetitive agricultural sector and viable in an open economy is not done properly. High share of own consumption, as is the casual market relations in large parts of farms are a significant part of agricultural production is

valued outside freight channels and circuits. As a result, market contribution in the concentration of land property and viable agricultural units operating in an open economy on the path of structural adjustment of Romanian agriculture is restricted;

• credit market is virtually blocked especially for large mass of individual farmers. For various reasons, including a central position stands the high transaction costs in Romanian rural credit market has not functioned as institutional infrastructure indispensable for the funds to farmers. Land loan foreclosure consequences are felt by lowering short-term yields in agricultural production in the absence of physical resources to ensure appropriate inputs and medium and long term by restricting drastically, in some cases cancel, structural adjustment measures in the rural economy as a whole.

• links with foreign markets agricultural sector remain at low levels in the exports. As a result, farmers do not feel sufficiently pressures and incentives they create international markets for quality, cost, innovation, etc., essential elements of structural adjustment in agriculture and thus to strengthen the competitiveness of Romanian products and.

In these circumstances there is no accident that in recent years, as the liberalization of foreign trade with agro food products every year imports have registered a dynamic upward and with it an unprecedented increase in trade deficit.

So far it seems that the major losers of the opening of the Romanian economy were farmers. And, this authentic recording the counter, as noted, a not insignificant role played by state and dynamic agricultural markets in Romania, where the restrictions and bottlenecks revealed define a true crisis.

Impact that it generates factors and boundary conditions presented, the state and dynamics of markets, is likely to cause major disturbances that may threaten the foundations functioning rural economy in Romania. Analysis and evaluation of constraints and bottlenecks on rural markets in our country suggests that priorities for action: organizing

supply, demand de-monopolization, unlocking connections between carriers of supply and demand, mitigate the institutional crisis in the field who would be promoted as part integral to a deep structural reforms in agriculture. [2]

Investments in Romanian agriculture have risen in recent years, despite the current economic crisis. Thus, in Romanian agriculture have invested millions of euros largest manufacturers of agricultural machinery, seeds and seedlings, chemical fertilizers, etc. These investors rely on both the growth and development of local farming and the export potential of Romania.

For *example*: the Austrian manufacturer of agricultural machinery Biso invested millions of euros in Romanian agricultural market development. In the last three years, Biso Romania has invested 7.5 million in Drajna (Calarasi county), where he built offices, a showroom, a service area and parts, and a production hall, which will serve about 200 employees in the future. For 2012, agricultural machinery manufacturing company has a budget of nearly 2 million for network expansion, which will increase with 3 new outlets, which means they will be present in Romania, by the end, with 8 branches. Moreover, the company is heading and attention to investments in green energy production. [6]

Another example: two Italian investors in the city develops Măcin, Tulcea, a project worth 50 million euros for the establishment of greenhouses for vegetables and fruits on an area of 100 hectares. The Măcin, there was a very strong vegetable base. There was a center for vegetables and fruit and vegetable association based on the former system. The project initiated by the two Italian investors will create up to 500 jobs. The Department of Agriculture and Rural Development Tulcea, 21,667 hectares of the total cultivation area of about 294,000 acres in the county is cultivated with the help of foreign investors. In a ranking of the most important investment they are two companies with British capital, which operates a total area of 10,699 hectares in rural Chilia Veche and Pardina in the Danube Delta. Also, according to DARD Tulcea,

Spanish grape growing and winemaking in the vineyard Sarica Niculiţel with an area of approximately 1,500 hectares, Italians investing in agriculture near the city of Tulcea and Isaccea, Cerna, Ciucurova, Dorobanţu and Mihail Kogălniceanu. [12]

The examples could continue, fortunately ...

In recent years, one of the most attractive areas for investment proved to be when the **livestock**, which absorbed about 16% of the total investment made in the Romanian rural environment. Another perspective can be viable and efficient farming and animal husbandry, biological, which takes into account: environmental protection, soil protection, protection of biodiversity, protection of local breeds (more resistant to diseases and climate), implement a system of sustainable agriculture and sustainable.

Financial resources for investment in agriculture will be achieved and accessing European funds, both of the remaining programming period 2007 - 2013, and those that will be allotted to Romania after 2014. Since beginning 2012, the Ministry of Agriculture and Rural Development (MARD) has attracted 502 million euros from European funds, but most came in the form of direct subsidies to farmers provided by Brussels. Only 73 million (14.5%) of the European Commission settled money went to finance investment projects. [11]

According to a study by INSEAD Alumni Association Romania (IAA Romania Business Barometer), 60% of respondents agree that agriculture is the main area that will attract investors this year. [5]

CONCLUSIONS

Romania has a great potential for agricultural production. Local production and self-consumption can provide agricultural and food for 50 million consumers. Romania currently provides agricultural products on the Romanian market for 10 million and the remaining 10 million Romanian food is imported. If imported vegetables, fruits, grapes, cereals, meat preparations and other products can be produced in very good

conditions in Romania means that the office market is not fully met. Normally it should be imported agricultural and food products are not favorable conditions in our country. [9]

Romania has the chance to be one of the most important agricultural countries in Europe, because the land is good, so rare in other countries have cheap labor and quality, has good weather almost all crops, etc. [6]

CAP was considered of interest even in 1958, the entry into force of the Treaties of Rome. The aim Common Agricultural Policy (CAP) is to ensure farmers a fair standard of living for farmers to provide consumers with quality products at reasonable prices and to preserve the countryside. [17]

About 90% of agricultural production in EU Member States is regulated under the so-called common market organizations (except, for example, alcohol and potatoes). Gradually the common market organizations have replaced the national products / sectors covered by the CAP. To implement common measures of market regulation, the Community shall have the following instruments: prices, market intervention, financial aid, production quotas, joint border protection. [17]

EU agricultural markets operating on a complex system of price regulation of marketing. Thus, annually by the European Council set three price levels for products covered by the CAP target price, the intervention price and the threshold price. Due to the higher level of domestic prices of agricultural products to world market, Community exporters are compensated with money representing the difference in price. Export subsidies are actually direct export subsidies. [17]

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bio-economic complex training to ensure the food and feed safety and security of anthropogenic ecosystems".

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ISSUES OF EFFICIENT USE OF AGRICULTURAL LAND AND SOIL QUALITY IN REPUBLIC OF MOLDOVA

Tamara LEAH

Institute of Pedology, Agrochemistry and Soil Protection "Nicolae Dimo", Chisinau 100 Ialoveni, 2070, Chisinau, Republic of Moldova, Phone: +373-22 284-861 Fax: +373-22 284-855, E-mail: tamaraleah09@gmail.com

Abstract

It highlights the main issues that confronting the agriculture of the Republic of Moldova, the effectiveness of land use and quality of agricultural soils. Issues of sustainable use of agricultural land are: excessive parceling land; inappropriate usage; failure of protective measures; irresponsible human activity, which leading to changes in landscapes, ecosystems and environment. Inefficient usage of agricultural land led to soil degradation that has spread throughout the area. Misuse of land led to reduced productivity of landscape, lowering evaluation notes, increased the processes of erosion, dehumification, salinization, secondary soil compaction. The results of highlight problems concerning the efficient use of agricultural land and diminution of soil quality degradation factors were developed mitigation measures and protection of land in context of sustainable development

Keywords: *soil, fertility, degradation, protection, agriculture*

INTRODUCTION

In Republic of Moldova, the agriculture is the most vulnerable economic sector to climate change due its dependence on weather conditions. Relief, climate and soils are the principal natural conditions affecting agricultural production. The relief and landscape serves as thermal threshold and causes differentiation of agricultural practices on relief units. Climate in Moldova is generally favorable, but sometimes show extreme events that compromise some or all crops (drought, spring frosts, hailstone, floods, etc.). The soils demonstrate a high fertility in the northern zone and moderate fertility in central and southern areas. Much of the soils are affected by degradation processes and requiring urgent improvement works.

Chernozems occupy the area of 2,510 million hectares or 70% of land area and 78% of agricultural land [1]. Country's food security depends on the state of quality and level of fertility of these soils. An effective sustainable agriculture, based on the current progressive technologies and procedures can only be conceived in a production system and quality long-storage and production capacity of agricultural soils.

MATERIAL AND METHOD

In order to characterize the issues of efficient use of agricultural land and evolution of soil quality were used the fertility indicators and principal factors and forms of soil degradation in agriculture. On the estimated results were elaborations the measures and technological procedures to improve soil fertility.

RESULTS AND DISCUSSIONS

The main problems that confront agriculture of Moldova are related to the effectiveness of land use and quality of agricultural soils. Issues of sustainable use of agricultural land are excessive parcelling of privatized land, inappropriate usage, and failure of protective measures, irresponsible human activity, leading to change in landscapes, ecosystems and environment. Insufficient usage of agricultural land led to soil degradation that has spread throughout the total area. Incorrect use of agricultural land led to reduced productivity, decreasing soil rating, increasing soil erosion, dehumification, salinization processes, and soil secondary compaction of arable layer [2]. The results highlight the problems of efficient use of land and

diminishing the quality of soil degradation, mitigation and soil protection measures in the context of sustainable development were development and elaborated.

Soil fertility. Current human impact has considerable influence on nutrients regimes and soil fertility, expressed through reduced productivity and lowering evaluation rating note of agricultural soils. The mail cause's reduction evaluation rating note is erosion, dehumification and unconditional irrigation waters. Note of soil evaluation of agricultural land decreased during 1970-2010 from 70 to 63 points. Annual losses of fertile soils as a result of the evaluation note reduction of soil is 330 MDL for 1 ha of agricultural land and 7,7 million MDL for the whole studied area [1]. The average rating note of agricultural land and their distribution on evaluation classes is presented in table 1 and 2.

Table1. Evaluation note of soil on the zones

Climatic Zones	Agricultural utilizations		
	Arable land	Orchards plantation	Vineyard plantation
North	76	74	70
Central	64	71	69
South	64	67	62
Southeast	69	69	67
The republic	68	70	67

Table 2. Arable land distribution by evaluation class and soil fertility

Evalu-ation class	Rating note, points	Soil fertility	Surface	
			thousand ha	%
I	81-100	very high	776,5	42,3
II	61-80	high	780,3	42,5
III	41-60	moderate	183,3	9,9
IV	21-40	low	95,7	5,3
V	1-20	very low	0	-

Soil degradation. Small farms, with an average size of 1.5 ha, often divided into 3-4 lots, occupies 28% of the total land area and 34% of private agricultural land. As a result of intensive use, often without the application of crop rotation, fertilizers, work conservation, the soil quality used in these households has worsened considerably, making them most vulnerable to changing climate. The world agriculture practice confirms that high soil productivities in very small farms are impossible to obtain and keep long time. Soils of Moldova are subject to degradation processes, which decrease their fertility and deterioration. Continue to expand the area affected by erosion and landslides processes, dehumification and damage of structure and compaction, salinization and swampy soil, drought intensified. Soils from southern part are most vulnerable and have a low adaptation to climate conditions (table 3, 4).

Table 3. Vulnerability degree of crops in the climatic zones

Zone	Precipitation	t°C increase	Vulnerability degree
North	70-80% from norm	with 1-1,5°C	Low
Center	60-70% from norm	with 2°C	Moderate
South	< 50% from norm	with 3-4°C	High

Table 4. Adaptation degree of crops in the climatic zones

Zone	Drought	Reducing harvest	Adaptation degree
North	weak 1 in 10 years	20%	High
Center	severe 1 in 5-6 years	20-50%	Moderate
South	very severe 1- in 3 years	> 50%	Low

Increasing temperature and precipitation changes observed in growth, already affect various aspects of agricultural crops, vineyards and orchards, pasture and meadows, increasing the degree of surface erosion leading to lower yields of crops and pastures on the slopes and hillsides.

Land reform has not created conditions for increasing soil fertility, sustainable land use, increasing agricultural productivity. Result of this strategy conduct to degradation of total agricultural lands. Nowadays, were identified and described 5 types and 40 forms of soil degradation, leading to lower production capacity or complete deterioration of soil cover, the estimated losses are enormous (table 5).

Erosion is the main factor of soil degradation. Soil erosion together with landslides presents a hazard phenomenon and dangerous risk,

which conditions enormous losses economy, population, and essentially reduces the land of the country. Annual social and household needs, from the agricultural circuit are removed significant areas of agricultural land, that contributes to reducing surface per capita (0.43 ha), the normative is 0.60 ha.

Table 5. The main factors and forms of soil degradation and affected agricultural area

Factors and forms of soil degradation	Affected surface, thou-sands ha	Cost of annual losses, th-ds $
Erosion by water	839,7	221365
Landslides	81,0	-
Destruction of soil by ravines	8,8	7622
Secondary compaction of arable soils	2183,0	39730
Salinization of humic-gleic soils	20,0	3640
Salinization of alluvial soil	99,0	5405
Alkalization of amorphous soils	25,0	1820
Dehumification	1037,0	18873
Degradation by irrigation	12,8	699
Other factors of degradation	2043	137325

Eroded soil surface increased in the last 40 years with 284 thousand ha, and annual growth intensity is 7,7 thousand ha. The low eroded soil fertility decreases by 20%, moderately eroded – by 20-40%, highly eroded – by 40-60% [2].

Increased land areas affected by active landslides is over 55 thousand ha and 350 thousand ha of passive landslides.

Dehumification. During the 130 years of exploitation of agricultural land the amount of humus in the soil decreased from 5-6% to 2.5-3.0% [3,5]. The losses of humus in soils depend on two major processes: biological (mineralization and dehumification) and erozional. The annual losses of humus in the arable soils and multi annual plantation of climatic zones influenced by erosion are estimated and presented in table 6.

Table 6. The annual losses of humus caused by erosion, thousand tones

Climatic zone	Arable land	Perennial plantation	Due to ravines
North	115	12,3	0,56
Center	255	32,7	0,74
Southeast	21	7,2	0,16
South	215	38,6	0,71
Total	606	90,8	2,17

During 1877-2007 years the humus amount in arable layer of chernozem typical in result of agriculture use decreased by 2.47% or 43% from initial contents of fallow land in 1877, the humus speed reduction was 0.019% annually [5].

To form an equilibrated or positive humus balance is necessary, averaged over rotation, to be incorporated into the soil at least 10 tones of manure. In the past 20 years, the amount of organic fertilizers decreased 60 times and consists 0.1 t/ha, surface of alfalfa decreased 4-5 times, plant residues on the large surface are burned [1]. Therefore, soil humus balance is negative (- 0.7 t/ha), from account of erosion losses - (- 1.1 t/ha). The total agriculture lands lost annually 2.4 million tones of humus [4]. Calculated prognoses shows that, if maintaining the current situation up to 2025 year the humus content in soils of Moldova will decrease until the critical level – 2.5-2.8%, and cereal crops, formed at the expense of natural fertility is will reduce to 2.1 t/ha (table 7).

Table 7. Prognosis modification of humus content and cereal crops

Years	Humus, %	Reserves 0-30 cm, t/ha	Crop, t/ha	
			wheat	corn
1897	5-6	200	-	-
1950	4-5	150	-	-
1965	3,5-4,0	180	3,2	4,2
1990	3,0-3,5	110	2,5	3,4
2025	2,5-3,0	90	2,1	2,8

Irrigation with unconditional waters reduces fertility in most of soils, both in the soil with low rating note, as well as in soil with higher note of evaluation. Irrigation affects negatively the aggregates state in arable layer, is losing large amounts of calcium and accumulated the magnesium and sodium.

Lack of investment and failing policy in agriculture has increased the unworked soil surfaces. Results show that in 2011 were left fallow around 200 thousands ha or 4 times more than in 2009. The abandonment of agricultural land has led to significant increases in prices of bakery production that endangers the country's food security. Prices for seeds, plant protection products,

mechanical services etc. increased on average by 20-25%. Without adequate subsides, use of plant protection products decreased 2 times, the surface of irrigation soils diminished more than 3 times. Processes and forms of soil degradation changed hydrological regime condition, promotes land aridity and desertification. On these investigation wee can conclude that the current state of the soil cover is unsatisfactory and on about 10% of land – critical.

Land suitability for different agricultural uses. Affiliation of the largest part of Moldova's territory to de under humid zone with frequent droughts in vegetation period of plants requires a total adaptation to the dry conditions taking into account the particularities of each agroclimatical zone.

North Zone is characterized by gray soils and clay alluvial chernozems. The restrictive factors of production capacity of soils are weakly erosion, degradation of structural stability, secondary compaction of recently ploughed layer (0-25 cm) and post ploughed layer (25-35 cm), dehumification, low content of humus and mobile phosphorus. The recommendation for this zone are crop rotation with perennial grasses, tillage once in 3-4 years at a depth of 35 cm, fertilization with organic and mineral fertilizers, irrigation of vegetable crops, and irrigation of other land only in long periods of drought [2].

Central Zone is characterized by gray and brown soils that have low and moderate fertility. The restrictive factors of soil capacity production are droughts, erosion, alkalization, salinization, compaction and dehumification. The main problem in this zone is soil erosion of surface and depth. This issue requires implementation complex of agrotechnical, fitoameliorative and hydrotechnical measures.

South Zone is characterized by ordinary, calcareous and southern chernozems. Soils are a good and moderate fertility. This zone is driest and has a high frequency of droughts. The agriculture in south part request irrigation on the whole territory, utilization of anti erosion agricultural machineries for the tillage on the slopes, respecting of crop rotation, cultivation system in alternative strips of crops in dependence of slope inclination, soil

tillage once in 5-6 years at a depth of 35 cm, application of fertilizes, irrigation with condition water from all possible sources, organization of large irrigation on the terrace of river Nistru and Prut with ordinary and calcareous chernozems.

Identifying the problems, causes and solutions to develop measures to combat land degradetion is possible only through cadastre evaluation and monitoring of soil quality, creation of land information system.

Information soil system will serve the citizens right of access to information concerning the quality of the soil cover of the republic, to promote measures to prevent and combat degradation processes, soil deterioration and degradation caused by natural phenomena or human activity, to maintain long term agricultural production capacity of land.

CONCLUSIONS

Agricultural land use in accordance with the potential of soil and climate of each zone will contribute to adapt agriculture to drought conditions and ensure food security of the country. Implementation of measures and elaborated actions will conduct to provide soil degradation, increase crops productivity, and improve the ecological state of environment.

Prevention of soil degradation can be achieved by profound changes of mentality, behaviour and rational management of agricultural land.

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EVOLUTION OF RESOURCES AND THEIR USE IN FISH PRODUCTION IN ROMANIA

Camelia LUCHIAN

Ministry of Agriculture, Forests and Rural Development, Paying and Intervention Agency for Agriculture, 17 Carol I Blvd, 030061, Bucharest, Romania
Email: camelia.luchian@apia.org.ro

Abstract

In the study, it was taken into consideration gradually the problem of fish production at national level, from the points of view of both the quantity (the production thus realized) and quality (human consumption, gross value added). It was noted that, predominantly, the import resources are prevalent, together with a tendency of consumption from total use. The usable production was decreased, but in the same time there was noted an increase of imports and exports, and of internal consumption availability, including human consumption. These problems underline the existence, in fish science, of an increased evolution for both intermediary consumption and gross value added.

Keywords: *fish, fishing, aquaculture, Romania*

INTRODUCTION

The present situation of fish science cannot be understood but only by deeply knowing the manifestation of the entire set of factors natural-technologic, economic and politics-social. These are the basis of the evolution, but also of the strategies and tactics of exploitation in fish science. All these elements, considered at a national level, can be delimitated by the actual production, registered consumption, productivity and income obtained in this sector.

For this reason the sector must be regarded as a whole with multiple points of view, the main aspects being tackled in the paper sequentially, from the point of view of the origin of production, balance, as well as intermediary consumption and gross value added. In this respect, the importance of fish science becomes a meaningful topic, the paper being structured in the directions discussed.

MATERIAL AND METHOD

In respect with the legislation [4], the names and indicators were used according with the norms imposed by legislation, regarding: territorial aspects (fish farms), fish potential (fish production, aquaculture, fish resources, capacity, catch, fish stock), fish farm activity (fishing, monitoring, intensive fish farm, fish effort).

The determinations used statistic data and interpretation, and were taken as per the level of indicators. There were taken into consideration indicators like: fish production, gross domestic product, intermediary production, gross added value etc. For the national level, the interpretation underlined the fish resources (with reference to usable production and imports), together with other uses like exports, internal consumption availability, stock variation and availability for internal consumption). The analysis encompassed years 1995-2000, and the dynamics of the analysis included comparisons between resources and availability.

RESULTS AND DISCUSSIONS

1.   Evolution of actual fish production in Romanian fish industry. The problem of fish production was taken into consideration gradually at national level, from the points of view of both the quantity (the production thus realized) and quality (human consumption, gross value added).

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Table 1. The evolution of fish production in Romania

Domain	UM	1995	2000	2003	2005
Aquaculture	tons	19830	9727	9041.69	7284
	%	100	49.05	45.59	36.73
Fishing in Romanian fresh waters	tons	9048	4896	8438.1	4042
	%	100	54.11	93.25	44.67
Fishing in Black Sea	tons	2719	2476	1612	2026
	%	100	91.06	59.28	74.51
Ocean fishing	tons	37508	0	0	0
	%	100	0	0	0
TOTAL	tons	69105	17099	19091.79	13352
	%	100	24.74	27.62	19.32

Source: INS, 1998 la 2005, Romanian Yearly statistics (1)

The evolution of fish production between 1995 and 2005 is presented in table 1. It demonstrates the dynamics of the production, but also a territorial structure.

Thus:

- the total of fish production in Romania is in a constant yearly decline, from 69105 tons in 1995 to 13352 tons in 2005 (the decrease in 2005 compared with 1995 being of 80.68 %). The decrease is much accentuated started with year 1996, by complete lack of ocean fishing (in 1995 it represented 54.27 % from the total fish production);

- aquaculture experienced a sudden fail in years 1996 and 1997, (of 29.89 % and respectively of 43.69 % in respect with year 1995), later on the level being between 10,818 tons and 7,284 tons. Even though, year 2005 presents a decrease with 63.27 % in respect with year 1995. But taking into consideration the total quantity of fish, aquaculture represents the most important source for fish production in Romania, rising to a significant 1/3 of total yearly production of fish.

- fish production from Romanian flowing rivers and the Black Sea notices the same constant yearly decrease, the rhythm being more visible for flowing rivers. Year 2005 sees decreases of 53,33 %, as compared with 1995, of total quantity of fish from interior waters, and a decrease of 25,49 % of total quantity of fishing from the Black Sea.

2. Resources and use of fish production in Romania. Fish resource is split by species structure in Romania, and is represented by: 85% cyprinidae, both of indigenous and Asiatic origin; 15% zander, pike, catfish, sturions, salmonidae and other river species.

The importance of fishing and fish science in Romania is still at a level much below its available resources. In table 2 are shown percentage levels of fishing and fish industry compared with gross value added (GVA) and gross domestic product (GDP):

Table 2. Importance of fishing and fish industry in total GVA and GDP a (%)

INDICATORS	1998	2000	2003	2004
Fishing and fish science / GVA	0.0058	0.0043	0.008	0.0063
Agriculture, hunting and silviculture / GVA	16.21	12.51	13.02	13.89
Fishing and fish science / GDP	0.00514	0.0038	0.0071	0.0056
Agriculture, hunting and silviculture / GDP	14.38	11.07	11.56	12.4

*Recalculated in prices of year 2004; Source: National Statistics Institute, 1998 to 2005

- fishing and fish science, off total GVA, presents variations in the annual dynamics of between 0,0043 % and 0,008 %. There is a slight increase in the former years; while latter there is a decrease, then again a high in year 2003 and a low of 0,006 % in year 2005. The annual comparison of the same indicator for total agriculture, hunting and silviculture present a decrease from 16.21 % in 1998 to 9.56 % in 2005, as opposed to fishing and fish

science where the annual difference identifies a decrease only in years 2000 to 2002.

- regarding the same comparative approach for fishing and fish science per GDP, there are noticed a similar pattern in oscillations for the same years.

Thus, we must note an important decrease from 2002 to 2003, a maximum in 2003, and then constant diminishes. For the same indicator, the level of annual decreases registered for agriculture, hunting and fishing are continuous, which indicates a favoring of this sector from fishing and fish science sector.

Also, the quantitative resources of fish production are taken into consideration in a comparison against GVA and GDP, together with the dynamics of their use. This structure was analyzed in relative and absolute figures, for years 2005 to 2010, at national level.

Table 3.- Structure of resources and fish production usage, in Romania (in fresh fish)

Specification	2005		2007	
	Tons	% resources	Tons	% resources
A.- RESOURCES	99112	100.0	81694	100.0
Usable production	17358	17.5	15106	18.5
Import	81754	82.5	66588	81.5
B.- USE	99112	100.0	81694	100.0
Export	437	0.4	988	1.2
Internal consumption availability	98675	99.6	80706	98.8
Stock variation (±)	536	0.5	-400	-0.5
Available to human consumption	98139	99.0	811106	99.3

Source: Yearly National Statistics Book (1; 3)

The view upon the structure of the resources and usage of fish production in Romania, presented in yearly balance above, reveals the following observations:

- the predominance of imports in all years, with values between 82,51 % - 85,21 %, second being usable production with levels between 14,79 % - 18,49 %

- the export is noted as being one of the possible usages, although of little value (from 0,73 % to 3,35 %), with growth trends in a rhythm similar with the one registered for internal consumption availability (between 97,03 % and 99,56 %);

- human consumption is a priority for national fish production (to a percentage of 99.02 % to 99,90 % from total yearly usage)

As seen above, there is underlined the predominance of import resources, together with a stressed tendency for consumption from total usage. This is the main reason for which knowing the proper level for the balance is a must, for every yearly production from years 2005 to 2010.

In table 4 is presented the dynamics of yearly structure in equivalent fresh fish.

- for resources, there is a tendency of gradual increase (from the point of view of the quantity, the resources from year 2010 are greater than in year 2005 with 3,58 %). But in the structure, there are the following discrepancies: usable production, used as comparison figure for year 2005, is decreased with 12,53 %, while the imports are increased with 7,004%.

- usage is increased, from 99112 tons in year 2005 to 102664 tons in year 2010, representing an increase of 3,58 %. Regarding the main components, yearly dynamics reveal an increase of export in year 2010 of 7% from year 2005, and for internal consumption, at the same comparison level, the increase is of only 0,95% - an increase comparable with those of human consumption.

As conclusion, there must be noted increases of both resources and usage. The usable production has the tendency to decrease slightly, but in the same time the imports are

on ascendant trend, similar with exports and internal consumption availabilities, including human consumption.

Table 4. Dynamics of yearly structure in equivalent fresh fish

Year	Resources		Usable		Import		Production use		Export	
	Tons	%	Tons	%	Tons	%	Tons	%	Tons	**%**
2005	99112	100.0	17358	100.0	81754	100.0	99112	100.0	437	100.0
2006	99268	100.2	16349	94.2	82919	101.4	99268	100.2	728	166.6
2007	81694	82.4	15106	87.0	66588	81.4	81694	82.4	988	226.1
2008	90299	91.1	16250	93.6	74049	90.6	90299	91.1	950	217.4
2009	102408	103.3	15202	87.6	87206	106.7	102408	103.3	3434	785.8
2010	102664	103.6	15184	87.5	87480	107.0	102664	103.6	3048	697.5

Data from Yearly National Statistics Book, years 2006, 2008, 2010, National Institute for Statistics, Romania

It must be noted that national fish resources are in crisis, in the same time with noticing a tendency of decrease of the fish economic value. The reasons for decreasing fish production, in fresh and salty waters, were represented by the characteristics of transition phase from centralized economy to market economy. The investment in the area was of very low value, as well as the institutional and legal framework, especially for land ownership. There is also noted a weak commercial chain for fish products.

In Romania, the fishing heritage is strengthened with the help of a considerable fishing industry. The production is represented by: aquaculture, fishing in fresh waters and fishing in Black Sea.

Table 5. Intermediary consumption from fish industry in Romania

Years	Agriculture + Hunting + Silviculture		Fishing out of which:		
	Total (thousand lei)	% from 2004 values	Total (thousand lei)	% from 2004 values	% from agriculture + hunting + silviculture
2004	27527	100	44.7	100	0.16
2005	25345	92.07	53.2	119.01	0.2
2006	27348	99.34	63.5	142.05	0.23
2007	28969	105.23	70.3	157.27	0.24
2008	39030	141.78	120.3	269.12	0.3
2009	38286	139.08	112.8	252.34	0.29
2010	38715	140.64	116.4	260.4	0.3

Data from Yearly National Statistics Book, years 2009, 2010, National Institute for Statistics, Romania

3. Intermediary consumption and gross value added (GVA) in Romanian fish industry.

Intermediary consumption and GVA reflects the quality of this sector. In the following comparison table, there is an attempt to balance the variation levels in value and percentage, as opposed to agriculture + hunting + silviculture.

For intermediary consumption it was considered the difference in the possibility of procuring the fish or the reasons for procuring, and also the variations in their physical characteristics. In the figures from table 5, there is a yearly variation of the intermediary consumption indicator. There is noted that:
- there is an increased tendency in fish industry, in year 2004 the level was of 44.7 thousand lei, while in 2010 the level reaches 116.4 thousand lei, the increase being of 160.4 %;

- compared with agriculture + hunting + silviculture, the increment rhythm of intermediary consumption for year 2010 compared with 2004 is of 119,8 %. In the

same time, the importance of fishing versus agriculture + hunting + silviculture, is in a rising trend (for year 2004 it represented 0,16 %, while for 2010 it was of 0,30 %.

Table 6. GVA from fishing, in Romania

Years	Agriculture + Hunting + Silviculture		Fishing out of which:		
	Total (thousand lei)	% from 2004 values	Total (thousand lei)	% from 2004 values	% from agriculture + hunting + silviculture
2004	31041.2	100	13.8	100	
2005	24278	78.21	13.8	100	0.05
2006	26845.8	86.48	16.1	116.66	0.05
2007	23966.3	77.20	25.9	187.68	0.1
2008	34081.9	109.79	44.4	321.73	0.13
2009	32714.6	105.39	39.1	283.33	0.11
2010	33128.1	106.72	40.9	296.37	0.12

Data from Yearly National Statistics Book, years 2009, 2010, National Institute for Statistics, Romania.

GVA allows fully understanding the true value of the activity in fish industry and its importance in the total economics. A decrease of GVA together with depreciation of fixed assets related exploitation allows the net added value.

The analysis in table 6 compares the GVA from fish industry with agriculture + hunting + silviculture, and underlines the following evolution:

- growing rhythm registered on yearly basis is rising continuously. In year 2004 GVA was of 13.8 thousand lei, while in 2010 the level is of 40.9 thousand lei, in an increase of 196.37%;

- compared with agriculture + hunting + silviculture, GVA of fish industry is increased significantly. In year 2004, the level was of only 0.05%, while in 2010 was of 0,12**%.**

CONCLUSIONS

Following the indicators shown in the structural analysis of the indicators, can be drawn the following conclusions:

The nowadays fishing industry dynamics is on a descendent trend. The decreases were manifested in different rhythms, for both total fish production as well as on the territorial fishing heritage.

From comparing the fish industry and fishing in total GVA and GDP in Romania, there can be seen a tendency for increasing, but also a surpass when compared with agriculture + hunting + silviculture.

In yearly balance analysis, with the increasing trend of consumption growth, there is also seen i) an increase of resources, amplified by imports, but also a decrease of usable production; ii) the overall increase of usage is determined by amplifying the export, but also of decreasing the availability of fish for human consumption and stock.

Intermediary consumption in fishing industry reflects the existence of a high growing trend, helped by comparison with agriculture + hunting + silviculture.

GVA from fishing is also on a growing trend.

All of these problems underline, during the entire period of time analyzed, the existence of a decrease in production, in the same time with a tendency of increase the consumption at intermediary level, as well as VAB. Growing rhythms surpass the agricultural sectors, and we have reasons to believe that there must be a sustained development of the fishing industry.

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THE ROLE AND PLACE OF THE AGRICULTURE IN RURAL DEVELOPMENT OF DOBROGEA PROVINCE

Aurel LUP[1], Constantin CHIRILA[2], Liliana MIRON[3]

[1]Ovidius University of Constanta, Phone: 0241 546 310, Email: lupaurel@yahoo.com
[2]Deputy Chamber, Phone: Email: constantin.chirila@cdep.ro
[3] Ovidius University of Constanta, Phone: Email: email: miron_stroe_liliana@yahoo.com

*Corresponding autho*r:*lupaurel@yahoo.com*

Abstract

This material represents the partial results of the rural development study in Dobrogea region where farming still has a significant role in the employment structure. The profile of the study is economic, using specific analytical methods and techniques. According to OECD classification, Dobrogea's counties (Constanta and Tulcea) are significantly rural, but with different development levels. Agriculture still holds an important role in the economy of both counties. Employment is about 20% in Constanta and in Tulcea, over 30%. However, the share of agriculture in the county's economy is lower in Tulcea, primarily due to the unit areas efficiencies that are 30-35% lower in Tulcea than in Constanta. The economic structure of the two counties is different. While Constanta is dominated by industry, trade and tourism, Tulcea is predominantly agrarian. Consequently, Tulcea County is one of the poorest, while Constanta is one of the richest counties. In these circumstances, rural development strategies in the two counties shall be different.

Keywords: rural development, agriculture, employed population.

INTRODUCTION

Sustainable rural development is one of the main EU agriculture policy objectives. Agriculture is the main component of the countryside and its functions are included in the European Chart of Rural Space (7). In Romania, the rural area has been studied in many papers and studies (1, 6).

The agriculture of Dobrogea, both in terms of development and current state of the rural area, has been studied by various authors (2,3,4,5) focusing on the role and place of agriculture in the economic and social development of the region in general, and of the rural area in particular.

Currently, on a national level, and also regionally and locally, many studies are underway to develop a strategy for agricultural development and to increase its contribution to sustainable rural development.

MATERIAL AND METHOD

There are used mainly the data concerning the agriculture of Dobrogea, presented separately on the two counties, Constanta and Tulcea. The data provides identification, ecological resources, the share of agriculture and rural economic and social development in the province.

The working methods and techniques used are characteristic to the specific profile of economic research: statistical data collection, processing and analysis, synthesis and conclusions.

RESULTS AND DISCUSSIONS

3.1. Province of Dobrogea. Brief presentation. Dobrogea with the two counties Constanta and Tulcea is located in the South-Eastern Romania. The total area of the province is 15485 km², of which Tulcea County in North 8431 km² (3.55% of the country) and Constanta county in South 7055 km² (2.97% of the country). Agricultural land is 57.9% of the province, of which 79.9% in Constanta and 39.9% in Tulcea. (4)

The agriculture of Dobrogea was first studied in 1850 by the Romanian scientist-agronomist Ion Ionescu from Brad, the results being

published in *Constantinople Journal* (2). Ionescu de la Brad discovers a province almost exclusively rural, hardly populated, practicing natural agriculture, appropriate to light soils and dry climate.

In 1878, Dobrogea is integrated into the kingdom of Romania and follows a period of massive colonization and building of agricultural structures, similar to other Romanian provinces. It remains one of the poorest populated provinces of Romania, but with land resources reported to the population, superior to other provinces. The agricultural system remains one of the poorest, with most mediocre results.

In 1949, the Communist regime triggers the agricultural process of collectivization, and in 1957, Dobrogea region becomes the first fully collectivized area with almost five years before the end of cooperativization nationwide (4).

During 1958-1989, massive investments are made in Dobrogea in mechanics, irrigation facilities, research, the increasing allocation of factors of technological enhancement: fertilizers, varieties, hybrids, pesticides. The evolution of the yeld per unit, dramatically increases- about three times compared to the 50s, years but not as expected as the investment efforts made so far [3].

3.2. Administrative organization, population.

In table 1, the main data presented concern the administrative and demographic organization of the two counties, Constanta and Tulcea. In the total area, of the Country Constanta ranks 6 place and Tulcea County ranks 4 place.

Table 1. Administrative organization and population

Specification	Constanta County	Tulcea County
Municipalities	3	1
Cities	9	4
Commons	58	46
Villages	188	133
Total population, of which:	722360	247444
- urban	504667	121711
- rural	217693	125733
Share of rural population	30.1	50.8

Source: Statistical Yearbooks of Constanta and Tulcea County, 2010 [8]

Components of the North-Eastern development macro-region the two counties differ in management structure, number of

inhabitants, and level of urbanization. The number of inhabitants is almost three times higher in Constanta County than in Tulcea County.

While the share of the rural population in the first case, passes only 30%, in the second case, more than half of the population lives in rural areas where agriculture is basically the only occupation and source of income.

The working population in agriculture still occupies large shares in both counties, but with significant differences. In Constanta, the primary sector (agriculture, forest and fishing) held in 2009 a percentage of 21.3 %, while in Tulcea 37.5 % of the active population worked in agriculture.

In Constanta County the secondary sector and the constructions had a share of 29.9% in the active structure of the population and 25.9% in Tulcea County. The tertiary sector considered the engine of development, still low in both counties, only 48% of the workforce in the first case and 36.6% in the second case.

3.3.Agriculture. Structure and performances.

The size and structure of the agricultural land had suffered small changes in recent years. In 2009, the situation was as follows:

	County	
	Constanta	Tulcea
Agricultural land thousands ha .... of wich:	560.1	363.9
- arable thousands ha………………..	485.0	294.0
- natural lawn thousands ha…………	58.7	60.7
- vineyards plantations thousands ha	12.6	8.2
- orchards plantation thousands ha….	3.8	1.0

Concerning the land quality, the classes of good and very good soil have a share of 84.3% of the arable land of Constanta County and 81.4% of the arable land of Tulcea County. Unlike the rest of the provinces, the surface of Dobrogea per one inhabitant is 0.67 ha in Constanta County and 1.19 ha in Tulcea County, with 47% more than the first case and with over 2.6 higher than the national average in the second case.

The size of the land resources reported to population represents the quantitive indicator of the production capacity as the main component of the population's income as material support of the rural development. The quality side is represented by the use of

agricultural land, crop structure, the total production and the yields per unit land area (ha).

Table 2. The structure of the arable land in 2009

Specification	Constanta County		Tulcea County	
	ha	%	ha	%
Total cultivated area	**484324**	**100.0**	**256869**	**100.0**
Cereal grains	*297662*	*61.5*	*155913*	*60.7*
- wheat	169981	35.1	77083	30.0
- maize	56973	11.8	40549	15.8
Pulses	*5811*	*1.2*	*2438*	*0.9*
- peas	4167	0.9	1550	0.6
Roots and tubers plants	*2732*	*0.6*	*2350*	*0.9*
- potatoes	2732	0.6	1931	0.8
Industrial crops	*153590*	*31.7*	*82871*	*32.3*
- sunflower	95274	19.7	41300	16.1
- rape	51400	10.6	38254	14.9
Vegetables and melons	*4116*	*0.8*	*2363*	*0.9*
Green fodder	*20413*	*4.2*	*10934*	*4.3*

Source: Statistical Yearbooks of Constanta and Tulcea Counties 2010 [8]

The use of arable land indicates primarily an extensive system of agriculture dominated by cereal species representing 61.5 % of the land in Constanta County and 60.7 % in Tulcea County. Of industrial plants dominate also the extensive oilseeds, sunflower and rape.

Due to the arid climate, most prominent in the country, and also because of the no using the irrigation systems, the dominant grains are wheat 35.1% and 30.0% of arable area, while maize is grown on a reduced area with over 2/3 in Constanta County and half under the wheat area in Tulcea County. Of pulses there are it cultivated mainly peas and some beans.

Roots plants are few, and the sugar beet is completely missing, potato is cultivated on areas representing less than 1 % of the arable land in both counties. Because of the drastic reduction in the number of animals after 1989, the fodder crops areas decreased with 50%.

A general issue in the Romanian agriculture in recent years is the abandonment of the total national areas, estimated 1.5 million hectares, but by not cultivating them, this sector is highly affecting the agriculture. From this point of view, the situation in Dobrogea is different. While in Constanta the degree of cultivated arable land is 99.8%, in Tulcea over 12% of the arable land remains uncultivated.

The production of main crops and yields per unit area. The total is production calculated as a product of a particular crop cultivated area and yield per unit area. The year 2008 was taken as an example in terms of weather conditions of which it mostly depends the yield per unit area. The data concerning the value of the agriculture on a county level is the year 2008.

Table 3. Total and average production of the main crops in 2009

Specification	Constanta County		Tulcea County	
	Tons	kg/ha	Tons	kg/ha
Cereals	*1021787*	*3433*	*446072*	*2935*
Wheat	697368	3922	256859	3031
Maize	145816	2550	140356	3088
Sunflower	*136164*	*1515*	*42684*	*1019*
Rape	138527	2163	52740	1608
Potatoes	41321	14520	18754	11916
Vegetables	91632	22262	88476	16086
Grain production in tons/100 ha arable	211	x	174	x

Source: Statistical Yearbooks of Constanta and Tulcea Counties 2010 [8]

The data of Table 3 reveal the extensive character of Dobrogea, and especially of Tulcea County, where yields per unit area are 25-30% lower than in Constanta County. Grain production from 100 ha arable land is higher with 21% than in Constanta County, similar to the structure of the cultivated land.

Technological level. The mediocre results achieved in the plant branch is due to technological level characterized by low costs growth factors such as fertilizers, irrigation and pesticides. Tractors and agricultural equipment stand on the worse level.

Whereas the national average aria per tractor is of 52.4 ha, in Constanta County is 99 ha per tractor, and in Tulcea County is 110 ha per tractor, compared to EU where a tractor works on less than 15 ha of arable land. Chemical fertilizers used in recent years are also below the level of research profile recommendations, 40 kg/ha active matter in Constanta County and only 28 kg/ha active matter in Tulcea County. Irrigations, the main technological factor to enhance crop production in Dobrogea are increasingly less used. If in 1989, in Constanta County there were irrigated 389 thousand hectares, reached in 2003 to 76 thousand hectares and in 2009 to only 2681 ha. The situation is similar in Tulcea County, too. Compared to 139

thousand hectares irrigated in 1989, the irrigated area has been reduced to 48 thousand hectares in 2003 and to only 15756 ha in 2009. Moreover, it should be added also the fragmentation process of agricultural lands, as a consequence of the reconstitution of the private property rights of the land (18/1991 Law), only 8.5 ha/farm (4.1 ha/individual farm) in Constanta and 6.2 ha/farm (2.5 ha/individual farm) in Tulcea.

This whole set of factors represents a brake on economic growth and performance of Dobrogea agriculture and significantly reduces its contribution to rural development.

Animal breeding. Animal breeding is the second important component in the structure of the produced goods in agriculture. Animal production represents the number of units of production (animal heads) and the yield of milk, meat, wool per capita. In late 1989, the main species of animal breeding of Dobrogea were [4]:

-In Constanta County: 1666.7 thousand head cattle (29.8 head/100 ha); 413.7 thousand head swine (83.0 head/100 ha) and 709.6 thousand head sheep (126.9 head/100 ha).

-In Tulcea County: 75.8 thousand head cattle (21.7 head/100 ha); 185.4 thousand head swine (65.6 head/100 ha) and 464.5 thousand sheep (144.9 head/100 ha)

After 1989, the number of animals was considerably reduced in such way that in 2009 were:

-In Constanta County: 36,706 head cattle, 22 % compared to 1989; swine 136,669 head, 33% compared to 1989 and 301,058 head sheep, 42.4 % compared to 1989.

-In Tulcea County: 29,754 head cattle, 39.3% compared to 1989; swine 98,624 head, 53.2% compared to 1989; 314,748 head sheep, 67.8% compared to 1989.

Due to significant reduction of the number of animals in both counties, the intensity of the process was more pronounced in Constanta County than in Tulcea County. In terms of animal productivity, meaning the output per animal, unlike the plant branch, it was superior to the previous period of the 1990.

However, the productivity growth does not compensate the losses of the reduction of the

breeding animal production. Consequently, the share of breeding animal in the structure of agricultural production value is lower than the planned economy period.

Agricultural production, value and structure. Although according to the OECD classification, the two counties of Dobrogea are *predominantly rural*, and the share of active population employed in agriculture is higher compared to other activities. 21.3% in Constanta County and 37.5% in Tulcea County, the contribution of agriculture to the gross added value is low, 7.2% in Constanta and 15.8% in Tulcea.

Table 4. Value and structure of the production (2009)

Specification	Constanţa County		Tulcea County	
	Mill. lei	%	Mill. lei	%
Total agricultural production	*1655.7*	*100.0*	*853.8*	*100.0*
- Crop production	1096.6	66.2	517.5	60.6
- Animal production	506.4	30.6	321.5	37.7
- Agricultural services	52.7	3.2	14.8	1.7

Source: Statistical Yearbooks of Constanta and Tulcea Counties 2010 [8]

In both counties, the share of crop production is significantly higher in the structure of agricultural production value than animal breeding industry. The reduced share of animal breeding indicates an extensive agricultural system and a low use of plant production. In countries with advanced agriculture, the share of animal breeding production exceeds the plant production which means a higher use of resources. Agricultural services have low shares in the structure of agriculture production.

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Incomes of farmers and rural development.
Since 1964, OCDE has published a study (581 pages) concerning the low incomes in agriculture in all 22 member states. The study aims to examine the incomes in agriculture of the member states, to identify the factors that affect them and to analyze the policies of improving the situation (10).

Throughout the years, Romanian farmers' income was below the economy average. In 1989, for instance, in Constanta, cooperatist members were earning 1,007 lei/month and those from Tulcea 465 lei/month, compared to 2,980 lei, the national average [4].

In 2009, farmers' families earned 1,823 lei/month, compared to the national average of 2,316 lei/month or 1,609/month of the unemployed (9).

Common Agricultural Policy has also, among the five objectives, the role to ensure a high standard of living for farmers. The low level of income, the economic development is largely due to the presence in the countryside only of primary agricultural activities, while the concept of sustainable rural development component comprises both farming and a non-agricultural activities job in rural space (6).

The absence of non-agricultural activities in sectors II and III of the economy in the rural space of Dobrogea affects rural poverty of Dobrogea in villages and finally the development of the human population. According to the National Human Development Report (11) the distribution of the poverty in Dobrogea's villages was different, and the Human Development Index was below 0.800.

Table 5. Poverty distribution and human development report in the agriculture of Dobrogea (2009)

County	Very poor villages %	Poor villages %	Medium developed villages %	Developed Villages %	High level of development villages %	Human Development Index
Constanta	18.1	8.6	16.6	13.0	43.8	0.650
Tulcea	20.9	15.6	22.8	19.9	20.8	0.590

Source: A.Lup: *Introduction to rural-agrarian economy and politics* [5], p.828

The values presented in the table show an increased level of poverty in the rural area of Dobrogea although with significant differences between the two counties. The development of Constanta County is due mainly to activities serving the seaside tourism and in Tulcea County the degree of poverty of the villages and towns, is due to Danube Delta, one of the poorest areas in the country. Human Development Index was of 0,650 and 0,590 in 2002, below 0,800, but overall covering the average degree of development of the two counties.

CONCLUSIONS

Although according to OECD classification the two counties of Dobrogea are significantly rural and the agriculture is mainly the porductive activity, its contribution to the gross added value in the area is considerably low, 7.2 % in Constanta County and 5.8 % in Tulcea County.

The main causes of the poor contribution of agriculture in the development of rural area of Dobrogea are:

-An extensive agricultural system both in terms of crop pattern and the technological level: few fertilizers, irrigation by 2-5 % of the area, in the driest region of the country;

-Inadequate operational structure of the rational exploitation of the soil. Most farms are small, a few hectares or less, unable of using a competent management and an efficient agricultural system;

-Tractors and work equipments – the lowest degree in the country, 99 hectares arable land per tractor in Constanta County and 110 hectares arable land to one tractor in Tulcea County, compared to Western Europe countries where a tractor stands for 12-15 ha.

The consequence of an extensive agriculture and a bad system is reflected in the low income of farmers, which cannot provide a sustainable rural development.

Dobrogea`s villages, especially the ones from Tulcea are poor and very poor. Exception made on the villages near the Black Sea, vere the tourism contributes significantly to household income.

The corollary of this situation is the low Human Development Index, in 2002 was 0.650 in Constanta County and 0.590 in Tulcea County, meaning that the average level of development is below 0.800.

The main ways of building a sustainable rural development are the structural and technological intensification of the agricultural system, creation of viable economic size farms in rural areas and implementation of activities from sectors II and III of the economy, such as storing, processing and distribution.

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ESTIMATION OF DROUGHT TOLERANCE OF TOP COMMERCIAL PIONEER CORN (*Zea mays L.*) HYBRIDS IN DRIP IRRIGATION EXPERIMENTS

Valentin MANDACHE, Gabriela VALSAN, Daniel Sorin NITU, Ion CIOCAZANU

Pioneer Hi-Bred Seeds Agro SRL, DN2, km 19.7, Ganeasa Commune, Sindrilita Village, Zip code 077104, Ilfov County, Romania. Phone: +4021.303.53.07, Fax: +4021.303.53.41 Mobile: +40722946964, E-mail: valentin.mandache@pioneer.com, gabriela.valsan@pioneer.com, daniel.nitu@pioneer.com, ion.ciocazanu@pioneer.com.

Corresponding author: **valentin.mandache@pioneer.com**

Abstract

Drought affects large corn areas in Romania, causing significant yield losess; developing hybrids with increased drought tolerance is a primary goal of the corn breeders for decades; testing breeding populations, parent lines and hybrids in environments that normally experience moderate to high levels of drought is essential in any corn breeding program aimed to improve drought tolerance. The study was conducted in 2008-2009, in a research field located in Afumati, Romania and consisted in 2 factors design with six top Pioneer commercial hybrids split in 4 water stress levels (A1- flowering stress, A2-grain filling stress, A3-flowering and grain filling stress, A4-non-stress), managed by drip irrigation, in three replications. Yield, lenght of the ear affected by drought, plant and ear height, 1000 kernel weight (TKW) were collected to estimate the drought tolerance of the 6 top commercial pioneer hybrids in Romania. Only data from 2008 were taken into consideration since 2009 was relatively favorable for corn and water stress was too low to produce significant yield damage. FL and GF stress reduced averaged yield over hybrids with 12.1 and 17.2 %, repectively, while continuous drough from FL to GF affected yield with 27.2 %. Significant differences in hybrid reaction were detected in all drought types. Thus, yield data suggest that PR37M34 is the most tolerant at FL stress, followed by PR37Y12, while PR37F73 is the most tolerant at GF stress, followed by PR35F38. PR37F73 proved to be the most resistant to prolonged continuos drougt, followed by PR37Y12 and PR35F38. The most important associated traits were also affected globally by water stress but different specific reaction of the hybrids was observed.

Keywords: breeding, corn, drought tolerance, hybrids, Zea mays L.

INTRODUCTION

Drought is the most important challenge to high corn yields [2]. Different levels of water deficits occur in most non-irrigated and even irrigated production fields producing annual yield losses up to 30% in 1998 in USA [3] and up to 60% in Southern and Eastern Africa in 1992 [4]. Prolonged periods of drought, enhanced by heat and low air moisture result in significant yield loss, even though today's hybrids are much more tolerant than those of the past. Average of yield loss globally is between 15% in temperate areas and 17% in tropical areas, figures were estimated empirical [1]. Drought affects large corn areas in Romania, Craciun and Craciun, in 1993 [5] using four hybrids (Fundulea 320, Fundulea 420, Fundulea 378 and Fundulea 340) and four levels of water supply, showed that yield decreased significantly both in non-irrigated and reduced irrigation level.

Pioneer has continually improved its hybrids for performance under drought for over half a century. Evolved genetics and breeding techniques are allowing Pioneer to accelerate the gain in drought tolerance of corn hybrids. Consequently, appropriate testing in water stress management locations represents the basic Pioneer strategy to accurately screen for drought tolerance.

The present study was aimed to estimate the drought tolerance of six top commercial Pioneer hybrids by the utilization of drip irrigation for managing different water stress levels.

MATERIAL AND METHOD

Six top commercial Pioneer hybrids, known for their good behaviour under dry land conditions,

PR34M34, PR37Y12, PR37F73, PR35P12, PR35F38 and PR35T06, were tested in experimental trials during 2008 and 2009 in an irrigated field in Afumati-Ilfov (situated in Southeast Romania, well known corn dry area). Three replicates split-split plot design was used, with hybrids split into 4 water stress levels: stress at flowering (FL), stress at grain filling (GF), continuous stress from flowering to grain filling (FL+GF) and the control non-stress (well watered) (NS). Plots consisted of 4 rows (2 central harvestable), long of 5.3 m, at 70 cm between rows; uniform plant population of 80.000 pl/ha was achieved by mechanically overplanting and thinning at 6 leaves stage. High input crop management measures were applied and irrigation amount and dates were rigorously controlled by using a modern drip irrigation system and a computed drip irrigation rate as shown in Table1.

Table 1. Irrigation regime applied to the experiments.

Crop stage	FL	GF	FL+GF	NS
10 leaves	450m^3	450m^3	450m^3	450m^3
Flowering	0	450m^3	0	450m^3
Early grain filling	450m^3	0	0	450m^3
Grain filling	450m^3	0	0	450m^3

High input technology and appropriate weed control were applied to the trials in both years.
Yield, plant (PLTHT) and ear (EARHT) height, length of the ear affected by drought (LEA) and thousand kernels weight (TKW) were collected during the vegetation and at harvest.
Analysis of variances (ANOVA) was computed to assess the effect of the main variation sources (hybrids and stress types) and the interaction between them. Linear regressions were used to estimate the specific hybrid reactions to the different stress levels.

RESULTS AND DISCUSSIONS

Annual rainfall amount and distribution caused large variation between the two experimental years. Only data from 2008 were taken into consideration since 2009 was relatively favorable for corn and water stress was too low to produce significant yield damage.
F values, resulted from ANOVA (Table 2), show that stress types caused the largest

variation in yield, PLTHT, EARHT and TKV, while for LEA the hybrids were the main source for the variations, although stress types contributed significantly to this variation. Lower values obtained for hybrids x stress type interaction suggest that specific reaction of the hybrids to water stress types is relatively similar, confirming thus the well known drought tolerance of the hybrids included in this study. However, the lower value for probability for LEA and PLTHT indicates a significantly different specific reaction of the hybrids to stress types. Influence of water stress levels and hybrids, respectively are presented in Fig.1 and Fig.2

Table 2. F values, resulted from ANOVA applied to the experiments in 2008

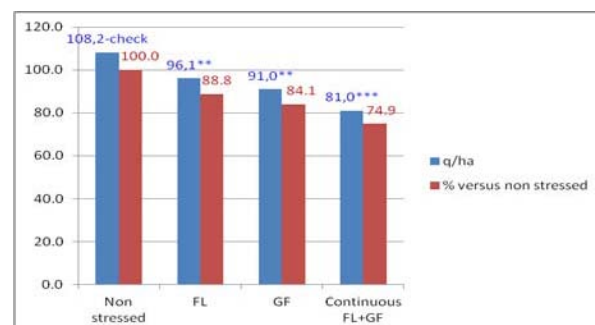| Trait | F value | | | | | |
	Stress	Prob	Hybrid	Prob	SxH	Prob
YIELD	29.3800	0.0006	9.9500	0.0000	0.7900	ns
LEA	69.0800	0.0000	154.3500	0.0000	2.9800	0.0030
PLTHT	20.7600	0.0014	1.9100	0.1100	1.4100	0.1900
EARHT	1.7400	0.2584	1.6800	0.1611	0.8116	ns
TKW	76.3100	0.0000	44.6700	0.0000	0.6900	ns

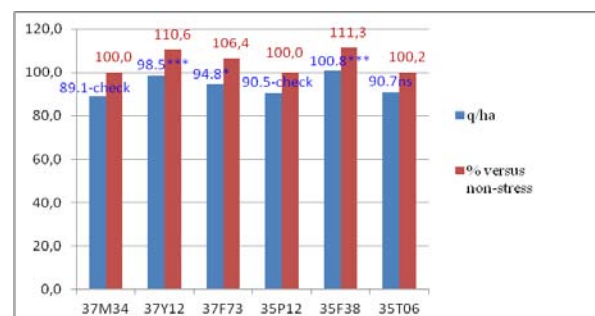Fig.1 Influence of water stress types on grain yield, Afumati, 2008

Fig.2 Influence of hybrid on grain yield, Afumati, 2008

Influence of water stress types on yield is presented in Table 3. Stress at FL and GF caused significant average yield reduction of 12.1 q/ha (11.2 %) and 17.2 q/ha (15.9 %)

versus non-stress level, while continuous drought FL+GF resulted in a more important yield damage of 33.4 q/ha (25.2 %). The largest yield reduction versus non-stressed at FL was registered at PR35P12 (19.5 q/ha), an oldest extinguishing product, since the most tolerant to drought in this stage proved to be the mid-late hybrids PR37M34 and PR37Y12 and PR35F38 a new late hybrid recently introduced on the market (lowest yield reduction of 6.9, 8.8 and 9.0 %, respectively) (Fig.3). When stressed was applied only at GF the lowest yield reductions versus non-stressed were registered at the mid-late hybrid PR37F73 (11.4 %) and PR35F38 (13.4 %), suggesting a better drought tolerance of these hybrids in grain filling stage. The largest yield reduction of 20.4 %, registered at PR35P12, suggests that this old products is also less tolerant to drought when stressed grain filling stage either.

When continuous water stress was applied to the experiments due to synergic effects of the two stress types (at FL and GF) a significant yield reduction was registered to all tested hybrids, with smaller differenced among them. However, PR37F73 registered the lowest yield reduction (21.7 %) versus non-stressed while PR35T06 was the most yield damaged (27.9 %). This data confirms the known characterization of these two hybrids: PR37F73 resistant to drought and heat, recommended for areas with frequent drought, and PR35T06, high yielding but less tolerant to drought and consequently recommended for irrigated technology and more humid areas of Europe.

Table 3. Influence of water stress on YIELD in different crop stages (q/ha), Afumati, 2008.

Hybrid	Non-stressed	FL	GF	FL x GF
37M34	101,1	94.1[ns]	85.4**	75.8***
37Y12	113,0	103.1*	92.5***	85.3***
37F73	107,3	92.8**	95.1*	84.0***
35P12	108,1	88.6**	86.1***	79.2***
35F38	114,3	104.0*	99**	85.8***
35T06	105,3	93.8*	87.8**	75.9***
*, **, *** - semnificantly different from non-stress at P=0.05, 0.01, 0.001, respectively				

Influence of water stress levels on agronomic traits. Length of afected ear (LEA) is a specific trait well correlated with drought tolerance of the corn hybrids.
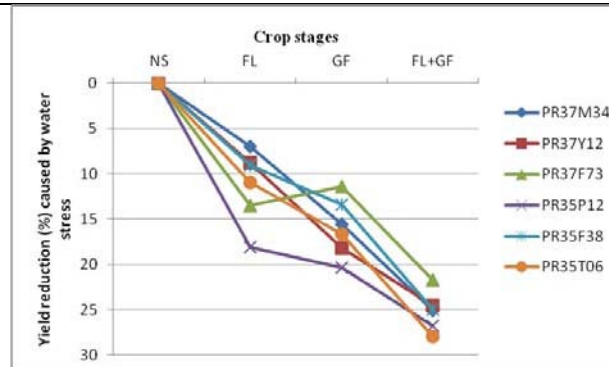
Fig.3 Hybrid specific YIELD reduction caused by water stress in different crop stages, Afumati, 2008

Significantly larger average values of the LEA increasing of 89.6 % versus non stressed, obtained for continuous drought (FL+GL), suggests a synergic effect of the combined drought. Hybrids had specific reactions in different crop stages; PR35P12 was most affected at FL water stress as compared to non stressed, but least affected at GF water stress. PR35T06 was not affected by FL water stress, while GF water stress produced the largest increasing of LEA to this hybrid versus non stressed. Taking into consideration the most damaging water stress levels, GF and continuous drought, PR37M34, PR35P12 and PR35F38 seemed to be less affected (more tolerant) and PR37Y12, PR37F73 and PR35T06 displayed significant LEA increasing versus non stressed.
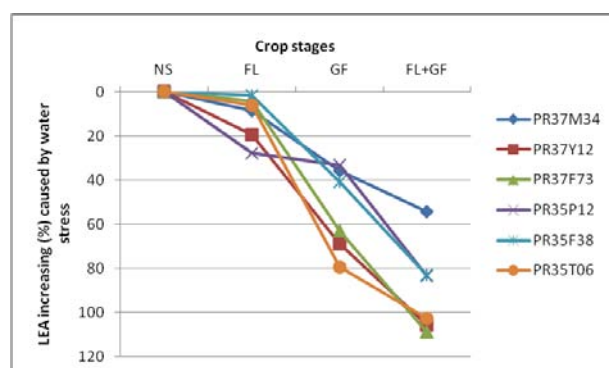
Fig.4 LEA increasing caused by water stress in different crop stages, Afumati, 2008

Generally, hybrids tolerant to drought have low LEA values. Data from Fig.4 show that LEA was mainly increased by grain filling stress (54.5 % average increasing versus non-stressed) as compared to FL stress (11.3 % average increasing versus non stressed).

Plant (PLTHT) and ear height (EARHT) are affected only by FL water stress, since plant growth ceases at the flowering time. Low intensity FL water stress in 2008 induced smaller reductions of PLTHT and EARHT versus non stressed.
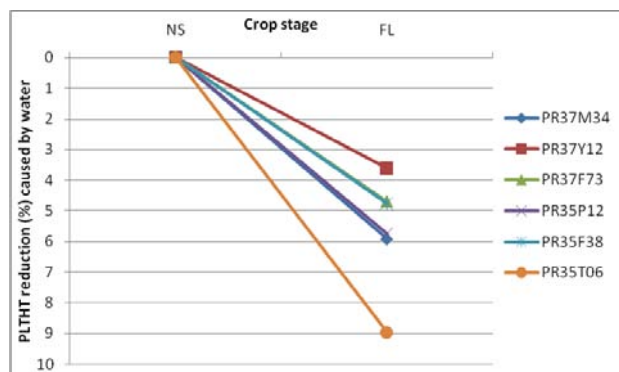
Fig.5 PLTHT reduction caused by water stress at FL stage, Afumati, 2008
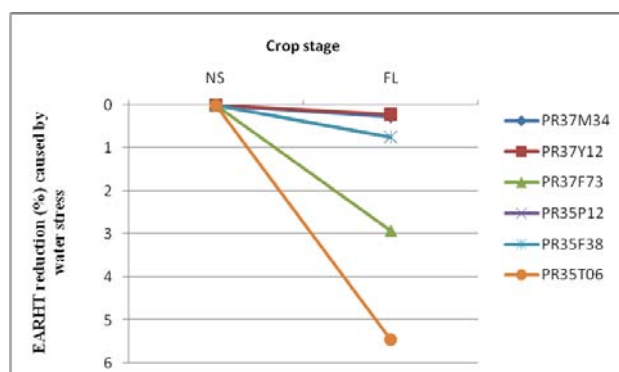
Fig.6 EARHT reduction caused by water stress at FL stage, Afumati, 2008

The most affected hybrids were PR35T06 for both PLTHT and EARHT. PR37Y12 and PR37F73 were less affected displaying the lowest reduction versus non-irrigated in PLTHT and PR37Y12 and PR35F38 in EARHT (Fig.5 and Fig.6). Data on **thousand kernel weight (TKV)**, an important yield component strongly correlated with tolerance to GF water stress, are presented in Fig.7. Averaged decreasing of TKW versus non stressed was 19.6 %. Grain filling was less affected by GF water stress in the case of PR37M34 (14.0 % TKW reduction versus non stressed) and surprisingly of PR35T06 (17.9 % TKW reduction versus non stressed,known as less tolerant to drought); PR35P12 was most affected by diminishing TKW with 22.6 % versus non stressed at GF water stress.
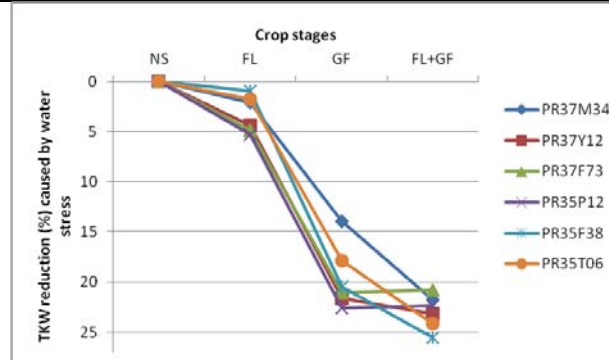

Fig.7 TKW reduction caused by water stress in different crop stages, Afumati, 2008

CONCLUSIONS

Water stress applied in different crop stages affected significantly grain yield and the agronomic traits and yield component. Grain filling water stress was the predominant drought type and strong synergic effect of FL and GF stresses occurred when continuous drought was applied.

Specific reactions of the hybrid to water stress in different crop stages were registered, confirming previous characterization of the hybrids.

Summarizing the data, PR37F73, PR35F38 and PR37M34 are recommended for their improved drought tolerance.

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THE STUDY ON THE EVOLUTION OF THE ROMANIAN RURAL ECONOMY

Nicoleta MATEOC-SÎRB[1], Camelia MĂNESCU[1], T. MATEOC[1], Aurora VENIG[2]

[1]University of Agricultural Sciences and Veterinary Medicine, Timisoara, 119 Calea Aradului, Timisoara, Timis, Romania, Phone: 0744604349, E-mail: mateocnicol@yahoo.com
[2] University of Oradea, Oradea, Bihor, Romania

Corresponding author : mateocnicol@yahoo.com

Abstract

The paper analyzes the romanian rural economy evolution in the last century and emphasizes the changes in Romanian economy after the year of 1989, and as well the rural entrepreneurship development.The transition of Romania, after December 1989, from a totalitarian regime and a hyper-centralized economy to a democratic state and it is right that, with a market economy involves through its end, a double connotation: on the one hand, the national, aimed at developing free and competitive society, on the other hand, the global one, associated with integration, on the principles of performance partnership, met in the current European and international structures.

Keywords **:** *economy, evolution, rural, Romania*

INTRODUCTION

Launched due to a deep crisis of the system, which resulted in aggravation of the state of shortage in all economic and social links, the economic reform has been subject to adverse restrictions imposed by the approach of ensuring in the last decades of macro-economic balances and of decisional capacities at central level, but as well by the excessive sensibility of the population towards the continuosly worse of life conditions.

The implementation way of the landing reform began by liquidation of assets of ex production agricultural cooperatives. These actions meant practically physical "distruction" of a big number of production units, and this phenomena has impacted negatively on the dynamics of land ownership reconstruction, of the capitalization degree of the new owners and over the obtained level of agricultural production.

In the period of time that followed, by the implemented economic social programs, there has stopped the economic decline and there has relanched the productive activities. In these years, the concerns for structural politics implementation were pushed by the macro-stabilization politics. Simultaneously, it followed the re-balance of some of the economic structures and assuming legislative and institutional reglementations regarding the mechanisms of economy in the market.

The changing of economic system brought as well negative phenomena never met before in the old economic system –centralized, like: unemployment, inflation, the economic financial instability, the continuously decreasing of life standard, etc.

Granting to Romania the status of functional market economy aims to approach us of the requested claims by the European Union politic, but in the same time forces us to increase the competitiveness of economic and financial system in order to reach the market economy of the others countries members.

MATERIAL AND METHOD

To achieve the objectives of this paper, the working method used were: data collection, processing, analysis and interpretation.
The data collected were centralized, analyzed and interpreted, so that we were able to obtain relevant conclusions.

RESULTS AND DISCUSSIONS

The main processes which are now in

progress in economy and which strongly influences the economic activities are the followings:

• accelerated development of advanced communications;

• internet explosion;

• development of electronic commerce;

• emergence of new models to achieve business and restructuring of companies;

• promoting new rules and formulas based on innovation;

• Forms of business expansion and working at distance.

The new economy marks a fundamental transformation in the history of human society development and it estimates that the period of this transition from industrial society to global society strictly based on internet, will be between 20 and 30 years.

The traditional companies, structured based on the centralized labor force, will change into companies of variable and dynamic structure, geographically spread, connected to national and international networks.

Generally, the romanian rural economy contains especially agricultural activities, non-agricultural activities based mainly by forestry, food products processing, small commercial activities, handcrafts, services, mining, energy production, but they are not enough developed. Excepting the mining and energetic industry, the non-agricultural activities are run mostly by the micro-enterprises and small medium enterprises (SME).

The rural economy is weak diversified and still depends of agricultural activities, and this fact has as consequence low incomes for the entrepreneurs from rural space.

In the whole national economy, the agriculture represents one of the major importance branches which can contribute to re-lunching country's economic growth, as more as the role which agriculture has, it cannot take no other economic activity due to the fact that the food request is essential and has a permanent character for the human existence on one side and on the other side the agriculture provides the needed raw material for re-lunching of more other industries (food

products, textiles, chemical, pharmaceutical, cosmetics, handcraft, etc).

Through the agriculture, there must ensure the alimentary security of population, meaning the possibility for all citizens to have access in permanence to a quality of sufficient products, of acceptable quality, for having an active and health life.
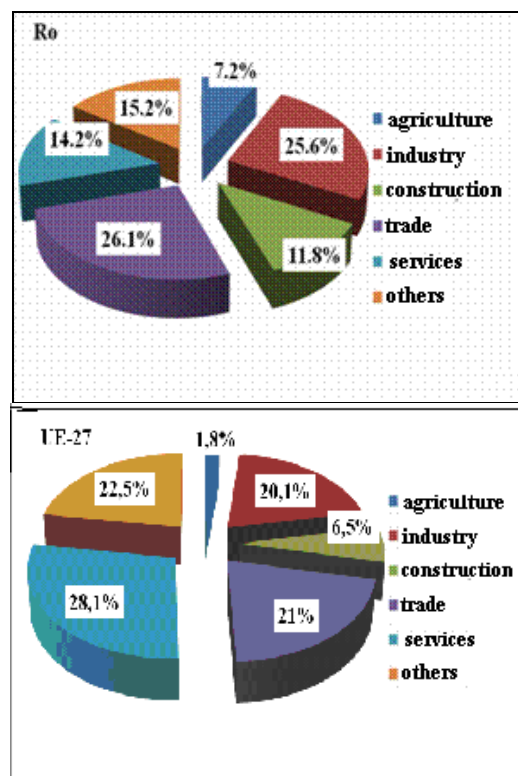
Fig.1. The Structure of Gross Added Values in 2008

The large share of Romanian agriculture compared to other European Union countries at GVA formation is explained by the too slow increase in the share of trade and services at total gross value added.

The structure of farming land fund shows that the biggest **shares in the farming surface own a number of seven countries**, as follows: France and Spain with more then 16%, then Germany, United Kingdom and Poland with more then 9%, and then Italy and **Romania with more then 8% from farming land of European Union.**

These countries focus around 78% from farming surface of European Union and around 71% from arable surface.
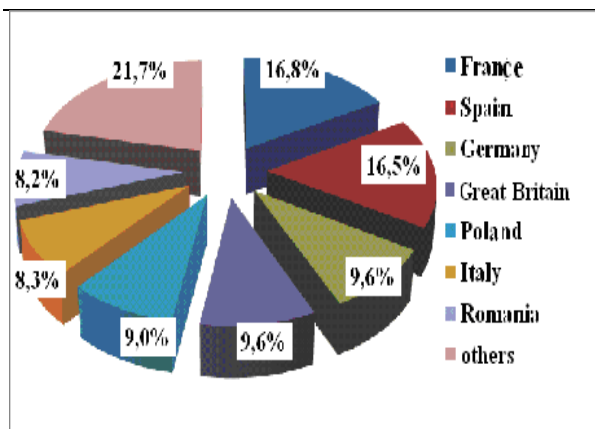
Fig. 2. Farming surface structure of UE-27
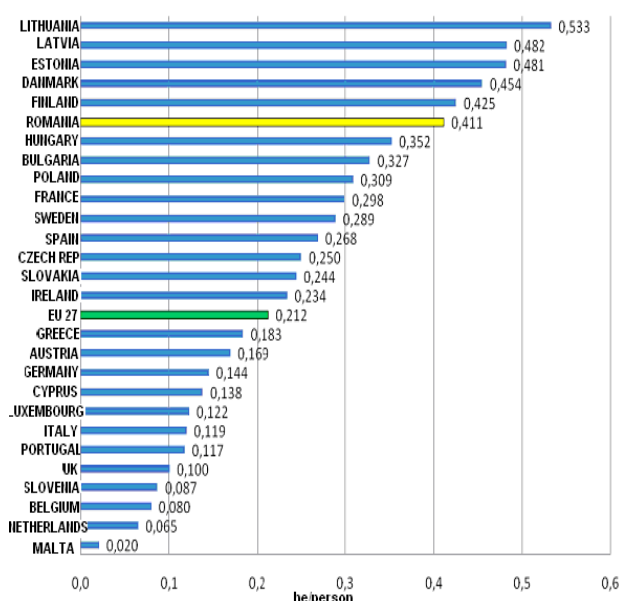
Fig.3. Arable surface per person in UE 27

In a period of time extremely short the Romanian agriculture met great mutations in the structure of landing propriety, the big farming units disappeared under their communism organization form, being emerged new exploitation types, individual settlements, familial associates and farming societies.

The situation of farming exploitation with legal personality, of individual settlements, but of surfaces found in their exploitation is the following: from the total of 3.931.350 farming exploitations registered at the end of the year 2007, 3.913.651 (99,5%) were individual farming exploitations, from which 65% from used farming surface, and din 17.699 units with legal personality exploited the rest of 35% from surface.

Table 1.The number of agricultural exploitations by legal status

Legal status	Total farming exploitations (number)		Farming exploitations which use the farming surface (number)	
	2002	2007	2002	2007
Total	4.484.893	3.931.350	4.299.361	3.851.790
Individual farming exploitation	4.462.221	3.913.651	4.277.315	3.834.407
Unity with legal personality	22.672	17.699	22.046	17.383

Source: Statistical Yearbook of Romania, 2009

Table 2.The surface of agricultural exploitations by legal status

Legal status	Used farming Surface, (he)		Medium used farming surface , (he)			
			on a exploitation		on a exploitation which uses farming land	
	2002	2007	2002	2007	2002	2007
Total	13.930.710	13.753.046,5	3,11	3,5	3,24	3,57
Individual farming exploitation	7.708.757,6	8.966.308,6	1,73	2,29	1,8	2,34
Unity with legal personality	6.221.952,5	4.786.737,9	274,43	270,45	282,23	275,4

Source: Statistical Yearbook of Romania, 2009
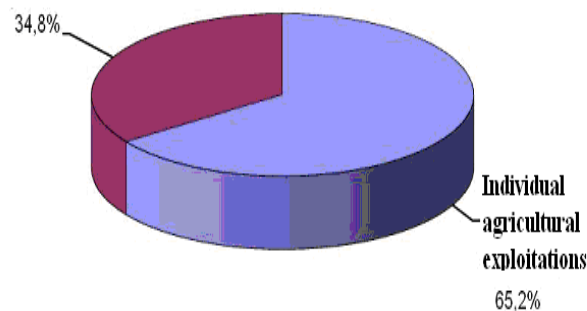
Fig. 4. Farming surface use based on organization form from 2007 (%)

Differences on the average size of farming exploitations in Romania to most European Union Member States are a major obstacle to ensuring a high level of efficiency due to the fact there may be no investments and there cannot be organized the activity on a modern base. The average farm dimensions of the old

territorial European Union countries exceeds 20 hectares.

Romania hasn't so far been able to create effective distribution mechanisms for local production sale and Romanian farmers struggle to sell their product on their own. According estimations, more the 70% from total of realized production is capitalized in this way.

From this point of view, very important is for the local producers to associate in the view of production capitalizing, as more as the competivity from the European Union countries is still high.

Business development in Romania shows large differences between regions, with special regard to the development of Small and Medium Enterprises (SMEs). Entrepreneurial development in rural areas is underrepresented as a result of insufficient exploitation of material resources, poor education, low utilities level, and the phenomenona of massive migration to urban or externally, to other states, especially of the population young people

The analysis of SMEs in rural areas highlights their relatively low capacity to answer the requirements for the provision of jobs for rural space population.

CONCLUSIONS

From the analyze of presented data in this paper, we can affirm that the economic and social development of romanian rural economy, there must be set in accordance with the development of settlements and micro regions within each area related to communities members' actions, with the actions of local authorities, of public institutions and NGOs that existing in the area.

In addition to ensuring the economic and social growth in rural areas, there is necessary to promote coherent development policies that lead to:

- modernization and rural space infrastructure development;

- Increasing the urbanization degree of rural areas;

- qualitative and quantitative improvement of public services.

Agriculture gradually loses its importance as a source of jobs and as participation in the national economy, while the lands still have a largely use of agricultural in nature. Sustainable development of rural space should not be limited only to obtaining good quality agricultural products and clean, unpolluted, it also involves activities of processing of agricultural food products based on new processing technologies.

For strengthening of commercial farms, there are needed investments, especially for application of new technologies aimed at increasing efficiencies and improving the quality of obtained products, in order to reduce production costs and to increase the competitiveness and compatibility with European Union standards, related to market and competition conditions.

Romania have failed so far to create effective mechanisms of distribution for the sale of local production and Romanian farmers struggle to sell products on their own. From this point of view it is very important for local producers to associate in the view of production capitalization, especially since the competition from European Union countries remained high.

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DISTRIBUTION OF FARMS AND UTILIZED AGRICULTURAL AREA OF ROMANIA BY THE SIZE CLASSES ACCORDING TO LEGAL PERSONALITIES

Marius Mihai MICU[1], Valentina TUDOR [2]

[1]University of Agricultural Sciences and Veterinary Medicine, Bucharest 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 21 318 25 64/232, Fax: + 40 21318 28 88, E-mail: micumariusmihai@yahoo.com
[2] University of Agricultural Sciences and Veterinary Medicine, Bucharest 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 21 318 25 64/232, Fax: + 40 21318 28 88, E-mail: valentina_tudor@yahoo.com

Corresponding author :micumariusmihai@yahoo.com

Abstract

This paper aims at presenting the situation of agricultural holdings and agricultural area used by those in Romania according to legal status, based on statistical data from 2002-2010. In this paper we address the size of farms in terms of physical size, agricultural area (UAA) expressed by the number of hectares given the structure of agricultural holdings by size of utilized agricultural area.During the analyzed data suggest that the Romanian agricultural sector continues to represent individual main component of Romanian private farming, which consists of individual farms and family associations without legal personalities. In 2010 the sector comprised of 3.82 million farms with an average size of 1.9 ha. About 133 thousands of them were exclusively livestock units and did not cultivate land. Another important component of Romanian agriculture is represented by farms with legal personality, whose number in the year 2010 was 30669 units (0.8% of total holdings) that used 45% of agricultural land used and operated an average of 191 ha.

Keywords **:** *agricultural area (UAA), agricultural holding , Romania*

INTRODUCTION

The current situation of Romanian agriculture is characterized by multiple social and economic problems and there are many households economically unsustainable[2].
Ownership and exploitation picture of Romanian agriculture is bipolarized, in terms of size and in terms of yields, low production. Bipolarity is revealed by the coexistence of two categories of farms: small and large.
In the category of small holdings are included peasant households (also they are found under the name of „individual farm''').
At the opposite pole are large farms, typically organized as units with legal personality: associations forms and cooperatives, companies, etc [6].
In both types of units in production performance is modest compared with the results of EU agriculture.

Starting from these general considerations and having the experience and results of developed European countries, consider in the Romanian agriculture, agricultural policy action of utmost importance is the definition and size of farms in a modern way.

MATERIAL AND METHOD

In the European Union, farm size is characterized by two parameters: physical size, expressed as the number of hectares of agricultural area (UAA) and economic size, expressed in number of units of economic size (ESU) [8].
In this paper we address the size of farms in terms of physical size, noting the structure of agricultural holdings by size of utilized agricultural area.
Data were collected through public institutions, including National Institute of

Statistics and Ministry of Agriculture and Rural Development.

The study was to research, analyze and interpret statistical data. This, together with extracts from the theoretical literature, enabled evaluation of agricultural holdings by size of utilized agricultural area in Romania.

RESULTS AND DISCUSSIONS

By applying the Land Law and its subsequent legislation occurred substantial changes in the agrarian structure, generating excessive fragmentation of agricultural land, average size of farms reduced by 83%, from 20.6 ha in 1989 [10] to 3.4 ha in 2010.

Subsistence farms accounted for 29.7% of utilized agricultural area, with an average size of 1.1 hectares, down by 5.8% compared to 2003, when they accounted for 35.5% of utilized agricultural area in while farms larger class size over 50 ha had a 52.8% share of utilized agricultural area, with an average size of 331 ha, and represented 0.6% of all agricultural holdings in the year 2010, but they note that their number has doubled since 2003 (Fig.1.).
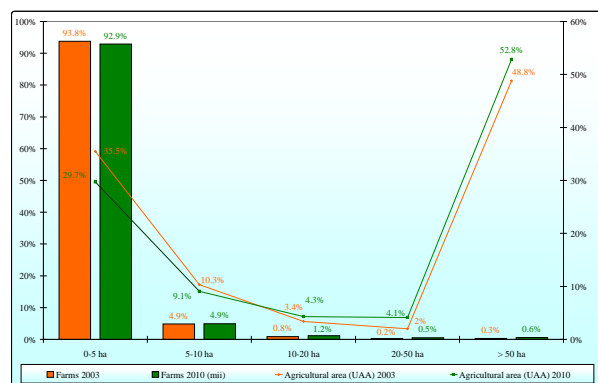
Fig.1. Percentage distribution of farms and agricultural land use by size classes [5, 9, 12]

As a result of the restoration and establishment of private property, the total number of farms in a Romanian agriculture arrived in 2010 to 3823 thousands of which only 97% actually use about 13 million ha of total agricultural area of the country (14635 thousands ha) (Table no. 1 and 2).

Individual agricultural sector is the main component of Romanian private farming,

which consists of individual farms and family associations without legal personalities. In 2010 the sector comprised of 3.82 million farms with an average size of 1.9 ha. About 133 thousands of them were exclusively livestock units and did not cultivate land (Table no. 1 and 2).

Individual farms are the most important part of agriculture in our country geographically (spatially), economically and socially, the main result of the reconstruction and establishment of ownership of land under the Land Law no. 18/1991. In the individual farms, the farms are prevalent with little land. With dimensions that drastically limits the ability of performance, with an extremely low operating capital and poor infrastructure of production, individual peasant economy is presented as an economic liability, oriented mainly to satisfy their consumption needs.

Table 1. Number of farms in Romanian agriculture, by legal status (2002-2010) [10, 11, 12]

Legal status of agricultural holdings	Year	Total agricultural holdings	Total agricultural holdings using agricultural surface
Individual farms	2002	4462221	4277315
	2005	4237889	4103404
	2010	3820393	3686698
Farms with legal personality:	2002	22672	22046
	2005	18263	17843
	2010	30669	30216
- agricultural companies / agricultural associations	2002	2261	2224
	2005	1630	1614
	2010	1390	1379
- agricultural companies	2002	6138	5706
	2005	4824	4563
	2010	16482	16087
- units of public administration	2002	5698	5618
	2005	4818	4750
	2010	3252	3245
- cooperative units	2002	87	77
	2005	108	89
	2010	68	67
-other	2002	8488	8421
	2005	6883	6827
	2010	9427	9388
TOTAL	2002	4484893	4299361
	2005	4256152	4121247
	2010	3851062	3716914

A subcomponent of private agriculture is the so-called simple or family associations,

indicating which are not specified as such in the statistics after 2002, which are included in individual farms. According to statistics of the RGA in 2002/2003, in Romania there were approximately 6500 such associations, with an average size of 121 ha and cultivating together about 5% of total agricultural land.

Tabel 2. The dynamics of agricultural area used by farms in Romanian agriculture, by legal status (2002-2010) [10, 11, 12]

Legal status of agricultural holdings	Year	Agricultural area (UAA)		Average of agricultural area (UAA) (ha)	
		ha	%	On a farm	On a farm that uses land
Individual farms	2002	7708757	55,3	1,73	1,80
	2005	9102018	65,5	2,2	2,2
	2010	7154137	55	1,87	1,94
Farms with legal personality:	2002	6221952	44,7	274,4	282,2
	2005	4804683	34,5	263,1	269,3
	2010	5852854	45	190,84	193,7
- agricultural companies / agricultural associations	2002	975564	7,0	413,5	438,7
	2005	742065	5,3	455,3	459,8
	2010	556785,7	4,3	400,57	403,76
- agricultural companies	2002	2168792	15,6	353,3	390,1
	2005	1780788	12,8	369,2	390,3
	2010	3172972,4	24,4	242,5	247,26
- units of public administration	2002	2867368	20,6	503,2	510,4
	2005	2124737	15,3	441,0	447,3
	2010	1649787,1	12,7	954,42	958,97
- cooperative units	2002	2365	0,02	27,2	30,7
	2005	3246	0,02	30,1	36,5
	2010	8176.22	0,06	120,24	122,03
- other	2002	207872	1,5	24,5	24,7
	2005	153847	1,1	22,4	22,5
	2010	448962,2	3,5	47,63	47,82
TOTAL	2002	13930710	100	3,1	3,2
	2005	13906701	100	3,3	3,4
	2010	13006991	100	3.4	3.5

Family associations were established following the disappearance of former CAP because smallholders have felt the need to regroup in such holdings for the following reasons: ease of performing mechanical works, supply of inputs easier, can easily call agronomic consulting services able to upgrade technologies and increase crop productivity [7]. Because family association is organized without rigid formality (no legal recognition or status has its own organizational structure is not well defined and no management structure with clearly defined), suffer a disadvantage compared with other agricultural enterprises, such as [3, 7]:
-difficulties in attracting development loans;

-uncertainty going because agreements between members are not substantiated by a statute of the farm;
-lack of economic goods and own agricultural machinery association, which is forced to use the services of agents;
-can not afford to hire wage labor;
-quality of management and human resources is modest;
-do not have a scientific resource management or accounting;
-flow of incoming and outgoing members of the association disrupts the normal course of business of production.
Another important component of Romanian agriculture is represented by farms with legal personality, whose number in the year 2010 was 30,669 units (0.8% of total holdings) that used 45% of agricultural land use and profit on average 191 ha (Table no. 1 and 2). This category includes several types of farms:
The agricultural companies / agricultural associations with legal personality were created in order to overcome the difficulties encountered by land fragmentation accompanied by lack of work and resources to finance inputs needed for production, investment and payment of other obligations. They were born on the ruins of former CAP, their main activity is crop production. These holdings are contractual forms of association based set-profit status, without the aim of making a profit and, therefore, no commercial. According to art. 5 of Law no. 36/1991, agricultural society invested with legal personality type is a private enterprise with the object of farming land, tools, animals and other means to the company and investments of agricultural interest. Specifically for this type of farm is variable number of associates, capital variability and that land is brought into use only in society. Some members participate only land they own, while others offer both land and labor, in which are rewarded financially in addition [1, 4]. In 2010 the company operated 1,390 respectively agricultural associations with legal personality, with an average size of 401 hectares, and owns 4% of utilized agricultural area of the country (Table no. 1 and 2). About

81% (1130 units) of these farms were established in the plant, and only 1% (11 units) dealt exclusively with animal husbandry, the remaining 18% (249 units) with agro-livestock mixed profile [11].

After 2001 agricultural companies / agricultural associations with legal personality kept the downward trend of earlier years of transition both in the number of units and the utilized agricultural area. Thus, in the period 2002-2010 their number decreased by 871 units, 39%, and the size of agricultural land operated by agricultural societies fell by 419 thousands ha, and 43% (Fig. 2). As mentioned during the time when fewer agricultural area used for all types of farms with legal personality, except for a slight improvement for cooperative units, we can say that most members of these agricultural companies / agricultural associations have preferred to return to individual agricultural sector and to continue work in households or informal associations of family, while a small portion turned to the establishment of cooperative units, mainly agricultural cooperative formed by Law no. 566/2004.
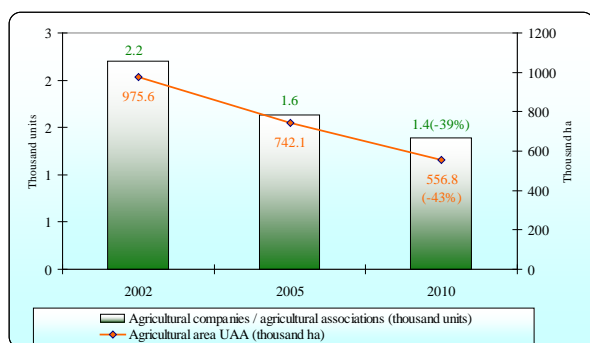

Fig.2. The evolution of agricultural companies / agricultural associations and agricultural area used in the period 2002-2010 (thousands)

Increasing the average farmland back into agricultural companies/agricultural associations with legal personality-from 413.5 ha in 2002 to 455.3 ha by the year 2005 - indicates that if these farms were held and some processes the merger, but during 2005 - 2010 shows a 15% reduction in the number of agricultural companies / agricultural associations areas and average reaching 400.6 ha (Table 1 and 2).

Initiative landowners to join in the agricultural unit was driven by several factors [7]:
-Some owners who had concerns in other sectors, did not intend to carry out direct agricultural activities or lived far away from where the land is returned to the Land Law;
-Division of land holdings in numerous small parcels and irregular agricultural mechanization was impossible;
-Need to use mechanical means associated as they were endowed former agricultural production cooperatives;
-Lack sufficient experience to carry out effective work in agriculture and the need for qualified technical leadership etc.

Having legal personality, these farms have the great advantage of being able to turn to loans for investment and are able to contract with other individuals or entities. The agricultural companies with legal process has other favorable characteristics of association have a management structure consisting of the General Meeting of Shareholders in the company who brought agricultural capital, Owners Representatives Assembly, the Council, the Administration, have the experience and advice of specialists agriculture, have accounting and can be managed scientifically, associate members can enjoy technical support from society for areas that will grow so individual.

Agricultural companies, established under Law no. 15/1990 and Law no. 268/2001, are the majority of vegetable farms operating private or state land leased or purchased or leased from those allotted after 1990. In 2010 the Romanian agriculture companies were represented by a total of 16,482 units that comprised 24.4% of utilized agricultural extent and had an average size of about 243 ha (Table no. 1 and 2);

Units of public administration, especially communal pastures under local or central government, totaling 3252 units with an average size of 954 ha (Table no. 1 and 2);

Cooperative units, which in 2010 included 68 units that exploit an area of 8176 hectares of agricultural land (Table no. 1 and 2). Crop production be the exclusive activity for 67 cooperative units, only one active in the

livestock sector and only 3 had to work both livestock and cultivation of agricultural land [11]. These cooperative farms had an average size of 120 ha, most of them agricultural cooperative agricultural cooperative formed after the adoption of Law no. 566/2004;

Cooperative units increased between 2002-2005 by an additional 19 units and their average size, in terms of agricultural area used, increased by about 30.1 hectares, since 2005 until 2010 is a decrease in their number by 40 units instead increase the average agricultural area returned to a cooperative unit in 2010 to 120.2 ha, reflecting the fact that if these forms of association processes have taken place to increase membership.

Other types of farms, whose number amounted to 9427 units with an average area of 48 ha, in the foundations, nongovernmental organizations, religious institutions.

In the period 2002-2010 there are two steps outlining an easy process of land concentration.

The first step is observed, taking in 2002-2005 by individual agricultural sector of agricultural stretches over 1.4 million hectares of agricultural units belonging to legal entities of different types, while reducing the number of individual holdings and increase their average size from 1.73 ha in 2002 to 2.2 ha in 2005, shows that this industry has been a slow process of land concentration, a phenomenon that has been, in fact, the entire agriculture (Table no. 1 and 2). Believe this was done, on the one hand, by the sale of agricultural land, some individual farms thus increasing their surface, and on the other hand, upon the formation of new associations or increasing family size old ones by accepting new members. Unfortunately, after 2002 there is no statistical evidence that shows the evolution of family associations, informal character allows them to easily set up and dismantling, and a permanent change in the number of associate members.

In the second phase 2005-2010, we see further reducing the number of individual agricultural holdings by about 10%, while reducing agricultural area used by them, decrease is approximately 21% (1.9 million ha), the surface average utilized agricultural on an individual farm is approximately 1.9 ha. In the agricultural sector with legal personality is an increasing number of agricultural holdings by about 68% (12,406 units), while increasing agricultural area used by them, the agricultural sector with legal taking over about 1.9 million hectares belonging to individual agriculture , average agricultural area a farm with legal status to approximately 191 ha. Decreased average agricultural area used by a farm with legal status from 263 ha in 2005 to 191 ha in 2010, although it noted a shift of total utilized agricultural area of 1.9 ha in the 2005-2010 agricultural sector with legal, reflect appearance of agricultural holdings, middle class, in terms of agricultural area used, starting to create a balance between individual farms have a very small area of land and farms with legal holding a very large area (Table no. 1 and 2).

CONCLUSIONS

Provisional results of the general agricultural census of 2010 brought into focus some aspects of agricultural land use. In this respect the following aspects:

-the average farm size being reduced by 83%, from 20.6 ha in 1989 (253) to 3.4 ha in 2010.

-as a result of the restoration and establishment of private property, the total number of farms in a Romanian agriculture arrived in 2010 to 3823 thousands, of which only 97% actually use about 13 million ha of total agricultural area of the country (14635 thousands ha) (Table no. 1 and 2).

-individual agricultural sector continues to be the main component of Romanian private farming, which consists of individual farms and family associations without legal personalities. In 2010 the sector comprised of 3.82 million farms with an average size of 1.9 ha. About 133 thousands of them were exclusively livestock units and did not cultivate land (Table no. 1 and 2).

-another important component of Romanian agriculture is represented by farms with legal personality, whose number in the year 2010 was 30,669 units (0.8% of total holdings) that

used 45% of agricultural land used and exploited in average 191 ha (Table no. 1 and 2).

This category includes several types of farms:

-In 2010 operated 1390 agricultural companies, agricultural associations with legal personality that, with an average size of 401 hectares, and owns 4% of utilized agricultural area of the country (Table no. 1 and 2). About 81% (1130 units) of these farms were established in the plant, and only 1% (11 units) dealt exclusively with animal husbandry, the remaining 18% (249 units) with agro-livestock mixed profile [11].

-Units of public administration, especially under local communal pastures or central, totaling 3252 units with an average size of 954 ha (Table no. 1 and 2).

-Cooperative units increased between 2002-2005 by an additional 19 units and their average size, in terms of agricultural area used, increased by about 30.1 hectares, since 2005 until 2010 is a decrease in their number by 40 units, in turn increasing the average agricultural area returned to a cooperative unit in 2010 to 120.2 ha, reflecting the fact that if these forms of association processes have taken place to increase membership.

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SOME INDICATORS OF CONSULTATIVE SERVICES DEVELOPMENT IN SERBIA

Branko MIHAILOVIC, Drago CVIJANOVIC, Vesna PARAUSIC [1]

[1]Institute of agricultural economics, 15, Volgina, 11000 Belgrade, Serbia, Phone/fax: + 381 (0) 11 2972-858, E-mail: drago_c@iep.bg.ac.rs

Corresponding author : drago_c@iep.bg.ac.rs

Abstract

Transition process and Serbia's entering into the European Union is possible to hasten by adequate and timely consultative services, before all during the programs and methodologies creation for conducting the enterprises' restructuring processes. In such conditions, the consultative organizations help the enterprises in accomplishing their goals, solving problems in business and management, identifying and using new possibilities, increasing their knowledge and applying suggested changes in the practice. Consulting is a result of manager need for integrated and complex business information. To obtain the transfer of consultant knowledge and manager skills development, a certain conditions must be fulfilled. First of all, business integrity and consultant competence are the most important. Business integrity, i.e. consultant ethics contributes image and reputation and is important competitiveness factor on consultant services market. Regarding actual consulting trends in countries within our region, as well as developmental level of consulting in EU countries, the market of consultative services in Serbia has not significantly changed in previous period (as we saw, the acknowledgement of it was got also by empirical research). The owners and managers of enterprises still do not feel a need for external services, in order to solve business problems. Having in mind a level and quality of demand, neither a supply of consultative services had not reached satisfactory level.

Key words: *consulting, management, investments, consultative organizations.*

INTRODUCTION

In its Guide to Membership, the Institute of Management Consultants in Great Britain, defines management consulting as a "service provided by independent and qualified person/persons in determination and research of the problems concerned to politics, organization, procedures and methods, recommending appropriate activities and supporting their implementation"[1]. The important step in creating the concept and practice of management consulting in our country was made by forming and work of Yugoslav Centre for Organization and Development (JUCOR), in period since 1969 to 1979, as special integration of numerous productivity organizations and economic/technological institutes from all ex-Yu republics. The United Nations had supported this integration by the project „Yugoslav Center for Organization and Development", financed by the United Nations Development Program (UNDP), and

as executive agencies had been engaged the United Nations for Industrial Development Organization (UNIDO) and International Labour Organization (ILO). Previous action meant real breaking point and key international input in spreading philosophy, concept and methods of management consulting, as well as in implementation of modern methods and techniques in our country. Introduction of modern management consulting has been realized through two basic forms [2]. First, over 100 national experts had training abroad, in the field of consultative work methodology (preparation and tracking the projects realization, making and presenting reports, etc.) at eminent organizations *PA International* from Great Britain and *Arthur Andersen* from USA. Second, with support of consultative teams, made from domestic and foreign experts, the enterprises from all ex-Yu republics had realized massive complex projects, which had provided special possibilities to our experts for training and affirmation in the field of

consultative services providing to the management. After the year 2000, the consulting in Serbia became very intensive, aggressive, poorly controlled and therefore very vulgar. In accordance to initiated economic reforms, the development of consultative services market is in direct dependence from the course of transition process and domestic enterprises restructuring. At the same time, elimination of external limits and returning Serbia into international economic courses had caused significant increase of demand for new knowledge, experiences and expertise, including those in the form of consultative services. The enterprise's privatization requires knowledge and creativity, which represents important consultative organizations' field of activity. Introduction of market oriented business in Serbia represents stimulus for consultants, in order to enlarge the assortment of consultative services, all the better that clients have to prepare to use rationally internal and external professional and creative potentials. However, Serbia is not a member of international consultative associations, which can unfavourably effect further consulting development, as well as on lack of information in companies on consulting positive effects. Significant support to consulting sector development would realize through forming national association of consultants, considering that the international associations are focused on coordination of consultative work on national and regional level [3].

MATERIAL AND METHOD

The consulting was not defined in statistical activities classification in Serbia, so there has been heavy analyzing its development. Therefore the evaluation will be done:1. *indirectly, with the help of substitutes, i.e. financial services* (financial mediation since 2002, while was changed the methodology of activities tracking in Serbia) and through technical and business services, which had been registered up to 2001; 2. *projection of consultative incomes* and putting the obtained

value in relation to GDP, in order to get data comparable to reports of international consultative associations; 3. *comparison of consultative organizations number with total number of organizations in the country.* Landmark would be the countries in the region, as well as some West Europe countries; 4. *qualitative analyses of business supply of consultative services* in Serbia, where will be used FEACO (European Federation of Management Consulting Associations) classification of consultative services, and make got results comparable to results of some European countries. Research has shown that the development of consultative services is insufficient compared with the analyzed countries and that it should rush through a further affirmation of the knowledge economy.

RESULTS AND DISCUSSIONS

1. The evaluation of substitutes. During the observed period (1999-2004), in Belgrade were dominated financial and other services in realized investments, in comparison with other areas in Serbia. However, the participation of realized investments in sector of financial and other services (Belgrade area) span a range between 38,30% and 64,95% of totally realized investments in this sector in the Republic of Serbia [4]. Such data on realized investments match with the concentration of consultative organizations, which are mostly located in Belgrade. The condition in sector of consultative services points out that it is necessary to do decentralization of consultative work. As support to this process should be decentralization of some ministries and Serbian Chamber of Commerce's consultative body, in order to create conditions for more adequate responses to enterprises needs, i.e. possibility for partner approach in solving business problems, considering that the partnership is a basic principle of modern consulting.

2. The evaluation of consultative services in Serbia by projection of consultative incomes.

The participation of consultative incomes in gross domestic product (GDP) of certain country can be of use as index of consulting sector development. According to that criteria, on the top is United Kingdom with participation of 0.84%, than Germany 0.60% and Czech with 0.47%. Those three countries are above European average with 0.44% [5]. The average participation of consultative incomes in GDP of Serbia amounts 0,25% (*Table 1*), which is double less participation than the average one in EU.

Table 1. Projection of consultative incomes in Serbia in period 2005-2007

	2005	2006	2007
GDP nominal milliard USD	24,058	27,544	30,969
Income on consultative market of Serbia USD	61.8	70.45	77.99
Participation projection of consultative incomes in GDP	0.257%	0.255%	0.252%

3. Relation of consultative organizations number and enterprises in the country total number. The data points out that in EU countries, there are 10 consultative organizations, in average, to 1,000 enterprises, along with mild oscillations in some countries (*Table 2*).

Table 2. Relation of consultative organizations number and total number of enterprises in the country

Country	Number of MC organizations (1)	Total number of enterprises (2)	(1/2)
Serbia	973	275,944	0.0035
Austria	9,300	273,659	0.034
Czech	1,363	897,649	0.0015
Denmark	7,550	202,248	0.0373
France	10,258	2,279,307	0.0045
Germany	15,250	1,665,326	0.0092
Greece	170	820,723	0.0002
Hungary	1,300	557,219	0.002
Italy	9,000	3,821,688	0.0024
Portugal	4,442	850,295	0.0052
Romania	640	412,304	0.0016
Slovenia	954	88,618	0.011
Spain	10,250	2,545,049	0.004
Great Britain	15,250	1,588,804	0.0096

The exception is Greece, where the relation of consultative organizations number and total number of enterprises in the country, is relatively unfavourable (0.0002). Serbia legs behind to European average, because here are, in average, 3-4 consultative organizations on 1,000 enterprises. Although the consulting development in Serbia, in last decade, has been aggressive, to some extent – intensive, there is significant market space for development of domestic consultative sector.

4. The structure of consultative services supply. The research of consultative services market in Serbia has shown following structure of consulting service lines: operative management (OM): 28%, information technology (IT): 5%, corporative strategy (CS): 50%, human resources (HR): 13%, out-sourcing services (web – designing and programming): 4%. The results of consulting empirical research in Serbia significantly match this sector development in the countries which had also been in transition. Group of countries analysis (Czech, Hungary, Romania, Slovenia, Bulgaria) shows that the most important consulting service lines is in domain of strategic management, or corporative strategy, than follows services of operative management and human resources managing (which is characteristic for Serbia, too). Considering first rule – the exception is Romania, which has the most significant participation of operative management services. The consulting in the field of information technologies and out-sourcing services have minor market participation [5]. Demand structure of consultative services in Serbia coincides with consultative services structure in Slovenia. That is to say, participations of some consulting service lines in Slovenia are: operative management (OM): 30%, information technology (IT): 8%, corporative strategy (CS): 45%, human resources (HR): 14%, out-sourcing services: 3%.

CONCLUSIONS

Inadequate economic development of Serbia is determined by many factors, among which the following stand out: a country geopolitics position decline, disadvantageous economy

structure, loss of traditional markets, financial indiscipline at all levels, and management capacity and skills insufficiency. Companies have performed their activities in such business environment characterized by inefficiency and employees' lack of motivation. Since 2000, the consulting became very actual in Serbia. The demand for consultative services rises together with real needs, and is dictated by: privatization, value evaluation of the enterprise, foundation of new small and medium enterprises, as a supposition of faster development of market economy, new products, seeking for new markets etc. For its objective and subjective reasons, Serbia is being late with transition, so it acceleratively privatizes public (social) property, very often in an awkward way, sometimes insufficiently controlled and under indistinct circumstances, everything in order to keep pace with other countries. Follow-up effect of those processes is inevitably hasty development of consultative services. It is naturally that the consulting will be similar to everything what happens in the economy: intensive, aggressive, almost uncontrolled, and therefore often even vulgar. The consulting has not been, down to the present day, defined in statistical activities classification in Serbia, so analyzing its development has been very difficult. In accordance to initiated economic reforms, the consultative services market development is in direct dependence to transition process and domestic enterprises restructuring. At the same time, eliminating external limitations and returning Serbia into international economic courses caused significant increase of demand for new knowledge, experiences and expertise, including those in form of consultative services.

Special interest has been related to programs of enterprises' rehabilitation and restructuring, but also to conceptualization and implementation of development strategy and networking with economic active participants on international market, introduction of information technology, performance improvement for managing main functions of the enterprise, joint ventures, technological cooperation and similar.

The enterprise's privatization requires knowledge and creativity, which represents important consultative organizations' field of activity. Introduction of market oriented business in Serbia represents stimulus for consultants, in order to enlarge the assortment of consultative services, all the better that clients have to prepare to use rationally internal and external professional and creative potentials.

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BIODIVERSITY, FORESTS AND POTENTIALS FOR PRODUCTION OF MEDICINAL HERBS ON THE TERRITORY OF CARPATHIAN SERBIA

Nada MIJAJLOVIC[1], Vesna POPOVIC[1], Predrag VUKOVIC[1]

[1]Institute of Agricultural Economics, Belgrade, Volgina street 15, 10060 Belgrade, Serbia, Phone: +381(0)112972842; Phone/fax: + 381(0)11 2972858; E-mail: nada_m@iep.bg.ac.rs; vesna_p@iep.bg.ac.rs; predrag_v@iep.bg.ac.rs

Corresponding author : nada_m@iep.bg.ac.rs;

Abstract

The subject of analysis is valuable and varied biodiversity, forest and medicinal and aromatic fund of NP "Iron Gate" ("Djerdap") and its protective zones, which extend within the administrative area of the municipality: Golubac, Kucevo, Majdanpek, Kladovo and Negotin in the Carpathian area of Eastern Serbia. The work is subject to assessment of the situation and opportunities for sustainable use and protection of biodiversity, forest ecosystems and the rich stock of medicinal and aromatic plants, whose exploitation and processing, including plantation farming can contribute to the diversification of agriculture and the economic and social viability of rural farm population, affected by depopulation. This is in line with accepted international obligations in this area (Carpathian Convention and relevant protocols - the Convention protocol on Biological Diversity and the Convention protocol on forests, WWF-DCP Carpathian Opportunity Initiative, etc.).

Keywords: biodiversity, forest, medicinal herbs, protected area, the Carpathian Convention

INTRODUCTION

Aiming to preserve and sustainably use the Carpathian area, as a part of the Danube region, there were adopted many documents at the international, state and municipal level. Adopting the Protocol on Preservation and Sustainable Use of Biological and Landscape Diversity within the convention on protection and sustainable development of Carpathian area, which was adopted in 2003 (Serbia ratified it), there were established obligations and methods of their conduction, aimed to preserve and protect this area [1]. A special accent to this document was put on protection of jeopardized and endemic species in intact eco-systems and in those violated within the area. The WWF (World Wildlife Fund) has started, within its activities, the initiative for recognizing the opportunities in the Carpathian area and suggested the measures of protection and improvement of this natural entirety [2]. Serbia has been involved in this organization's activity.

MATERIAL AND METHOD

This paper aimed at perceiving the potentials of the Carpathian areas in Serbia regarding biodiversity, forest funds and medicinal/aromatic herbs. The analyses were done by using the desk method, using available literature, data from the publications of the Republic Statistical Office, as well as the international documents, which were adopted for this area. Particularly was discussed about the NP Iron Gate, as a valuable and sensitive natural resource, with all its peculiarities and related municipalities (jeopardized and endemic species have been specially singled out and the measures of their protection in the forthcoming period have been determined).

RESULTS AND DISCUSSIONS

Biodiversity – Iron Gate is the national park which fulfills geo-morphological, hydrological and natural conditions for the national park status [3]. The national park Iron Gate

occupies the territory in south-east Serbia, on the border line with Romania. The area under the national park amounts around 64 km^2, while the protected zone amounts around 94 km^2. Iron Gate lies on the right bank of the river Danube, from Golubac to Karakas, in line of 100 km. Narrow hilly-mountain wooded zone lies by the Danube river and is wide 2-8 km, while the altitude ranges from 50 to 800 m [4]. As Iron Gate main characteristic is considered a forest overgrowing (64%), where the forest communities are opulent and diverse. From over 1.100 plant sorts should single out the relict and the endemic. *Corylus colurna* is one of the relict sorts which make here a consistent and old phytocenosis with other relicts. Of always green trees and bushes in Iron Gate gorge are present *Ilex aqufolium*, *Daphne laureola* , *Ruscus hypoglossum* and *Taxus baccata*. Besides the relict species, in these communities can be found some of the modern species of trees and bushes. Out of endemic Balkan species, in Iron Gate are represented: *Erysimum commatum*, *Hieracium mermoreum, Achillea clypeolata*, *Dianthus petraeus, Silene flavescens*, *Acer intermedium*, *Alyssum petraeum*, *Coronilla elegans*, *Seseleria rigida*, *Cerastium banaticum*, *Satureia kitaibeli*, *Centaurea atropurpurea*, *Parietaria serbica*, *Jurinea subhastata* [5].

In regard of animal species were stated they were relict and in the natural park Iron Gate can meet bear, lynx, wolf, jackal, golden eagle, owl, black stork etc. [6].

In the documents of the Danube region was determined an evanescence of migratory sorts of fishes due to the construction of Iron Gate floodgate; it is worked on finding a solution for bringing them back in their own natural residence and to provide them again the migratory river paths [7].With the construction of Iron Gate accumulation, many of fishes have disappeared permanently (beluga, sturgeon, german sturgeon, stellate sturgeon, Black Sea and Danube herring), other species have expanded numerically in this newly arisen situation, as it is concerning a bream. One of the anticipated measures within the EU strategy for the Danube region is to"secure the

sustainable population of the sturgeon species and other autochthonous fishes in the Danube till 2020, fighting the invasive species"[8]. Of the fishes-predators species should mention: catfish, pike, river barbel, chab, redstart, sterlet and carp. A number of carps decreases owing to exaggerated catch and domination of fishes-herbivors species. In the group of Asian new species, we can mention white amur, white carp (*Cirrhinus macrops*) и silver carp (*Hypophthalmichthys molitrix*).

Forests and potentials for collecting medicinal and aromatic herbs – As already stated, the NP Iron Gate is significantly covered by forest and various flora communities, which dispose with numerous medicinal and aromatic herbal sorts. Especially will be discussed on the municipalities which belong to the park or borders on them.

The municipality *Golubac* occupies a territory of 368 km², of that the area overgrown by forests 174,06 km², or 47,4% of the territory (which is above the republic average - 28% - [9]. Of the stated forest fund, there is predominantly represented a beech with 82,2% and some lesser an oak, with 9,5%. The river Danube is a key natural potential of Golubac and the best comparative advantage of this municipality.

According to the official statistics [10] , the area under forests in the municipality *Negotin* is 27. 530 ha (or 25,28% of the total municipal area; this data has been unchanged in last five years). There are planned the activities of afforestation, where the accent will be put on protection, healing, controlled felling of trees and sustainable use of these forest communities.

The development opportunity, which contributes to diversification of agricultural activities in Negotin municipality, is collecting, growing and processing of diverse medicinal herbs and wild fruits [11].

Within the municipality *Kučevo*, which occupies 721 km², are significant the areas overgrown by forests (348,8 km² or 48,34%). The forests are a basic resource for wood and timber industry and it represents one of the priorities in sustainable development in this municipality [12].

The municipality *Kladovo* has favorable agroecological conditions, which reflect in existence of huge plains and river terraces (Donji Kljuc) and raised areas under forests and pastures (Gornji Kljuc). Under forests is more than 40% of the municipality, of which the most belong to the NP „Iron Gate"and „Srbijasume". It considers that there are significant potentials for collecting wild fruits and medicinal herbs in this municipality [13].

Majdanpek is the municipality in hilly-mountain part of Carpathians and is afforested with 68% (2,3 times more than the national average). Raw forest potentials of the municipality Majdanpek are insufficiently used, a wood is used for the production of firewood, charcoal and cellulose.

In this municipality is planning to intensify the following activities (for which there are real potentials and opportunities), aiming to increase employment of the population: collecting medicinal herbs and wild fruits, which is connected to organic food production and development of cosmetic and pharmaceutical industry.

The vulnerability of the ecosystem of the Danube region as a whole draws attention to several aspects:

• Destruction of natural habitats excavation of mineral resources

• The discharge of waste water treatment directly into the waterways of the Danube

• Work mining – energy plants polluting are all components of environment: air, water and land and all this directly reflects on the wildlife of area as well as the human population.

Danube region in implementing measures to protect and preserve natural ecosystems must be viewed as a whole, and intergovernmental cooperation and compliance of all factors to the local community can result in a successful outcome of what is agreed and documented [15].

In addition to the high percentage of forest area in the Carpathian area that belongs to Serbia in terms of biodiversity mast be taken into account the area permanent grassland (where meadows occupy 37 % and pastures 16 % of the total area of agricultural).Pastures are required for the development of livestock (economic sector that is underdeveloped in Carpathian area). Medicinal herbs from meadow can be systematically collected and controlled in natural communities, and possible also plantation medicinal and aromatic species that well here and it is not used enough opportunity in this area [16]. Mountain National Park of Iron Gate has great potential for the production of medicinal herbs and forest.

CONCLUSIONS

There are many natural resources in the Carpathian area that have to be preserved and used on the sustainable development principles, through already the above mentioned documents. This situation was perceived and many serious activities due were undertaken, as at the inter-state, as well as at the local level, in order to make the mentioned resources of the NP Iron Gate protected in practice too, not only by the adopted formal official documents. Some of the measures regarding a rational use of the existing forest fund and potentials in collecting the medicinal and aromatic herbs should undertake, aiming to expand and diversify the economic activities of this area. In this case are of great significance the republic plans for small and medium enterprises' development, to motivate the population and make it return in these depopulated areas.

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URBANIZATION CHALLENGES FOR THE SUSTAINABLE DEVELOPMENT OF THE AGRICULTURAL SECTOR FROM THE REPUBLIC OF MOLDOVA

Victor MOROZ, Eugenia LUCASENCO

Institute of Economy, Finance and Statistics. 45, Ion Creanga str., MD-2064, Chisinau, Republic of Moldova, Phone: +37322 501119, Fax: +37322 743794, email: vmoroz27@gmail.com, eugenia_lucasenco@yahoo.com

Corresponding author : vmoroz27@gmail.com

Abstract

The paper aims to present the state of sustainable development of agricultural sector from the Republic of Moldova in the context of the urbanization and migration processes challenges. The research method is to compare indicators of economic and social development in the urban and rural areas over the past decade. The study relies on statistical data received from the National Bureau of Statistics and Ministry of Agriculture and Food Industry of Moldova. There are two main dimensions of the sustainable development of the agricultural sector. The first there are the urbanization challenges and population migration from rural areas. The second concerns the inneficient use of natural resources and capital formed in the rural area. Evaluation of sustainability of agriculture in Moldova has a particular importance, since it will help to create preconditions for implementation of reforms in the country's economy. Further research should be focused on identifying patterns of sustainable development in rural areas.

Key-words: urbanization, sustainable development, structural changes, migration

INTRODUCTION

Sustainable development represents a very important phenomenon for the economy of the Republic of Moldova, which is extremely dependent on the energy resources import, raw material and other resources of vital importance. Mainly, it is manifested in three important aspects: economic, social and environmental. Also, positive changes happened in the latest years that can serve as a framework for the consolidation of the sustainable development in the country. These reffer to the development of the financial-banking and custom systems, intensification of creation of competitive companies, diversification of the external trade structure.

Economic growth from low to high income is encompassed by the spatial concentration of production. Urbanization as the concentration of population in cities and towns is one of the most evident features of economic development. While this transition from rural to urban is largely completed in developed countries, the urbanization process continues quite rapidly in the developing countries [4].

This process has its own characteristics in Moldova. It has been formed as a result of the lack of interest for a long period of time in the sustainable development of the peripheral areas, thing which led to what is currently:

-A considerable gap between the level of socio-economic development of regions and capital;

-Financial and intellectual resources of the country, business development, investments, social and technical infrastructure and other resources are mainly concentrated in the capital city - Chisinau;

-Poverty is predominately concentrated in the rural areas and small towns;

-Migration predominantly covers the rural areas, creating the basis for the formation of "abandoned territories".

In the Republic of Moldova only the economic aspect of the sustainable development is actively discussed and manifested, the other two aspects: social and environmental being left behind.

The equilibrated approach in implementing the socio-economic state policy must be strengthened by including actively and widely

all the territories in the process of economic growth.

The regional contribution to the growth of the national economy should be increased in order to ensure a socio-economic, sustainable development and to reduce significantly the poverty in the countryside.

MATERIAL AND METHOD

The purpose of this study is to observe urbanization and its effects on the social and economic development of the Republic of Moldova. Several scientific papers related to regional development, rural transformation and urbanization have been studied [1,2,4]. On the base of this, the current transformations of rural areas have been conceptualized in connection with urbanization. The analysis of local economic system shows that there are growing differences between the capital and other territories. The study highlights this issue in order to show the causes of disparities between the urban and rural areas. The working assumptions are based on comparison and interpretation of the indicators calculated for the rural areas and for the urban territories. The analysis covers economic and social issues, with special attention to labor migration, as a driving force for urbanization.

RESULTS AND DISCUSSIONS

There are two different ways to refer to urbanization. The first is as a demographic phenomenon, in which an increasing proportion of the population is concentrated in urban areas. In developing countries this indicator depends on quality of statistical data. In the Republic of Moldova the ratio between urban and rural population remains almost unchanged since 2000. At the same time at least one forth of the labor force migrated out of the country.

A second way to refer to urbanization is as a social and economic phenomenon inherent in industrialization, as urban areas facilitate linked production, distribution, and exchange processes. In this way, urbanization can be seen as a process of infiltration of the countryside by non-farm activities [1].

According to the census from 2004 in 1989 - 2004, an urban degradation in Moldova has been noticed, followed by weakening economic and social functions of small towns, reduced number of urban population as a whole.

The economic crisis of the 90's has mostly struck the small cities and towns, especially those whose lives are determined by the activity of one - two companies.

The main reasons of urban degradation: economy deindustrialization of small towns, stagnation of their infrastructure, cessation of construction of housing and rapid depopulation. In general, for the period 1989 – 2004, due to the socio-economic depression and mass emigration in 47 towns the population has been reduced and only in 6 cities was an increase in the number of inhabitants.

At present, the republic has 60 settlements with the status of towns and 5 municipalities. Meanwhile, nearly 60% of the total urban population of the republic is concentrated in two large municipalities - Chisinau and Belts.

The rest of the cities (small) are spread across regions - each area has 1-2 cities with a population from 2 thousands to 37 thousands, in Gagauzia - 3 towns with a population from 16 to 24 thousands. A population growth, in recent years, has been noticed within only a few small towns.

Intermediate towns perform social and economic functions that are important for regional development, functioning quite reasonably. Therefore the intermediate towns are important not merely because of their size, but because of the services they render to the rural areas. As services centers, these towns, can provide public, social, commercial and personal service not only to its own population but also to the surrounding rural hinterlands.

For the case of the Republic of Moldova the measurable indicators of urbanization could be share of agriculture in GDP, structure of disposable incomes of rural households and

construction of dwelling houses in rural and urban areas.

A basic characteristic of economic development seems to be the long-term shift of economic activities from agriculture to industry and services. This often leads to a fall of the agricultural share in Gross Domestic Product (GDP), but, also, to its growth in absolute terms (see Table 1).

Table 1. The share of agriculture in the nominal GDP

Year	GDP nominal (million MDL)	Share of agriculture in GDP (million MDL)	Share of agriculture in GDP (%)
2002	22556	4 729	21,0
2005	37652	6 158	16,4
2006	44754	6 474	14,5
2007	53430	5 316	10,0
2008	62922	5 524	8,8
2009	60430	5 110	8,5
2010	71849	8 557	11,9

Within the structure of the natural resources of the Republic of Moldova the climate, soil and some deposits are outnumbered by the regenerative biological resources, particularly the agricultural ones, followed by water resources (surface or underground), forest, hunting and fish farming resources. The spontaneous biological and agricultural resources are also the most vulnerable ones to natural risks and climate change.

The most important natural resource for the country's economy is the soil layer. The chernozem types account for about 2/3 of the approximate 10 soil types encountered in the country. These soil types are some of the most fertile soils, but they are also among the most receptive, and thus vulnerable to certain risk phenomena (rain showers, droughts, etc.), as well as to the technogenic impact. The forecasts on the evolution of the soil quality in climate change conditions imply the reduction and limitation of achieving their productive potential, including the acceleration of the erosion, degradation and desertification processes. The main anthropogenic causes for the degradation and thus reduction of the soil's fertility, which amplify the consequences of the natural risks, are the following: excessively high quota (65%) of cultivated lands and insufficient activities to combat the natural and technogenic erosion of the soils. In the same time the way the soil is used and managed influences to a great extent the vulnerability of the hydrographical network, of the micro-ecosystems, which are part of the agro-ecosystems, as well as the risk level towards different pests of the agricultural crops.

The geographical space of the Republic of Moldova is characterized by a lack of humidity. The natural aquatic resources occupy approximately 62,2 km^2 with a total volume of 200-220 mil. m^3. The available water resources constitute an average 7.2 km³ annually, with 6.3 km³ in dry years and 4.5 km³ in very dry years respectively. The largest water resources are in the cross-border rivers - Nistru (about 57%) and Prut (9.7%). The average water resources in the interior rivers constitute 18.2% and the ones in the underground - 15.2%.

Small rivers, that in the past decades have lost a great part of their debit and water quality, diversity and biological productivity, are particularly exposed to natural risks, especially torrential rains, which cause floods, and droughts. The internal hydrographical network is in an increased process of degradation. In the same time, over 600 communities are under the risk of flooding because of poorly developed or deteriorated protection infrastructure.

The forest resources in the Republic of Moldova occupy 450.9 thousand hectares or 13.3% of the country's surface. About 89% of the total area of the forest fund is managed by state forest authorities, the rest is managed by town halls and other land holders, including 0.4 thousand hectares of forest in private property. All the forests of the country are part of the first functional group, having exclusively the environment protection function, which is currently partially accomplished.

Forests' capacity to mitigate the natural risks impact and the consequences of climate change are weakened by the reduced share of forest areas, by their excessive segmentation (the forest fund is divided in over 800 forest

bodies), by the anthropogenic pressure on the forests (illegal forest cutting, cow grazing, poaching, etc.), and by the recovery and enlargement of the forest areas on the basis of a reduced number of species. In the same time the forest's role to stabilize the water table and maintain the aquatic resources is being reduced, as well as the role to diminish the soil erosion processes and land slides.

Agriculture is one of the key driving forces in shaping Moldovan landscape, nature and culture over centuries. Favorable climate and high quality soils historically have determined Moldova's agricultural specialization, particularly in the production of high value crops like fruits and vegetables. Agriculture contributed with 11.9% of the country GDP in the year 2010, while about 28% of the active population of the country was engaged in this sector. The status of the agricultural sector has changed dramatically over the last two decades along with the disruption of production and distribution networks. Land areas used for high value crops have been reduced by two times. The shift in production has also been accompanied by significant reductions in land productivity.

This situation is directly related to the lack of investments, capital and credit availability to the agricultural sector, factors that have resulted in farmers applying low yield technologies and drastically reducing their use of agricultural inputs, especially such as fertilizer and other agricultural chemicals. The agricultural sector benefits with only 8.4% of capital investments, and the foreign investments in the Moldovan agriculture are even more modest, with only 1.5% of total investments in agriculture in 2010 [3].

At the same time the Republic of Moldova is particularly prone to natural hazards due to a specific combination of geography, inappropriate land use practices, and climate change. Moreover, as a result of the high poverty level in the rural areas, the vulnerability of agriculture in the Republic of Moldova, as well as inadequate risk mitigation measures, the impact of natural hazards on the poor population in the rural areas is particularly severe.

The situation is associated with the major risks related to the structural changes that may affect the countryside and the economy as a whole such as: a) migration and uncontrolled urbanization, b) lack of professional qualifications and adaptability of the population in the rural areas, c) inadequate use and devalued assets in rural areas, d) inappropriate use of the natural resources.

An important characteristic of rural areas is the dominant position of the agricultural sector that is characterized by a production process different from that of industrial production. Secondly, the lifestyle of persons engaged in the agricultural sector often differs from the rural lifestyle of those who are engaged in other non-farm activities. With the decreasing economic importance of agriculture, new economic activities are possible and needed in rural areas in order to achieve more consistency between urban and rural areas.

Tabel 2. Evolution of the average nominal monthly salary per employee in selected braches, lei

	Agriculture	Industry	Other communal , social and personal service activities
2006	914,5	2084,5	1302,2
2007	1098,6	2540,7	1600,3
2008	1484,4	3041,7	2013,9
2009	1468,9	3135,6	2289,1
2010	1638,6	3430,9	2394,3

The lack of labor opportunities in rural areas and small towns has generated a massive migration flow out of the countryside. Number of migrants in Moldova has increased during the last years with around 50-60 thousand persons annually. Although the intensity of migration in the last five years has stabilized, however it remained at a high level (about 300,000 annually), which is about ¼ of the economically active population.
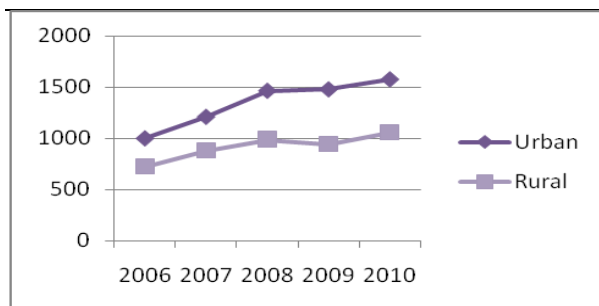
Fig. 1 Evolution of total disposable income of the households from rural and urban areas (monthly average per person, lei)
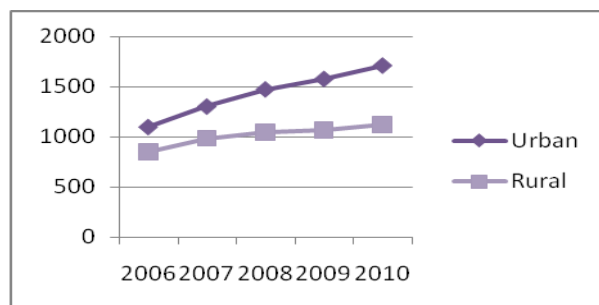

Fig. 2 Evolution of the total consumption expenditures of the households from rural and urban areas (monthly average per person, lei)

Analysis of household data suggests that remittances (amounting to around 30 percent of GDP) have proven more effective in reducing poverty than all of Moldova's (mostly untargeted) social protection programs combined. Those households who have 'exported' their workers to more prosperous economies typically enjoy per capita consumption that is 20 percent higher than in households without migrants, who in rural areas are struggling. Data analysis shows that the importance of the incomes generated from self-employment in agriculture has decreased significantly during the last five years. In the same time importance of others incomes like remunerated activity, social payments and other income sources (which means mostly remittances) has increased. Increase of social payments means aging of the rural population (see Figure 3).
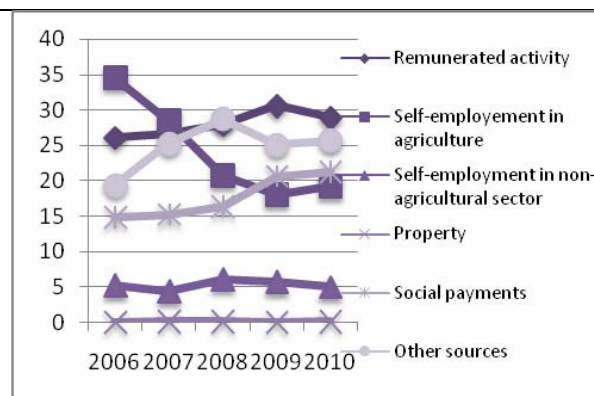
Fig. 3 Structure of disposable incomes of rural households, 2006-2010, %

The largest part of remittances is used for investment in private houses construction. As a rule these investments are made in urban areas (see figure 2). This means forthcoming increase of the urban population mostly in the capital city area. Implementation of dwelling houses per inhabitant in the Chisinau area is more than ten times higher than in countryside [1].
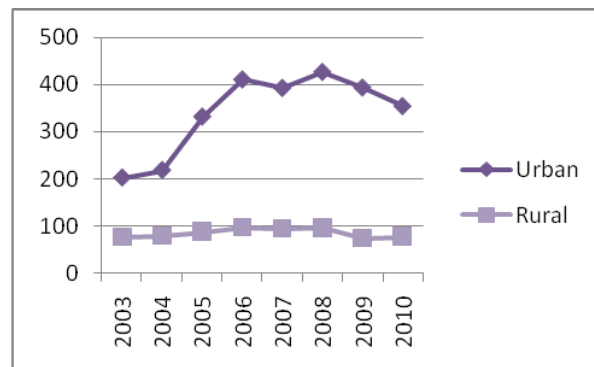
Fig.4 Implementation of private dwelling houses in urban and rural areas, 2002-2010, thousand sq. meters

Recent changes in labor demand may explain some of differences in the development of the rural and urban sectors. Thus the lack of job creation in the agricultural sector and the expansion of the construction industry and service sectors are thus possible explanations for the different impact of the emigration variable. Another explanation of this situation stems from the low prices paid to Moldovan farmers (farm -gate prices) that during recent years were far below international prices. From the medium and long term perspective this is expanding the rural – urban differential with a very significant urban bias, resulting in

out-migration of the rural workforce without an associated increase in rural productivity.

Different controversial aspects appear in the process of transition from a rural society to an urbanized one. There are diverse opportunities and problems that are brought by this process, but for sure they can be handled. Among the negative consequences there are: socio-economic instability and insecurity, environmental degradation, scarcity and inequality. In order to prevent the appearance of these problems, there is necessary a good governance of the big and small tows from the country, by maintaining a strong urban economy and promoting a good sustainable development of the regions.

Economic development can not exist without urbanization, the last one being generally rather a necessity than a consequence of the economic growth. An increase of income per capita has, in every country, been accompanied by urbanization. However, the sustainable development is limited by the lack of a good urban management, which, in an improved form, could bring more positive aspects in the process of economic development of the country. In the Republic of Moldova, sustainable development of the rural areas should be directed, primarily to the improvement of the quality of life, representing a system of measures aimed to reduce poverty at all levels: household, community, district, country. The essence of this approach is that firstly, we have to figure out what kind of agricultural systems do exist in order to define the optimal use of the available resources and then create a system of measures for overcoming the crisis.

CONCLUSIONS

In the Republic of Moldova, the countryside is involved in a process of rapid social and economic transformation. Thus importance of the incomes generated from self-employment in agriculture has decreased significantly during the last five years, while importance of others incomes like remunerated activity, social payments and other income sources has increased.

Investment in private dwelling houses in the rural area is more than four times lower than in the capital city area. Implementation of dwelling houses per inhabitant in the Chisinau area is more than ten times higher than in countryside.

Mobilization of resources in the rural areas for the sustainable development should be covered by the internal and external resources. The investment attractiveness of the territory could be accessed by the following attributes:

-Financial capitals: financial resources in any form

-Human capital: skills, abilities, knowledge, health and ability to work

-Social capital: formal and informal social connections and relationships with others, responsibility and ability to adapt to changes

-Natural capital: natural resources and environment, and the opportunities that they provide

-Physical capital: machinery, equipment, technologies, products produced in farms and the existing physical infrastructure

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THE QUALITY AND MARKET COMPETITIVENESS OF THE AGROALIMENTARY PRODUCT

Laurentiu MUNTEANU

University of Agricultural Sciences and Veterinary Medicine, Bucharest 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 754 200 100, E-mail: laurentiu.f.munteanu@gmail.com

Corresponding author:laurentiu.f.munteanu@gmail.com

Abstract

The scope of the presented paper was to get acquainted with the quality management system for each of the stages of the agro alimentary products' branch. Through a cause/effect two-dimensional knowledge system, the chains following the quality along the agro alimentary channel were highlighted, such as: structure concept (through the complexity and dynamics of the agro alimentary system); the value for money interaction; indicators and conformity regulators; the use of the quality collection signs (their use being conditioned by the independence degree and implications of the economical agents, the nature of the legal connection between owners and users); the quality and its implications in the direct selling of the products by the agricultural producers; the conformity denomination and the promotion of the ecological products and traditional brands; the character and necessity to implement the new standard series ISO 9000:2000 and GMP; the quality in the promotion system (referring to the correlation of the conformity quality and the promotion means for the agricultural products); the electronic means of promoting the quality of agro alimentary through web pages, on the Internet.

Keywords: *market quality, quality management, ISO.*

INTRODUCTION

The quality assessment structure can also be presented through the classic indicator system (physical and chemical, energetic and of equivalence), but it must be amplified with the new means related to the conformity standard system, approval certificates and promotion forms.

The scope of this paper is to capture the quality system for the agricultural products in a three-dimensional form, within the market: the overall presentation of the quality indicators; their necessity, not only for agro alimentary products, but also for the traditional and ecological ones; the forms of promotion on the market, through the quality structure of the agro alimentary products [1].

MATERIAL AND METHOD

The alimentary product concept can be represented through a successive trivalent form: from the natural food, from which it passed to the improved food, reaching the functional food. Thus, from the natural source

of the food, the modified source was reached. The quality management of the agro alimentary branch is facing an invasion risk from the enriched, modified, transformed, new agro alimentary products.

In this overall framework, the research was targeted onto the acknowledgement of the variation in quality forms, within the agro alimentary market system, regarding the consumer's behaviour, on one hand, and on the other hand, onto the quality indicators (referring especially to the energetic and economic indicators). The ISO standard structure has imposed the necessity of a differentiation between production quality and product quality [2].

Yet, the current management requirements, within the market branch, impose (face) the competitiveness increment of the agricultural products, which implies the crossing from a conformity quality, to a concept quality (understanding, through this quality type, the production and existence of products at the level of the current consumer requirements). It can be stated that the knowledge and assessment of a company's entire activity in

the agro alimentary market system, can be included in the total quality management notion. But each of the characteristic quality parameters can be divided through a more analytical approach, by introducing other new parameters. This is one of the main reasons why the term of quality can be discussed from the following points of view: of the agricultural producer, of the processing sectors for agricultural products, of the seller and of the consumer.

The indicators characterizing the quality become a competitiveness instrument, capturing the products' market differentiation, and also the product's brand, distribution channel etc... Finally, all these represent synthetically an evaluation through an ethical code in the marketing of alimentary products[3]. This paper dwells upon the necessity of a differentiated implementing of conformity quality indicators and market quality for the agro alimentary product (the conformity denomination).

RESULTS AND DISCUSSIONS

The overall debate over the quality management in the agro alimentary branch is based on the agro alimentary product's indicators, signifying the nutritional, social, material and cultural aspects of an individual, collectively or even human society.

But the quality management in the agro alimentary branch faces an invasion risk from the enriched, modified, transformed, new, alimentary products, which has brought the attention of legal bodies, toxicologists and producers. In this overall framework, structuring can be made in the quality management within the agro alimentary branch, according to several criteria, such as origin, degree of maturity, degree of perishability, commercial, processing means, management etc.

Defining the term of quality is related to the assessment form given by the market's manifestations, representing a result of the agro alimentary product's capacities, satisfying the consumer's requirements, which includes the product's quality in a restraint meaning (referring to the compliance with the quality regulations), but at the same time, including all the additional elements competing at the purchase of the product (conditioning, delivery terms, use instructions etc.).

Under this aspect, the quality management for the market of agro alimentary products includes two main (large) quality types: the l i m i t q u a l i t y, given by the minimal level of the characteristics accepted on the market, for a certain product; t h e s p e c i f i c q u a l i t y, referring to the product's brand, the producing enterprise through its activity etc. These are the reasons why, in an agro alimentary branch, the agricultural/agro alimentary products in fresh condition, the finished products obtained through their processing, the term of quality, can be discussed through the following points of view:

- the agricultural producer, regarding the quality, first of all, as the large obtained quantity and the delivery in good conditions on the market. As a result of the production (system's) quality, the quality is a precise and measurable variable;

- the processing sectors for agricultural products, mainly focusing on the easiness to industrialize and the capacity to preserve the processed or finished products. In this vision, the quality is the result of the technological processing practices;

- the seller, regarding the quality first of all through the exchange value, the selling at the best price. A high quality product is the one offering the performance of the product's quality at a reasonable price, which is considered accessible. So, the client will generally purchase the product that he/she can afford;

- the consumer, researching and trying to define quality, on one hand, through the nutritional substance content, the absence of toxic compounds, the quantity and nature of the micro-organisms present in the products taken into account etc. All these aspects refer, on one hand, to the means through which quality fulfils its functions, and, on the other hand, the value for money is evaluated, which is considered to be an essential factor for the

consumer. From this point of view, the frequency of use, the real market price, the user's trust in the product, the product's reliability etc., represent consequences of the market phenomena generated and usually taken into account by the consumer. Also, within the branch, the term of quality will have to be considered according to the existing competition on the market, and not only the theoretical standards.

In this case, the value for money of the agricultural products is highly important. A high quality agricultural product has a higher level in the price of the producer, looking to know if the advantages related to a higher selling price are not annulled through (by) the additional costs or inferior (production) capacities.

For this reason, the policy regarding the quality in the agro alimentary branch imposes the existence of a correlation, both with the additional costs it implies, but mostly with the (retail) price level supported by the consumer. Certain consumers accept to pay more on a high quality product, if they have information regarding: What is the quality? How large is the consumer collectively, requiring the quality of the certain product? Up to what price level is the consumer willing to accept purchasing the product?

In conclusion, the notion of quality in the agro alimentary branch has a complex and dynamic character. The factors influencing the product quality themselves can be divided into two groups: technical factors, which are revealed in the technological production process, combined with the factors acting in the field of product circulation.

The product quality indicators within the agro alimentary market characterize the physical aspect and the physical and chemical characteristics of the agricultural/agro alimentary products, along with the equivalence and economic indicators.

 The standard system represents a means of conformity in the compliance with the market quality of agro alimentary products, and the Standardization represents an organized, systematic and permanent activity for the elaboration and application of the standard.

The standardization of agricultural/agro alimentary products is a regulation type unitary guideline, regarding the minimal technical requirements which have to be fulfilled by the agricultural/agro alimentary products, in order to be accepted and paid for, at the price established by the beneficiary.

The Quality Assurance Standards are especially important since the adherence to the standards imposed by the International Standards Organization (ISO 9000) and the European Standards (ES 29000). The new series of standards ISO 9000:2000 describes fundamental elements of the quality management system, with the specification of the terminology.

To all these, the Good Manufacturing Practices (GMP), can be added, which impose the processing conditions and procedures – based on a long experience – insuring a constant quality and safety of the food. Through its objectives, the standardization favours the acceleration of the sale-purchase mechanism on the internal and external market, because, in STAS, the product quality is defined, and the beneficiary is guaranteed that it shall be complied with.

Frequently, in the case of agro alimentary products, the regulations also define other notions, such as those regarding the conformity certificates.

Through common standards for the alimentary products at an international level, the Codex Alimentarius organization targets the improving of the consumer protection and the facilitation of a loyal trade.

The conformity regulations for traditional alimentary products, referring to the territory of the EU, have appeared from the necessity that the national authorities of the particular member state examine every request and fulfil the minimal common dispositions. For this purpose, there is a national position presentation procedure, in order to guarantee that the specific agricultural/agro alimentary product is indeed traditional and has specific characteristics. Several definitions can be stated for the conformity criteria for approving the Romanian traditional alimentary products, referring to specificity, traditionalism, approval,

original denomination, geographical indication etc[4].

The product's brand represents a term, a symbol, cumulating the most representative elements of the product's quality on the market, identifying the product, the product category or even the enterprise, in order to differentiate from its competitors[5]. But in the case of an agro alimentary product, it is still necessary to know the specificity of the certification brand notions, the geographical indication. Thus, the product's brand represents: a symbol for the product's quality guarantee, a means of information and presentation of the product's origins. The assortment itself, as a form of product conformity within the agro alimentary market, through strategy, follows the establishment of commercial policy trends [6]. The quality has special implications in the promotion of agro alimentary products; there are conformity correlations with the promotion means for these products. For the agro alimentary products, it is also necessary to know the beneficiaries of the promotion programmes, which can be represented by:

-Romanian companies, manufacturing agricultural/agro alimentary products with controlled denomination of origin and/or geographical indication [7];

-Individual producers, producer organizations, professional/interprofessional organizations from the regional agro alimentary sector;

-the professional and interprofessional organizations of the production/distribution sector(s), from one or several member states, representative at a national or community level.

Thus, in the promotion of agro alimentary products, there are documents/guidelines, some in a project phase, which, according to the quality, give and fundament a minimal nutritional criteria (MNC).

There are various promotion forms in agro-marketing; their use facilitates the correct positioning of the agro alimentary products, finally achieving an optimal capitalization on the products and the creation of a very good image for the company.

The quality promotion means for the agro alimentary products can be done also through the direct selling of those products by local agricultural producers. Especially from the point of view of value for money, there are advantages for this means of direct capitalization on the agricultural products, both for the agricultural producer and for the buyer.

But the direct selling of products by the agricultural producers implies the existence of limitations and restrictions for the activities regarding the quality of these products (referring to the assuming of civil liability, the existence of knowledge regarding the culinary technologies and commercial techniques etc.). In the promotion system for these products, through the direct selling forms, they can be categorized in: individual and collective forms of direct selling.

For the promotion, especially under the aspect of the quality of agro alimentary products through direct selling, for the current conditions in our country, it is necessary to found and/or consolidate capitalization associations – especially for the products intended for fresh consumption -, situation generated by economic phenomena related to the lack of balance between request and offer, the perishable character of products, the agricultural producers' need to obtain high incomes, the high market competition, the familiarization with the market influencing factors etc). In the promotion of quality through collective forms of direct selling, the advertising means frequently used by the agricultural producers practicing direct selling can be applied, namely: the local media, the local radio broadcasts, panels located on public roads, visits to agricultural exhibitions with tasting, audible announcements at various selling points etc.

The conformity denomination of ecological/traditional agro alimentary products imposes an adequate correlation with their promotion, which in Romania is based on the currently registered denominations. The information and promotion are activities representing a graphic symbol of the market destined products, with origins from the activity regions [8]. The following elements are observed in these products: the product's property and quality, the form of choosing the name of the traditional product, the positioning and repositioning of the traditional product, the

opportunity of extending the traditional products, the traditional multi-products. The multi-product strategy creates a competition between producers in this field of activity; each traditional product can be developed in the direction of presenting quality attributes different from those of the other products, for the purpose of gaining a place on the market as good as possible.

In the promotion system, each of these dimensional forms include a number of nomination elements; this is why the current denominations, integrated structures including the name of the producers, the name of the company/geographical area, used technologies etc.

From the quality point of view, the promotion of ecological products and traditional brands, represents a certain current opportunity, a natural consequence of the implementing of the European legislation in the field of activity (and not only), the implementing of traceability in the branch of agro alimentary products etc., all these representing a guarantee for insuring the population's alimentary quality safety.

For the Romanian agro alimentary products, many of the traditional/ecological ones bring benefits to both the European buyers and the Romanian agricultural producers.

The promotion of products having a denomination of protected origin (DPO), a geographical indication (PGI), or are known as guaranteed traditional specialty (GTS), the national logo, is used for the purpose of identifying the traditional agro alimentary products on the market, through the denomination (PGI/DPO) of the products which have obtained national protection. After obtaining protection at a community level, the national logo will be used along with that of the community.

All these elements are used because the quality and specific characteristics of these products are strictly related to the special geographical environment (with its inherently implicated natural and human factors). The maintaining of the product's quality supply is subjected to audits. These protection system help sustain the cultural legacy of the community. Furthermore,

the diversity of the agricultural production, within the rural area of origin, is added.

Within the market for traditional products, the promotion of the, traditionally specific" quality orients both the consumers and the manifestations of the economic agents towards the delimitation of branch patterns for the products of specific qualities. Referring can be made to: the branches' administration models, management models, general development models, strategic marketing models, innovation models.

The electronic instruments represent a modern means of promoting the quality of agro alimentary products, targeting to draw visitors through the aid of the internet. This implies two aspects: the promotion of the company's brand, of the products and services; the promotion on the internet network of the website created in the sphere of the quality achievements of the agro alimentary products and the consumption effect.

In promotion, web pages can be divided in the following website categories: those of the producers (with or without selling), those of the traders (with or without selling), magazine type websites, websites of institutions or associations, national or international, in the field of production/distribution/consumption of agro alimentary products, websites for manifests (fairs, festivals, exhibitions), websites of companies offering consultancy services in the agro alimentary field. This means generates very low operational costs, due to the automation of the control process, an element which is especially favourable for producers with low capacities, but high quality agro alimentary products.

The internet offers new direct marketing possibilities, especially for promoting the product quality, because the computer can not only remember the name and personal data for all the users, but also their quality related preferences, being capable to adapt the offer and product presentation means according to each client's profile/preferences. The availability, independent of a certain schedule is also added. This is the reason why shopping can be done at any hour, with a high degree of comfort and, last but not least, there is an

unlimited access to various products and information. In the launching of quality, there are also disadvantages which can be signalled, related to fraud issues, security issues, launching and integration costs [9].

CONCLUSIONS

Through a synthesis of the aforementioned ideas, quality management aspects can be revealed highlighted for the case of the agro alimentary market through the following elements:

The existence of a certain differentiation of the quality of agro alimentary products, for which the indicator system imposes the necessities: to be completed with elements which are characteristic for the agro alimentary system and/or to be replaced with an aggregated quality management system, adequate for the agro alimentary market.

Within the agro alimentary branch, the quality notion can be discussed from the point of view of: the agricultural producer, the processing sectors for agricultural products, the seller and the consumer..

The products' quality indicators within the agro alimentary market characterize the physical aspect and the physical and chemical characteristics of the agricultural/agro alimentary products, along with the equivalence and economic indicators. The standard system represents a means of conformity, in the compliance with the market quality of agro alimentary products. The standardization represents an organized, systematic and permanent standard elaboration and application activity, for which the Quality Assurance Standards are especially important since the adhering to the standards established by the International Standardization Organizations (ISO 9000 and ES 29000).

In the case of Romania too, the conformity regulations for traditional alimentary products can imply definitions of conformity criteria for the approval of these products, regarding specificity, traditionally, approval, denomination of origin, geographical indication etc.

In promoting agro alimentary products, quality has special implications; there are permanently conformity correlations, imposing the knowing of the beneficiaries of the promotion programmes. This can also be done through the direct forms of selling these products by the agricultural producers; there are advantages both for the agricultural producer and the buyer. The quality promotion for ecological products and traditional brands represents a certain opportunity for these Romanian products, because it brings benefits to both the European consumers and the Romanian agricultural producers. The products having a denomination of protected origin (DPO), a geographical indication (PGI), or are known as guaranteed traditional specialty (GTS) can be referred to.

The electronic instruments represent a modern quality promotion form for the agro alimentary products, but it implies two aspects: the promotion of the company's image, of the products and services; the promotion on the internet network of the website created in the sphere of quality related achievements of the agro alimentary products and the consumption effect. Although this form is known, the necessary resources are not yet invested for its use at maximum efficiency.

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HUMUS SUBSTANCES AND SOIL FERTILITY

Cecilia Violeta NEAGU [1], Georgeta OPREA [2]

[1]University of Agricultural Sciences and Veterinary Medicine Bucharest – Călăraşi Faculty Branch, 1 Nicolae Titulescu, Călăraşi, Romania, Phone/Fax: +40242332077, E-mail: cecilianeagu2005@yahoo.com
[2]I.N.C.D.A. Fundulea, 1 Nicolae Titulescu, 8264, Fundulea, Călăraşi, Romania, Phone/Fax: +40242642080, E-mail: getaoprea56@yahoo.com

Corresponding author: cecilianeagu2005@yahoo.com

Abstract

The humus substances play an important role in obtaining high yields and stable over time. He is permanently double process: the humus improvement of organic material reaching the soil and the mineralization of components at different stages of humus improving, The results of this process is influenced by soil type, climate, irrigation, fertilization. The beneficial effect of humus substances on plant growth may be related to indirect effects (fertilization efficiency or reduce soil compaction) or direct (overall improvement in plant biomass). Factors influencing the humus improving are: climate, biological, pedological, that cultural and technological factors: plant debris, C/N of debris, application of organic and mineral fertilizers and herbicides absorption on humus substrates.Mineralization of soil organic matter, humus substances is thus favourably influenced by mineral fertilization. In this paper we studied the effect of fertilizers on soil humus (C_t), organic matter humus improved (C_e), the carbon content of humus acids (HFA). The interpretation of results was observed that the intensity of nitrification is influenced by humus substances existing total.

Keywords: alluvium soil, softness, humus substances, total carbon, humus carbon, extractable carbon .

INTRODUCTION

The mineral fertilizers raised during the time, problems especially on the mineralization and nitrification processes of the nitrogen in the soil.
In the conditions in which the organic substance of the soil can give to the plants by the mineralization processes significant quantities of nitrogen, it is imposed to explore the researches regarding finding out some methods for the improvement of the nitrogen regime that will ensure an increased efficiency of the mineral fertilization.
The humus equilibrium of a cultivated soil consists of its attitude to regulate the potential of humus improvement-mineralization at identical levels.
The organic substance has direct and indirect action on the soil and plans, depending on their molecular mass.
From the category of substances with high molecular mass (>1000) carbon hydrates, uroides, nucleus acids, proteins, lignite, chitin, humus acids, are part and in the category of organic substances with low molecular mass (<

1000) the products of hydrolysis and degradation by oxidation are part, the compounds with high molecular mass, metabolites of the bodies in the soil, fractions of fulvic and himatomelanic acids. [5].
Generally, it is accepted that the substances with high molecular mass have as effect the modification of the physical features of the soil, whereas the substances with low molecular mass participate in the chemical reactions in the soil and modify the metabolism of the vegetal bodies, after their absorption by root.
The most important component of the organic substance of the soil is represented by the system of humus substances. It is about substance of dark colour, with acid character, rich in nitrogen (unlike vegetal remains). Their most important fraction is soluble in alkaline water solutions. The soluble organic substance in alkalis is partially precipitated by acids (chlorine hydric, sulphurhidric): it is about a substance of black-brown colour, humus acid (with big molecule) that is found abundantly in the chernozem soils, providing them superior agricultural qualities. In solution it remains

another brown-yellow fraction, with a molecule whose mass is under 10000, characteristic especially to the acid soils (fulvic acid).

The system of humus substances is accompanied by a fraction insoluble in alkaline solutions - humina, insufficiently characterized, formed of substances with high molecule, described as being the most persistent in the soil (fulvic acids have a persistence of several tens years, and humus – several hundreds, humina - more). It contains vegetal, animal, microbial remains, non humus yet and of recent date [4].

The fulvic and humus acids are in a sensitively equal percentage of C (51,3 compared to 51,2%), H (4,32 compared to 4,38%), rigorously equal in P (0,1%). The fulvic acids are richer than O (42,9 compared to 40,9%), but poorer in N (0,56 compared to 1,08%), S (0,2 compared to 0,6%) and C aromatic (37 compared to 50% of C total) [2].

The nitrogen in humus can be represented by aminoacids, ammonia, but also by aromatic amines.

 The degree of polymerization of humus acids increases with the age, type of soil and age of soil culture. Their molecular mass is of 10000-100000, the most polymerized coming from the chernozem soils. Also in these soils there are older humus acids (average age dated with ^{14}C is until 1500 years) [1].

The factors that influence the humus improvement are those: climacteric, biological, land, respectively cultural and technological factors: vegetal remains, C/N rate of vegetal remains, application of organic and mineral fertilizers and absorption of herbicides on humus under layers.

MATERIAL AND METHOD

The researches were made on limestone molic alluvium soil, on river deposits AL/AL (ASmok$_1$) that was collected near Roseţi locality, that is in the Danube Meadow. In the first 20 cm pH is 7,6; carbonates are in proportion of 1%, humus 3,1%. The soils texture is clay in the first 35 cm and in clay depth. The natural conditions in which the mother rock appear are fine middle river deposits. The under soil water is at a depth of 2-3 m.

The researches were made on soil tests collected from Amp area (0-20 cm), in three field repetitions and mixed in a middle test of the experimental variation.

In order to estimate the mineralization and nitrification processes it was used Waksman method of incubation, in conditions of controlled temperature and humidity, eliminating the possibility of loosing the nitrates by leaching.

The analyses made were those needed to the level of soil fertility:

- Determination of colorimetric ammonia nitrogen contents;

The extraction of ammonia was made with a solution of K_2SO_4. The dosing of ammonia ion was made colorimetrically, with Nessler reactive (alkaline solution, of potassium tetraiodinemercury), ammonia forming with it a compound of yellow colour. The intensity of the colour depended on the concentration of ammonia in the soil. Reading the tests was made at the wave length of 410 nm.

- Determination of the nitrates contents by colorimetric method;

The extraction of nitrates was made with a solution of K_2SO_4. dosing of nitrates was made with phenyldisulphur acid, by which the nitrates are linked in nitro derivates of phenyldisulphur acid, coloured in yellow in alkaline area (colour intensity obtained by nitrates concentration). Maximum extinction was to 410 nm.

- Determination of contents of C total on spectrophotometer way (Salfeld method);

Humus in soil is determined by the contents of organic carbon (C_t). The reactive used for the determination of total carbon were sulphur acid and potassium dichromate. Supernatant coloured at 590 nm. As witness, standard solution of glucoses was used and the same with the sol tests and once with them.

- Determination of humus improved organic substance in soil (extractible carbon C_e);

By the determination of extractible carbon in the soil we identify in fact the humus improved organic substance in soil. Kononova method was used, M.M., Belchikova, N.P., combined with spectrophotometer technique. Sodium

pyrophosphate, sodium hydroxide and concentrated sulphur acid were used.

- Determination of humus acids contents in soil (C_{ah}) was made by difference.

The results obtained following the analyses were processed statistically by variation analysis [3].

RESULTS AND DISCUSSIONS

Mineralization of organic substance of soil, so humus substances is influences favourably by mineral fertilization.

The current research aimed the effect of fertilizers on humus in soil (C_t), of humus improved organic substance (C_e), of carbon contents in humus acids (C_{ah}).

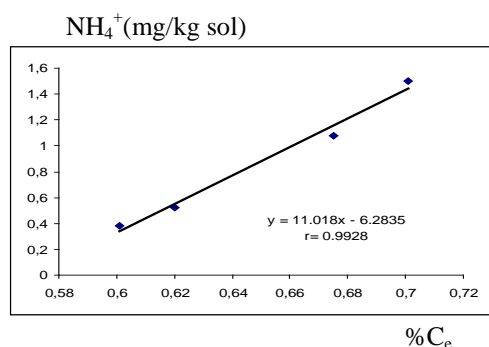The results of determinations are presented in the figures 1 – 5.

Fig.1. Correlation of ammonia quantity in soil with extractible carbon in studied soil (n = 4)

As it can be seen in the chart, the contents of the soil in ammonia correlates quite well with its contents in humus substances (C_e).
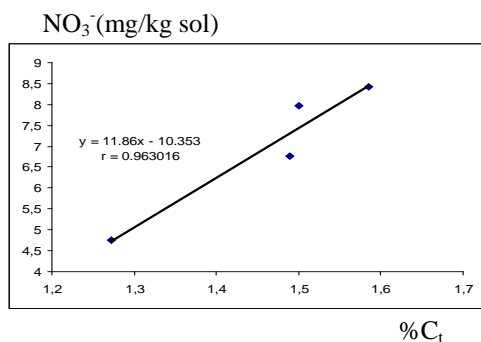
Fig.2. Correlation of nitrification capacity with total carbon percent (% humus) in studied soil (n = 4)

The quantity of mineralized material (contents of soil in organic substance, C_t) determines the nitrification intensification.
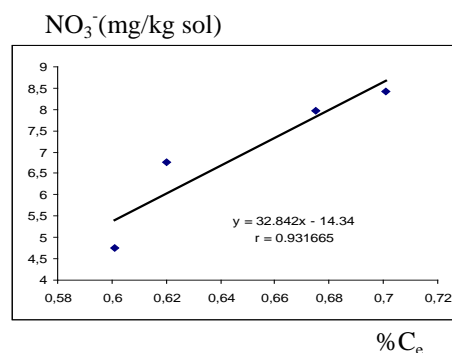
Fig.3.Correlation of nitrification capacity with extractible carbon contents in studied soil (n = 4)

The total quantity of humus substances (extractible carbon in alkalis, C_e) determines very close quantity of ammonia in soil (r = 0,9928; n = 4) and by this, nitrification intensification (r = 0,93167; n = 4)
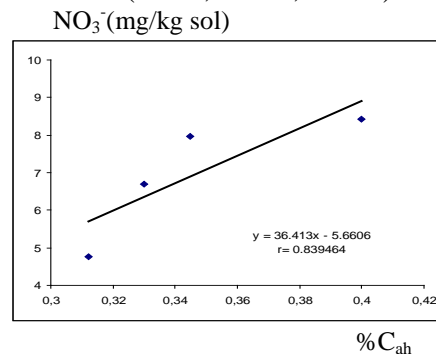
Fig.4. Correlation of nitrification capacity with carbon percent in humus acids in studied soil (n = 4)

The contents of soil in humus acids intensify the processes of ammonia producing (mineralization) and those of nitrification in soil. At the processes of mineralization-nitrification participate both more sensitive humus substances, and – to a smaller extent – humus acids (r = 0,839464).

The formation of ammonia by mineralization determines the nitrification.

Fig. 5. Correlation of humus carbon with extractible carbon percent in studied soil (n = 4)

The contents of soil in humus substances extractible in alkalis (C_e) determines the quantity of humus acids in soil (C_{ah}).

The close correlation of the soil contents in humus acids with its sufficiency in humus improved substance is indicated both by the high value of the correlation coefficient, and by the colineal disposition of the points.

CONCLUSIONS
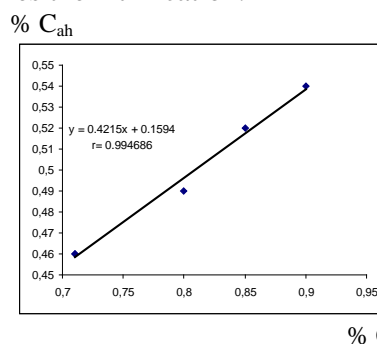
From the charts presented it can be noticed that the high value of correlation coefficient demonstrates the fact that the soil richness in organic substance (C_t) is given by extractible carbon in alkalis (C_e)

The determinations certify an increase of total carbon in soil once with the doses of nitrogen fertilizer incorporated in the studied soil. Moreover, the data obtained certify that the increase is given by the accumulation of humus improved carbon (extractible carbon in alkalis C_e), first of all by carbon in humus acids (C_{ah}), the most stable form of humus.

Data in the paper certify that there is a very close correlation between the total carbon in soil and the humus improved carbon, first of all with carbon in humus acids.

Extractible carbon is also closely correlated with carbon in humus acids, highlighting the fact that these fractions are in a relatively constant percent in humus substance, determining both stable humus and nutritive one.

Mineral fertilization determines significant increase of nitrogen easily hydrosable in soil, fraction with an important contribution in plants nutrition with nitrogen.

Quantity of mineral nitrogen that is produced in the soil is the main factor that determines the level of crops, of produced vegetal biomass.

Considering the organic substance in soil as bearing the features of potential fertilization (by storing the chemical elements needed for the plants, by improving the soil to retain water, by soil structuring etc.) results that the mineral nitrogen produced is a measure of losing the potential fertility.

Increasing doses of nitrogen have a stimulator effect on the mineralization and nitrification processes.

The process of humus improving is conditioned by a multitude of climacteric, land, cultural factors, that provide varied conditions for humus improved. To this the biologic factor could add, represented by soil population. Depending on their variation, more types of humus can appear. The most important climacteric factors are the temperature and humidity. The best values needed for the humus improved process are 30-35°C for temperature and 60-70% for humidity[3].

The effect of humus substances on the plants growing depends on source, concentration and molecular mass of humus fraction. The fraction with molecular mass is responsible for the determination of positive effects of humus substances on plants growing. These effects are partly at the level of plasmatic membrane, by positive influence on absorption of several nutrients and especially nitrates.

The high number of intermediary products of decomposing of vegetal remains have influence on the physical chemical features of soil, on dynamics of nutritive substances, constituting the forerunners of humus substances.

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WASTEWATER TREATMENT IN CITY CALARASI

Cecilia Violeta NEAGU[1], Dumitra CONSTANTIN[2]

[1]University of Agricultural Sciences and Veterinary Medicine Bucharest – Călăraşi Faculty Branch, 1 Nicolae Titulescu, Călăraşi, Romania, Phone/Fax: +40242332077, E-mail: cecilianeagu2005@yahoo.com
[2]University of Agricultural Sciences and Veterinary Medicine Bucharest – Călăraşi Faculty Branch, 1 Nicolae Titulescu, Călăraşi, Romania, Phone/Fax: +40242332077, E-mail: constantinmiti@yahoo.com

Corresponding author: cecilianeagu2005@yahoo.com

Abstract

A good knowledge of the phenomena of wasterwater treatment, causes and consequences, constitute a permanent incentive to an active attitude to protect and maintain the best possible environment.Discharge of untreated or poorly treated wastewater into surface water will have serious consequences for self-cleaning natural phenomenon, the Danube and Borcea arm is now possible to limit the recovery of natural biogeochemical balance, for which necessary:rehabilitation and modernization of existing treatment, completing treatment plant with facilities for biological stage, the laboratory to carry out self-monitoring, these measures are strictly necessary for raising the tratment of industrial wastewater and municipal.Quality indicators of wasterwater discharged into the environment suspension, BOD_5, COD-Cr, ammonium, total phosphorus, does not fall within the limits imposed by curent standards.Calarasi treatment plant components are in an advanced state of decay. Currently takes place in the rehabilitation and extension of wastewater in the city of Calarasi.

Keywords: wastewater treatment, treated wate , treatment plant, emissary, quality indicator.

INTRODUCTION

The environment quality is a complex that notion that contains numerous aspects of man-nature relation. Usign this term is considered both the productive potential of the environment, and the way in whihc life and health of people, and various social-economic objectives can be affected by the unfavourable natural factors or by consequences of some economic activities, which attract processes of degradation or lead to environment pollution.

The waste water treatment represent the group of measures and proceedings by which the impurities of chemical nature (mineral and organic) or biological contained in the waste water or reduced under certain limits, so that this water do not harm the receiver in whihc they evacuate and do not jeopardise the use of this water.

The treatment processes, are to a great extend, similar to those whihc take place during the self treatment, but they are directed by men and deveop with a higher speed.   The installations are made just to intensify and favour the processes which develop during the self treatment.

The waste water treatment contains the following two big group of successive operations:
- retain and/or transformation of toxic substances in non toxic products;
- processing of substances resulted under diverse forms (mud, emulsions, foam etc.) in the first operation [1].

The treatment process are of physical mechanic, chemic and biologic nature. Following the application of these processes it results that the main products: treated water (treated effluent) – which are evacuated in or can be capitalized in irrigations or other uses; mud – which is directed to station and capitalization.

The continuous capitalization or treatment of the products obtained at treatment is made using, mostly, the same mechanic, physic, chemical and biological proceedings. In this regard, it can be given as a good example the mud treatment derived from the town treatment stations, which can be made by : hydration, anaerobic fermentation, aerobic stabilization, chemical conditioning, incineration etc.

In 2000 the Framework Directive of Water was approved (Directive 2000/60/EC), which

establishes the political framework for water management in the European Union, based on the principles of sustainable development and which integrates all the water problems. Under the Framework Directive of Water the water quality requirements are met corresponding to minimum 11 European directives in water sector, among which the Directive 91/271/CEE on the urban water treatment has an important place, its implementation deadlines being crucial for reaching the good state of water [4].

MATERIAL AND METHOD

The aim of this paper was to identify the current state of waste water in Borcea Branch and the Danube and the modality to treat it. Calarasi Agency for Environment Protection makes analyses for the waste water evacuate in emissary. The most important monitored indicators are: chemical consumption of oxygen - CCO-Cr, biochemical consumption of oxygen - CBO$_5$, ammonia nitrogen, total phosphorus, total substances in suspension and heavy metals: plumb, zinc, nickel, copper, cadmium.

Currently, the total length of the sewerage network in Călăraşi is 50 km. it is made by concrete, cement and PREMO tubes.The sewerage system is unitary (75%) and separated (25%).From the point of view of oldness, over 30% of the sewerage collectors are older than 40 years.The difficulties which appear in the operation of the sewerage network can be summarized as following:

- at most waste water collectors in the separated were connected to sewage ends or chamber for pluvial water discharge;

- the old collectors present numerous deteriorations gathered during the time imposed by: differentiated tests due to the loess of polishing, section division, blocking with tree roots or blocking with tree roots with material of gravimetric particles.

Considerign both the position of Romania in the hidrogeographic basin of the Danube the Black Sea Basin and the need for environment protection in these areas, Romania declared its entire territory as sensitive area. This decision is made as the aglomerations with more than

10.000 equivalent inabitants must ensure locuitori echivalenţi trebuie să asigure o infrastructură pentru epurarea apelor uzate urbane care să permită epurarea avansată, mai ales în ceea ce priveşte nutrienţii azot şi fosfor – HG 352/2005 art. 3 (1). În ceea ce priveşte gradul de epurare, epurarea secundară (treaptă biologică) este o regulă generală pentru aglomerarile mai mici de 10.000 locuitori echivalenţi.

The deadlines for the Directive implementation vary and depend on the dimension of the crowd and impact on the receptor waters.

The equivalent habitants l.e.) represents a measure unit for the biodegradable pollution and establishes the pollution dimension derived from a human crowd. It is expressed as average of that pollution produced by a person in a day– in the directive the value of 60 grams fixed of biochemical consume of oxygen at 5 times per day (CBO$_5$). The way of calculus of equivalent habitants for a human crowd is given by the rate between the total charge in CBO$_5$ of waste water and value of 60g CBO$_5$/zi corresponding to an equivalent habitant.

In table 1 the economic agents are represented who discharge the waste water in the public sewerage network, their sectors of activity and debits of effluents discharged.

Table 1. Economic agents who evacuate waste water in the sewerage network

No. crt.	Economic agent	Activity sector	Debit (m^3/day)
1.	S.C. DONASID S.A.	steel	205
2.	S.C. PRODPAN S.A.	food	5.35
4.	S.C. AVICOLA S.A	Poultry meat processing	1316
5.	S.C. PREFAB S.A.	Constructions materials	30
6.	S.C. PETROM S.A.	Petroleum products	12.5
7.	S.C.CONSID S.A.	constructions	67
8.	SUGCT	constructions	47.5
9.	SOTAM	transports	13.5
10.	REMAT S.A.	Recovery of materials	51.5
11.	S.C. CATEX	confections	375
12.	S.C. ELECTRICA S.A.	Electric power distribution	47
13.	S.C. AUTOTRANS S.A.	transports	33.8
14.	S.C. ALDIS S.A.	Meat industry	315
15.	S.C.ROMPLAY S.A.	Wood processing	375
16.	S.C.PRODIMPEST	Fish processing	53.5

In table 2 the characteristics of the industrial waste water of the agents who exceed the norms based on analyses made by   ECOAQUA Călăraşi are listed.

Table 2. Characteristics of the industrial waste water that exceed the indicators foreseen in the norms

No. crt.	Indicator	U.M.	PREFAB SA	AVICOLA SA
1.	Temperature	0C	21	21.5
2.	Decanted suspensions	mg/l	-	-
3.	Total suspensions	mg/l	516	2130
4.	Fixed rests (105 UC)	mg/l	1304	2300
5.	pH	units	8.43	6.91
6.	CCO-Mn	mg O2/l	138.31	687.55
7.	CCO-Cr	mg O2/l	648.29	3267.96
8.	CBO5	mg O2/l	332.86	1262.27
9.	Ammonia	mg/l	90	40
10.	Nitrites	mg/l	0.2	0.3
11.	Alkalinity	mechiv/l	13	6.5
12.	Chloride	mg/l	95.03	235.81

The companies PREFAB, AVICOLA exceed the current indicators foreseen in NTPA 002/2002. in these cases the principle of polluter pays and conformity plans apply.

The analyses made on waste water evacuated in emissary within the laboratory of Călăraşi Agency for Environment Protection, , 2009-2010 [2], highlighted the following values:

Table 3. Indicators of quality for treated water

	CCO-Cr mg/L	CBO5 mg/L	N-NH$_4^+$ mg/L	Pt mg/L	MTS mg/L
NTPA-001*	125	25	2(3)	1(2)	35.0 (60.0)
01.2009	109.81	53.4	25.2	2.88	26
02.2009	124.26	51.4	26.72	3.7	75.2
03.2009	112.62	49.4	34.83	4.0	90.0
04.2009	161.29	70.8	29.03	4.87	112.0
05.2009	118.23	51.5	1.02	3.3	47.2
06.2009	114.62	-	30.69	4.55	61.6
07.2009	134.47	-	18.19	4.41	74.4
08.2009	109.92	-	25.74	3.19	11.2
09.2009	96.75	41.2	21.53	3.7	32
10.2009	150.7	68.9	31.23	4.6	54
11.2009	163.03	42.8	23.02	3.7	20
12.2009	177.24	72.4	37.59	4	44
01.2010	152.08	70.8	25.06	3.91	43.6
02.2010	126.56	55.3	31.55	3.38	30.4
03.2010	100.06	51.3	27.06	3.47	33.6
04.2010	158.61	66.4	28.27	3.49	48.8
05.2010	107.52	51.3	26.35	2.59	40.8
06.2010	143.49	62.7	31.62	4.3	75.2
07.2010	124.18	50.4	25.38	3.63	55.6
08.2010	56.8	37.2	23.07	4.88	67.5
09.2010	135	57.3	24.55	3.21	74.4
10.2010	129	67.5	26.38	4.04	55.8
11.2010	113	51.3	34.86	3.91	44.8
12.2010	125	53.4	21.92	2.4	51.3

* NTPA 001- Normative on establishing the charge limits with pollutants of industrial and town waste water at evacuation in natural receptors

**in   lunile notated with „-„ determinations were not made for CBO$_5$

Analysing the data presented in table 3, we can notice the following:
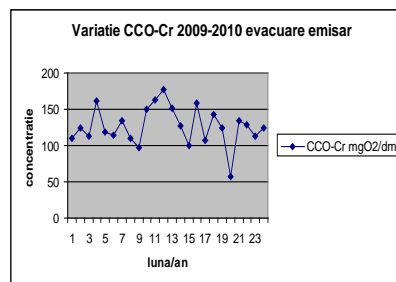
Fig.1. Variation CCO-Cr at evacuation in emissary in 2009-2010

According to NTPA-001, the limit value at evacuation in emissary for CCO-Cr is of 125 mgO/l. from the determinations made it can be noticed that more than 50% of the values obtained are higher than 125 mgO/l.
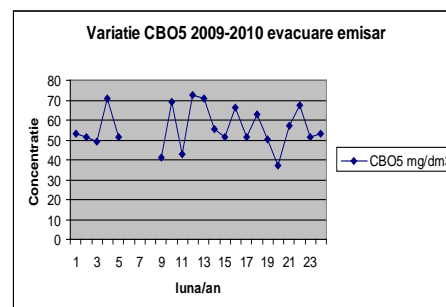
Fig.2. Variation CBO5 at evacuation in emissary in 2009-2010

For CBO$_5$, the limit value at evacuation in emissary is of 25 mgO/l. Determinations made highlight an exceeded value.
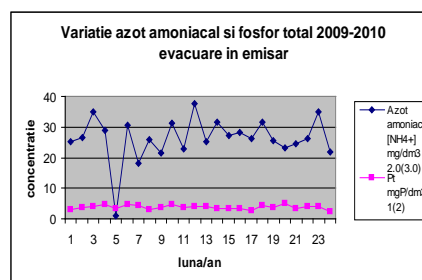
Fig.3. Variation of ammonia nitrogen and total phosphor at evacuation in emissary in 2009-2010

Also, for the ammonia nitrogen the limit value is 2(3) mg/l, the exceeded value of about 10 times, for total phosphor limit value is 1(2) mg/l, also exceeded value of about 2 times.

Fig.4. Variation of total substances in suspension at evacuation in emissary in 2009-2010

For MTS – total substances in suspension limit value is 25(60) mg/l, value which is also exceeded.

For heavy metals exceeding were not registered.

Based on the analyses made can conclude such as:

- efficiency from 15% to 30% in reduction of organic substances hardly biodegradable (CCO - Cr);

-lack of efficiency in retaining CBO_5: efficiency under 50%;
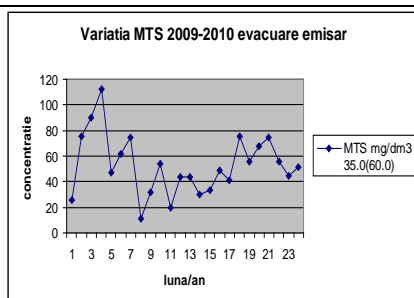
-low efficiency in retaining ammonia and total phosphor ;

-problems in retaining MTS – total substances in suspension;

-heavy metals do not raise problems of emissary pollution.

According to data provided by Buzău – Ialomiţa Basin Administration, the quantities of evacuated polluters in 2010, are presented synthetically in the following table [3]:

Table 4. Pollutants quantities evacuated in the Danube in 2010

Emissary	Pollutant (t/an)				
	MTS	CBO_5	CCO-Cr	ammonia	Total phosphor
The Danube	1064	392,218	1250,451	130,32	10,33

We notice in the table the high quantities of substances in suspension and organic substances hardly biodegradable which reach annual the Danube.

CONCLUSIONS

1. Untreated or poorly treated waste water continuous discharge in the surface water had hard consequences on natural environment self treatment, the Danube and Borcea Branch being at present in the sector of Călăraşi county at the limit of natural possibilities of renewing the biochemical balance, thus measures of rehabilitation and modernisation of the treatment station are required.

2. Equipment and construction of treatment stations are in an advanced state of moral degradation and wear. The efficiency of the present treatment station is very reduced, varying between 10 and 90%, depending on analysed indicators.

3. The quality indicators of the waste water when entering the station fit into the limits imposed by normative NTPA 002, related to the quality of the waste water evacuated in the sewerage network or directly in the treatment station;

4. The quality indicators of the waste water discharged in natural emissary do not fit into the limits imposed by the norms in force, respectively NTPA 001- suspensions, CBO5, CCO-Cr, ammonia, total phosphor;

5. In 2006 The Master Plan was elaborated, in which investment were identified needed for the development of infrastructure in water and waste water sector for Călăraşi county, making a rating of them for a period of 20 years, until 2026.

6. For the compliance with the requirements of the European Directives Project EuropeAid/119083/D/SV/RO2003/RO/16/P/P PA/013-04 started, Technical Assistance for the preparation of projects in drinking water and waste water sectors in Romania.. the general objective of the project is to ensure a local strategy for the development of the water and waste water sector, for the compliance with the general requirements negotiated by Romania within the accession and post accession process.

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THE ANALYSIS AGRI-ENVIRONMENTAL INDICATORS OF THE AREA BUCHAREST-ILFOV

Raluca NECULA [1], Diana NECULA [2]

[1]University of Agricultural Sciences and Veterinary Medicine, Bucharest 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 21 318 25 64/232, Fax: + 40 21318 28 88, E-mail: raluca_nec@yahoo.com
[2] Research Institute for Agricultural Economics and Rural Development, Marasti, nr. 61, sector 1, cod 011464,Tel: + 40-21-318.16.86, Tel/Fax: + 40-21-318.16.86, Email: anaiddiananec@yahoo.es

Corresponding author : raluca_nec@yahoo.com

Abstract

Ilfov rural areas are crossing a period of profound transformation, with the progressive abandonment of agricultural activities and rapid urbanization of areas near Bucharest. This is due, in large part,to the land use change from agricultural land, into land with alternative uses (residential, business), because in Ilfov, land costs have increased significantly, especially under the pressure of a dynamic real estate markets, such that farmers are determined to sell properties.

Keywords: agri-environment, crops, irrigations, fertilizers

INTRODUCTION

Bucharest-Ilfov Region, established in Bucharest - the capital of Romania - Ilfov County, is located in the south central part of the Romanian Plain.The Agri-environment is the meeting point between biodiversity and agriculture. Unlike most of Europe, in Romania agri-environment measures are, in fact, to continue the current traditional management.Biodiversity area can not be kept unless we maintain traditional agricultural processes. In this area land area equipped with irrigation works and land surface equipped with drainage works, they decreased year by year due to the extension of the built buildable. Irrigation networks have been dismantled in construction areas. They stayed functional channels that take rainwater drainage and excess water.

MATERIAL AND METHOD

Obtaining and processing the data on plant protection products used in plant protection treatments on crop land areas treated, the amount of products used, types of products and active substances.

RESULTS AND DISCUSSIONS

Environmental protection has become one of the most debated issues of contemporary and a first order for company management.
Man and environment are inseparable entities, human existence is dependent on the environment and environmental factors (air, water, soil) may change after their use by humans. This is pollution, dimension of life in developing some products, resulting from physiological processes and of human activity and animals, are residues that may interfere with the welfare depending on the nature of their content.
Keeping the agri-environmental is a very important problem because of the rapid evolution of determinants such as industrialization, urbanization, chemical treatment. The effects of environmental degradation are felt directly and indirectly by humans and other components of the environment, soil degradation is potentially one of the most serious environmental problems, with effects on short, medium and long term.[3] Short-term adverse effects likely to endanger the comfort and health of people,

to harm living resources and ecosystems, causing economic damage.

Long term effects on regional and global scale as the greenhouse effect and climate change, stratospheric ozone depletion, acid rain. Farmers in Romania are using small amounts of fertilizer than the European average, which reduces productivity/ha, but facilitates the conversion of farmland to organic. According to data from the Ministry of Agriculture, fertilizer consumption in 2009 slightly increased reaching 426,000 tons from 387,000 tons in 2007. Of this, 296,000 tonnes are nitrogen fertilizers, 100,000 tons of phosphate based, and 30,000 - ton potash fertilizer.

On the other hand, Romanians overwhelmingly are using natural fertilizers. In 2009, farmers have used 13,748,000 tons of manure, a large part from dairy farms. According to ministry the data, 90% of the manure comes from individual households.[2] Quantities of fertilizers used nationwide have seen a gradual increase in the analyzed period, with last year, 2010, a value 40 percent higher than 2000, in Bucharest Ilfov region quantities of chemical fertilizers vary with differences rather large, for example in 2004 they diminished by about 20%, and in 2010 reached a difference of about 50% compared to 2000, natural fertilizers in the region analyzed decreased in 2010 by almost 45% representing 0, 26% of the total quantity used nationalwide.

Table 1. The area of land equipped with irrigation works and agricultural area irrigated[1][4]

Land Improvements	Land use	2000	2003	2006	2009	2010
Irigattions - Total	Total area	62225	62194	50263	49560	49560
-	Agricltural area	62193	62162	50231	49391	49320
-	Arable	60025	59994	49740	48900	48829
Effectively irrigated area	Agricultural area	993	1716	25	70	:
-	Arable	993	1716	25	70	:

Source: INS - Romanian Statistical Yearbook 2000-2010, TEMPO-Online Database

Analyzing Table 2 it reveals that the area equipped with land drainage works have approximately the same values as in 2000, with respect to irrigation these areas were reduced in 2010 to about 20% compared to 2000.

Table 2. The area of land equipped with drainage works in the BI region during 2000-2010 (2000 = 100%)[4]

Land use	2000 Ha	2000 %	2003	2006	2009	2010
Total area	60138	100	100.0	100.0	100.0	100.0
Agricultural area	51982	100	100.0	97.8	96.0	95.9
Arable land	51907	100	100.0	97.8	96.0	95.9
Orchards, nurseries, shrubs	75	100	100.0	100.0	100.0	100.0

Source: Calculations based on data from Statistical Yearbook of Romania 2001-2010

Table 3. The evolution of dynamics of fertilizer quantities given to the country and the region BI during 2000-2010[1]

Owner ship	Fertilizers		2000 t	2003	2006	2009	2010
Total	Chimical	TOT	342174	105.9	106.1	124.6	140.5
		B- I	4728	87.8	41	65.8	52
	Nitrogenous	TOT	239279	105.4	105.4	123.7	127.8
		B- I	3297	91.9	49.8	66.4	51.3
	Phosphate	TOT	88258	107.7	106.4	113.9	139.7
		B- I	1182	80.2	22.4	65.1	64.6
	Potassic	TOT	14637	102.8	115	202.3	351.8
		B- I	249	68.7	12.4	61	0.8
	Natural	TOT	15812625	109.2	94.2	86.9	96.3
		B- I	70335	126.9	59.4	28.3	55.3
Private property	Chimical	TOT	289336	121.6	122.2	143.7	163.5
		B- I	3725	100.4	44.5	77.3	62.9
	Nitrogenous	TOT	203678	120.1	120.7	141	147.4
		B- I	2573	109.9	55.1	77.8	62.9
	Phosphate	TOT	73344	126.3	124.5	135.3	165.8
		B- I	1002	81.6	21.6	74.4	72.2
	Potassic	TOT	12314	117.8	132.9	238.2	414.9
		B- I	150	61.3	15.3	88	1.3
	Natural	TOT	15443468	110.4	95.6	88.4	98.1
		B- I	47225	175.9	85.3	39.6	82.3

Source: Calculations based on data from Statistical Yearbook of Romania 2001-2010

Managing pesticides in our country has experienced a high utilization, which is considered negative because it tends to a minimum sustainable agriculture using chemicals (the largest remaining in the soil and with serious consequences on the finished product).
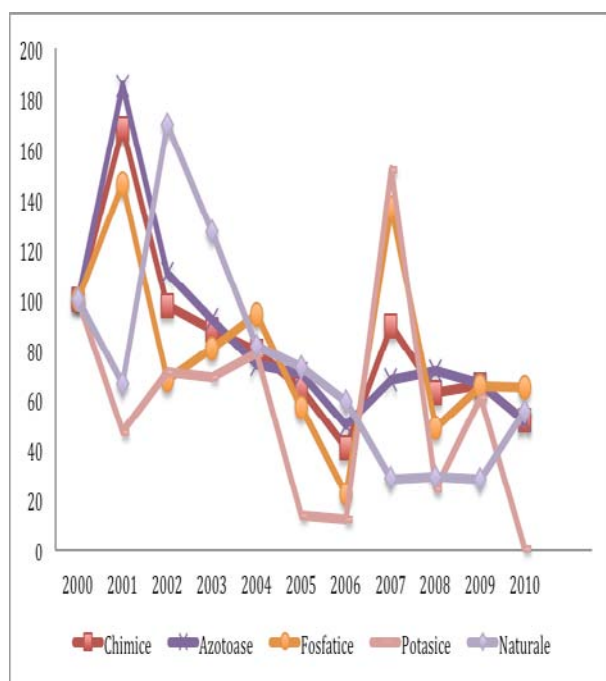
Fig.1.Evolution of fertilizer consumption, 2000-2010

In Table 4 it is presented the dynamic surface that pesticides were used, 2000 is taken as reference year: on all forms of property-surface that were used insecticides aproximatv drops 49%, fungicides 58%, surface that herbicides were used as the only experienced a significant increase in 2006, returning to the weight close to 2000 in 2010 and 95.73%. Regarding private property, dynamic surfaces also show a decrease in insecticides and fungicides and a significant increase in 2006 with 177.27 percent to herbicides.

Table 4. Dynamics of surface that pesticides were used during 2000-2010 in North-West[1]14]

Owner ship	Pesticides	2000 %	2003	2006	2009	2010
Total	Insecticides	100	64.89	48.03	61.20	51.16
	Fungicides	100	75.75	65.74	38.94	41.80
	Hrbicides	100	103.97	191.25	138.69	95.73
Private property	Insecticides	100	80.87	58.20	76.52	63.61
	Fungicides	100	88.48	87.31	47.05	48.05
	Herbicides	100	133.18	277.27	194.89	140.86

Source: Calculations based on data from Statistical Yearbook of Romania 2001-2010

Figure 2
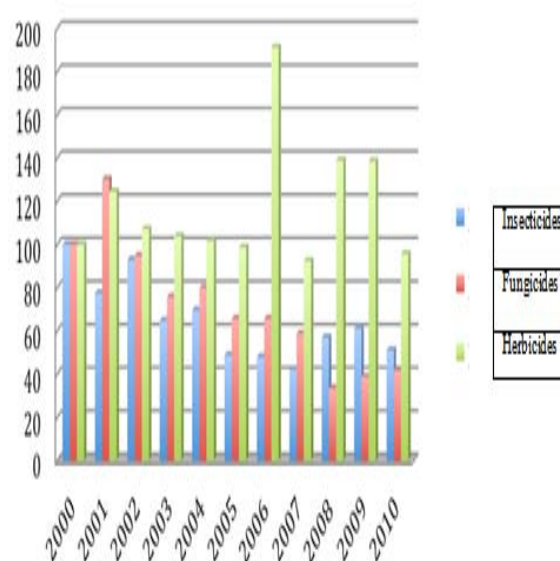
Dynamics of surface that pesticides were used during 2000-2010 in B-I area

Fig.2.Dynamics of surface that pesticides were used, 2000-2010, in the B-I area

CONCLUSIONS

As a result of information analysis can be concluded that:

Arrangements for use of resources at farm level should reflect the general principle of economic rationality and efficiency, in addition to imposing an economic assessment of benefits and environmental damage. Thus, the relationship agriculture - environment will express a greater extent the characteristics of sustainable development.

Currently, the environmental damage caused by current agricultural practices are multiple conventional type:

- Environmental pollution, especially the groundwater and surface water with nitrates, metals, etc.. from the use of chemicals to fertilize the soil;

- Air pollution by increasing the emission of ammonia as a result of intensive farming systems and crop spraying ;

- Issues arising from the phenomenon of marginalization: the degradation of infrastructure, land abandonment, soil chemical and physical erosion;

- Soil pollution which causes a decrease in its productive capacity and decreased quality of water resources;

- As a strong point we can observe the transition from a traditional agriculture to a future based on economic agriculture, with the focus on competitiveness that would provide a sustainable agriculture of Romania in the European market.

ACKNOWLEDGEMENTS

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THE ANALYSIS OF THE EVOLUTION OF AGRICULTURE IN THE SOUTH WEST REGION OF ROMANIA

Raluca NECULA [1], Diana NECULA [2]

[1]University of Agricultural Sciences and Veterinary Medicine, Bucharest 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 21 318 25 64/232, Fax: + 40 21318 28 88, E-mail : raluca_nec@yahoo.com
[2] Research Institute for Agricultural Economics and Rural Development, Marasti, nr. 61, sector 1, cod 011464, Tel: + 40-21-318.16.86, Tel/fax: + 40-21-318.16.86, E-mail: anaiddiananec@yahoo.es

Corresponding author : raluca_nec@yahoo.com

Abstract

In the South-West Oltenia agriculture is an important resource, with over 1 million hectares for the cultivation of cereals (especially corn and wheat), oil plants (especially sunflower), vegetables (soy, peas, beans, tomatoes, cabbage, leek, onion) and fruit (apples, watermelon, melon, grapes) and potatoes. However, the productivity is inferior the productivity sector registered in EU countries due to insufficient technical equipment, small scale agricultural enterprises, which represent obstacles to effective development. Also, irrigation systems are underdeveloped.

Keywords: agriculture, crops , development,evolution

INTRODUCTION

South-West is a development region of Romania, founded in 1998. Like other developing regions, has no administrative powers, its main functions is the coordination of regional development projects and absorption of EU funds. In the southern region, the cereal crops occupies large areas, especially in Olt, Dolj and Mehedinti south.[3] In hilly areas of Gorj and Valcea orchards occupy important areas.The most cultivated fruit tree species is the plum that produce "tuica", a specific drink from this area , it is also cultivated the apple, thewalnut (in Ramnicu Valcea is a popular research station), peach, apricot and fig that are specific to warmer areas like south and west. In mountain areas from north (the northern side of Gorj , Valcea counties and West of Mehedinti) the place of crops is taken by forest and mountain meadows.[2]

MATERIAL AND METHOD

Below are presented and analyzed a series of specific indicators of agriculture in the region.

There will be analyzed: the land, material and technical basis of agriculture, surface and crop production, livestock and animal agricultural production;

RESULTS AND DISCUSSIONS

The land.
From the analysis of the structure by use of land it was found that agricultural land had a negative trend, decreasing during the period examined, reaching in 2010 at a decrease of 1.2% compared to 2000 .There were significant changes in the area occupied by vineyards and nurseries, orchards and tree nurseries which declined by about 25% in 2010 compared to the reference year .This decrease can be attributed to several factors, including aging   of existing plantations and lack of financial resources and support from the State regarding the establishment of new plantations, imported grapes, fruit and wine at prices much lower than those for domestic production, which led to decreased interest in this sector.
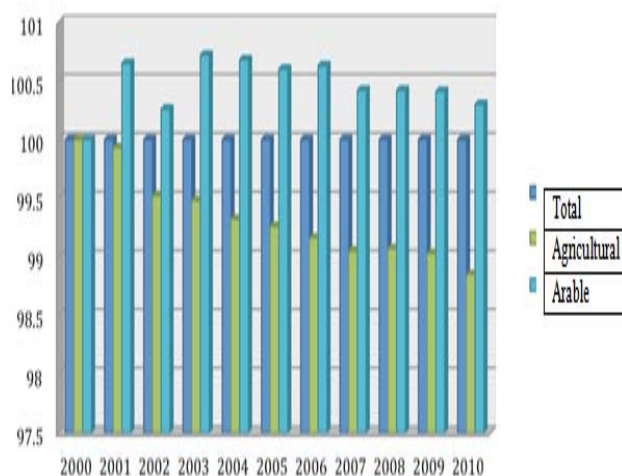
Fig.1.The evlolution of land fund by use categories in the period 2000-2010

Material and technical basis of agriculture.

Making investments in tractors and agricultural machines provide increasing levels of agricultural mechanization.

Table 1. The endowment with machinery and agricultural equipments during 2000-2010 (2000 = 100%)[1][4]

Categories of tractors and agricultural machines	2000		2003	2006	2010
	Nr	%			
Tractors	20681	100	104.27	108.01	112.70
Tractor plows	16821	100	105.45	113.15	113.40
Mechanical cultivators	3119	100	121.39	115.68	111.51
Mechanical drills	9461	100	111.99	120.78	120.52
Fertilizer spreaders	1002	100	102.99	*	*
Sprayers with mechanical drive	699	100	71.24	38.20	41.63
Self-propelled combine harvesters	4322	100	100.39	105.85	99.49
Self-propelled combine harvesters	96	100	32.29	46.88	33.33
Potato harvesting combines and machines	32	100	56.25	6.25	18.75
Press balers for straw and hay	492	100	49.80	48.78	99.39
Vindrovere feed	158	100	74.68	83.54	72.15

Source: Calculations based on data from Statistical Yearbook of Romania 2001-2010

Mechanization is manifested as the main factor of growth of agricultural production, mechanization is the decisive condition of valueing the other factors of production that enhances agricultural production (fertilizers, irrigation, agrobiological progress, etc..)

Fig.2.Acquisition of agricultural machinery during 2000-2010

In terms of material and technical basis in the South West you can see the increased number of basic equipment such as tractors, cultivators and seeders, representing an improvement of agricultural mechanization.

Area and crop production.

There was a decrease in grain cereals from 13.6% in 2010, corn has suffered a decline of about 40%, only wheat acreage was up by 13.97%, barley and barley increased by 24.42% .Legumes decreased by about 30%, while the largest decrease recorded a soybean crop and tobacco.Significant increases were recorded in cultures of oil plants, respectively 31% and of these the largest increase was recorded for rape.

Total production for the main crops produced in South-West region had positive developments, which largely influenced by the growth of cultivated areas. For example, total production of cereal grains had a positive swing in the period with values ranging from 194% in 2004 and 88.3% in 2010.

The only crops that have suffered a sharp decline were the tobacco crops and soy

beans, this drop is influenced primarily by reducing the acreage in these crops and reduced market demand.

Table 2.Livestock in the NE Romania, 2000-2010

Animal categories	2000		2003	2006	2009	2010
	No.	%				
Cattles	303690	100	104.83	100.42	85.42	64.44
Cows, buffaloes and heifers	193941	100	96.16	94.76	82.86	63.70
Swines	569019	100	120.13	161.33	139.24	121.94
Sheep	729508	100	93.73	88.47	98.12	82.37
Sheep and ewes	556632	100	96.56	98.69	113.06	98.08
Goats	131937	100	115.64	114.25	138.50	185.67
Horses	99425	100	111.45	97.29	125.43	84.22
Poultry	11126316	100	101.26	99.84	94.24	89.81
Rabbits	*	*	104.33	64.90	58.89	46.13

[1][4], (2000 = 100%)

Regarding the dynamic evolution of the average yields per hectare it can be concluded that it was positive in some years with very large values.Therefore, for 2010, cereal grain production increased by about 118%, 4 times for sunflower and maize about 4.5 times.However there are exceptions.

So, in the year 2010, production per hectare for growing barley decreased by about 4%.

Livestock and agricultural production animal.

Livestock sector has a significant share in Romanian agriculture and it is one of the main activities in rural areas, which lead to a detailed analysis of animal density per 100 ha and the number of animals, especially the main species.In terms of livestock analyzed in Table 2, it reveals a distressing loss for the main species: cattle percentage oscillations recorded from the reference year a tendency of growth until 2008 ascertaining, declines in 2009 and reaches in 2010 to -35.5% from the reference year.The same evolution have had the herds of cows, buffaloes and heifers in 2010, their number decreased by 36.3%.The

analysis of the pig population shows a fulminant increase, the threshold peaking in 2007 where we observed an additional 64.52% compared to 2000.

CONCLUSIONS

Romania is located in 7th place in Europe in the agricultural area and on the 5th place as arable land. Favorable geographical conditions, topography, climate, fertile soil can make from the agriculture of the country an attractive and profitable industry.

According to the data processed, taken from the National Statistics Institute (INS) results the following:

- Agricultural production decreased in 2010 compared to the previous year due to a decrease of animal and plant production

- Agricultural industry production index in 2010 compared to 2009 was 101.0% total, 106.6% at plant production and 93.2% at animal production

- In respect to the value of agricultural services, it is generally insignificant in 2010 contributing with only 0.9% at the value of national agricultural industry.

-the structure of agricultural sector production value in 2010 is similar to the previous year in crop production and animal production and the share of South-West Oltenia region is insignificant.

Romanian agriculture remains a subsistence agriculture, structural problems of it are difficult to solve.

The main factors that affected and affects domestic production and marketing of agricultural products, causing trade deficit of agricultural balance are:

- the fragmented structure of farms and the uncertainty of integrated production distribution and marketing;

- Oscillating volume of production from year to year dismounted export strategies, a good example of this is the production of grain.

Also contributing to this is the lack of market information to producers regarding the quality standards especially.In conclusion, agriculture is not adapted to the specific regional planning and financial crisis does not

contribute to its development.The highly fragmented structure of agricultural surface is an obstacle in attracting new investment and low investment rates have increased the agriculture vulnerability to weather conditions in Romanian and industrial sector has a very volatile behavior.

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ELABORATION OF SOME MODELS TO REDUCE THE HYDRIC EROSION IN OLT COUNTY

Daniel NIJLOVEANU, Victor TITA

University of Agricultural Sciences and Veterinary Medicine, Bucharest, Romania, Faculty of Management, Economic Engineering in Agriculture and Rural Development, Slatina Branch, 150, Strehareti St., Zip Code: 0500, Slatina City, Olt County, Romania, Phone: 0726148524, 0768371361. E-mail: nijloveanu_daniel@yahoo.com, vtita@yahoo.com

Corresponding author: nijloveanu_daniel@yahoo.com

Abstract

This paper presents some problem related to soil erosion, which are today among the most discussed topics in the circles of specialists worldwide. Hydric soil erosion represents "a physical phenomenon" resulting from the destruction or disposal of soil and rock particles from the action of water, wind, ice and gravity forces. As it is known, one of the most important components of the biosphere is the soil which is the loose, soft and reliable layer, that is found on the surface of crust and together with the atmosphere constitute the living environment of the plants. Soil degradation by hydric soil erosion cause the destroy of fertile topsoil of the soil surface and the impossibility of its recovery. Man, through misuse of land has led to a reduction of water retention in the soil, it evaporates or drains very quickly to surface clogging rivers and causing flooding, because the vegetation cover is missing as to cushion the effects of strong rainfall, this erosion is due to pollution by pesticides and chemical fertilizers, acid rain, massive cutting of forests, poor soil work which degrade its structure over time. In this context it is necessary the realization of a work aimed to analyse hydric soil erosion, damages bring by this and to provide appropriate measures to control and combat these very serious erosion phenomena that develop within agriculture area of Olt County.

Keywords: hydric erosion, soil, fertility ,degradation

INTRODUCTION

Hydric soil erosion represents "a physical phenomenon" resulting from the destruction or disposal of soil and rock particles from the action of water, wind, ice and gravity forces.

As it is known, one of the most important components of the biosphere is the soil which is the loose, soft and reliable layer, that is found on the surface of crust and together with the atmosphere constitute the living environment of the plants.

Soil, as a natural body which is formed after long paedogenesis processes, represents a real and effective complex laboratory for remediation, neutralization, recycling of waste.

 Pollutant elements are grouped into three categories:

- Biological factors, represented by organisms (bacteria, viruses, parasites). They are part of different wastes (domestic, livestock and industrial)

- Chemical elements, in a greater part by organic nature, they serve as nutritional support for bacteria, insects and rodents, undergo decomposition processes with toxic gases release and can be involved as a degrading factor in water sources

- Physical elements that disturb the soil composition, floods, acid rain, massive deforestation etc.

MATERIAL AND METHOD

Eroded surfaces are influenced by many factors that characterize the surface morphology of land, with the consensus of researchers in relation to the calculation amount of soil that is eroded from an area of land called General Soil Transport Equation (GSTE), or RUSLE equation, or ABAG in German, or equation is called the Universal Soil Loss Equation (USLE). The equation is:

where:

$$A = R . K . L . S . C . P$$

A = annual average amount of soil lost (t / ha) at the upper limit,

R = rainfall (effect) - and surface leakage factor [kJ/m2. mm / h] or [N / h]

- K = soil erosion factor [(t/h/kJ/m2. Mm / h] or [t / ha / N / h],

- L = the length of the slope factor,

- S = the inclination of the slope factor, size of the slope,

- C = factor reflecting the degree of coverage or tillage of soil,

- P = capacity factor of soil erosion to protect themselves.

RESULTS AND DISCUSSIONS

We made a correlation between slope and amount of soil eroded for low rainfall up to 10 mm and a duration of one hour and slope up to 250 m. Observe the amount of eroded soil increases from "0" up to 260 t / ha. On slopes over 45% and rains with low intensity, the amount of eroded soil is very high (Fig1.).
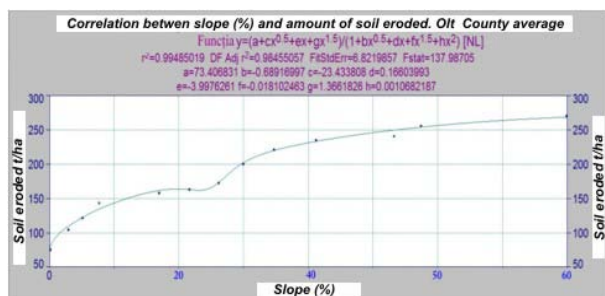

Figure 1. Loss of soil by washing under light rain in Olt County.

With the amount of fallen water from 80 to 90 mm within an hour, drained soil from the eroded surfaces can reach up to 4,500 tonnes per hectare, as shown below.
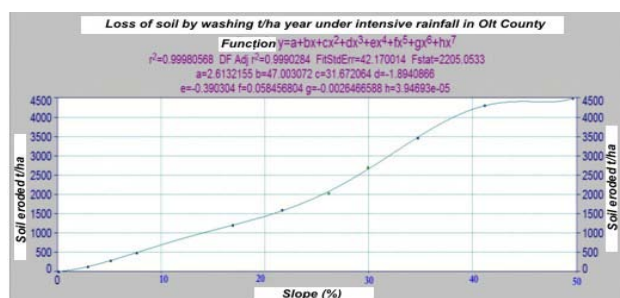
Figure 2. Loss of soil by washing under intensive rainfall in Olt County.

We developed a model for Olt County erosion and, to calculate the model we used the universal equation of soil loss, adjusted for Romania by Berca Mihai and by us for Olt County. This model was calculated using a computer program.

It was taken into account the effect of slope which was measured by SL indicator, a variable measuring the length and size of the slope. Rain energy was given by the indicator
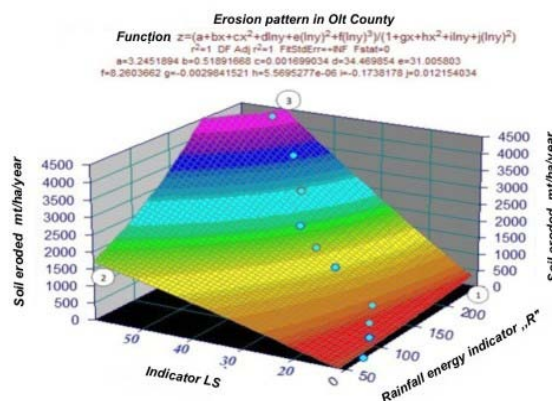
that expressed the energy of raindrops, and the results were presented in the following figure.

Figure 3. Erosion Pattern in Olt County.

Figure 3 shows that no matter how large the kinetic energy of rain, if the slope approached zero the soil would remain in place not being driven by water from precipitation (point 1 on the figure). As the slope increased LS, both in length and the inclination, even at low values of rainfall energy index (R) soil loss could lead up to 1700 m3/ha, the second item on the figure.

If all elements meet together (long and steep slopes, high rainfall combined with energy) soil losses can reach up to the amount of 4500 m3/ha, which leads to a real landslide, as we found in Teslui, a locality of Olt County (point three on the figure)

Soil erosion can be controlled only by covering the soil with vegetation to minimize the kinetic energy of rain, bringing it approximately to the value of "0" and at the same time reduce water flow on slopes, forcing water to enter deeper into the ground to restore water reserves in aquifers. In the

first model we used P factor values corresponding for soil covered with annual and perennial grasses, resulting the following figure.

Figure 4.a. Hydric erosion model based on vegetation structure (annual and perennial grasses) and soil coverage in Olt County.

From Figure 4.a. we observed that if a soil coverage was realised with 95% consisting of annual and perennial grasses, soil erosion could be 100% combated (point one on the graph) and the situation became alarming at a rat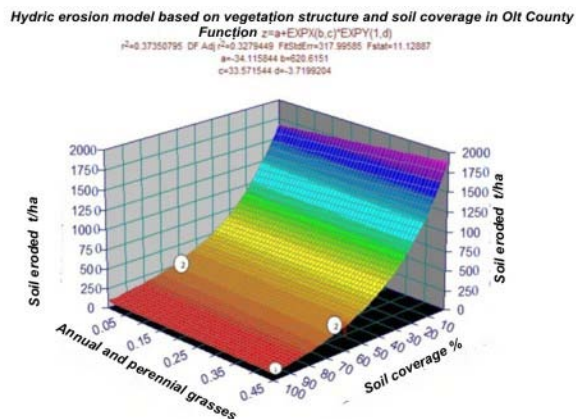e of 50% coverage when the quantity of eroded soil was 250 t / ha (second point on the graph). In the second model of combating the soil erosion we used values of P factor corresponding to dicotyledonous soil cover. We saw that at a soil coverage of 100%, the soil was not subject to erosion, and to a high of 60% coverage 500 t/ha were lost.
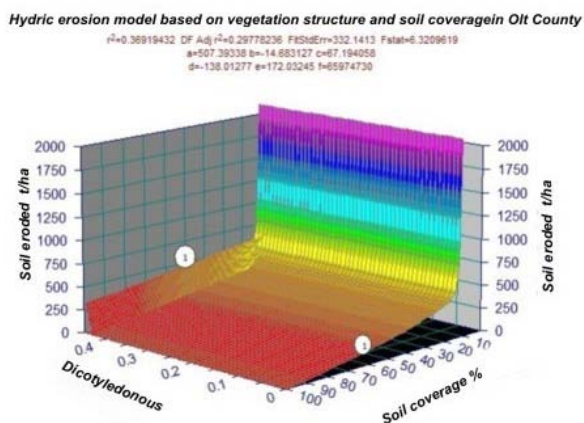
Figure 4.b. Hydric erosion model based on vegetation structure and soil coverage in Olt County.

Effectiveness of erosion model presented in Figure 4.a depending on the slope and coverage of ground vegetation consists of

annual and perennial dicotyledonous, reacted differently depending on: a) the size of the slope, b) rain intensity, c) degree of the vegetation cover.

Thus, from the following figure, where we took into account the slope and vegetation coverage (annual and perennial grasses) shows that the slopes up to 40% and a coverage of 100%, about 7 t / ha were washed. And the highest amount of eroded soil was found under a bare soil and a slope over 40%. Note that this model was made taking into account rains with a value of 90 mm / hour.
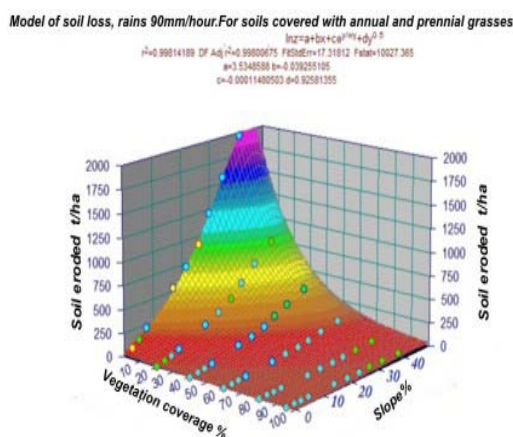
Figure 5. Model of soil loss, rains 90mm/hour.

For soils covered with annual and perennial grasses.

Comparing the two models showed that best results against erosion were given by the model of planting annual and perennial grasses.

CONCLUSIONS

Soils in the studied area are specific to the climatic regime and soil and are numerous and vary from one place to another, each floor having its personality. There are some areas of particular soils located on slopes that are highly exposed to erosion and even landslides. Comparing the two erosion models shows that the best results against the erosion process were given by the cultivation model of annual grasses and perennial plants.

Soil protection against erosion can be achieved by agricultural crops and agricultural technology specific as described

before. Knowing of crops, depending on the level of protection that they provide to the soil erosion models, they are classified into the following categories:

-very good protective - grasses (Lolium and Dactylis species) and perennial leguminous (alfalfa, clover, ghizdei);

-good protective - cereals (wheat, barley, oats, millet, Sudan grass, etc..)

-medium protective - annual leguminous (peas, vetch, soybean, lupins, beans, etc..)

-weak protection - hoes crops (corn, sunflower, potatoes, sugar beets, zucchini, vine, etc..)

On land with slopes over 10% culture system is applied in strips with grass strips, whose width varies depending on the slope:

a) slope of 7% -11% - strip width of 63-151 m;

b) slope of 9% -14% - strip width of 32-65 m;

c) slope of 14% -19% - strip width of 22-29 m;

d) slope over 24% - 21 m wide strip

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ANALYSIS OF BANKRUPTCY RISK BASED ON THE BALANCE OF ASSETS

Elena NIREAN, Olga SÂRBU

State Agrarian University of Moldova, Chisinau   42 Mircesti, sector Rascani, MD-4224, Chisinau, Republic of Moldova, Phone: +373 68364646, e-mail: ni-lena@mail.ru

Abstract

Assessing the solvency of economic agents and default risk of bankruptcy depends on many factors. It is wrong to say that an enterprise with economic or financial difficulties is bankrupt. Bankruptcy is the last step in a possible long process of degradation in economic and financial situation of the company, having, in essence, a legal component. The main criteria underlying the determination of insolvency and bankruptcy are no implicit solvency and indebtedness, which will be analyzed through a concrete example based on an agricultural enterprise.

Keywords: *risk, bankruptcy, solvency, working capital.*

INTRODUCTION

Bankruptcy is a process that starts financial and ends legal, while a component failure does not necessarily legal. Appreciation of an economic agent solvency and bankruptcy default risk depends on several factors such as [1]: the sector of activity; life cycle of activity; the economic, financial, fiscal, social, legal and ecological aspects of the outside of the economic agent; particularities of the economic agent; the seasonality, frequency, and fluctuations of the activity; frequency difficulties in paying the obligations; capital structure; size of the company.

It is wrong to say that an undertaking economic or financial difficulties, is bankrupt. Bankruptcy is the last step in a long process of degradation of the possible an economic - financial situation of the company, having, in essence, a legal component. Under the Insolvency Law, bankruptcy process is a process in which the court shall rule to satisfy creditors of the insolvent debtor's assets account. Depending on the issues involved or the situation facing the company, difficulties can be interpreted in several ways.

The risk of bankruptcy (insolvency) – The risk of Bankruptcy (Insolvency) is by itself the probability of suffering default of an undertaking as a result of previous commitments contracted, the current operations, etc. compulsory levies. In other words, *bankruptcy risk* is the probability of

suffering a deficit in insurance availability and support: deployment cycle manufacturing continued flow of funds. The main criteria underlying the determination of insolvency and bankruptcy are no implicit solvency and indebtedness.

MATERIAL AND METHOD

In order to investigate this problem was analyzed the specialized literature, statistical data from the National Bureau of Statistics, as well as data SRL "Agro - Tiras." The methods were used: analysis, synthesis, spreadsheet method, analytical method of calculation.

RESULTS AND DISCUSSIONS

Investigation of bankruptcy risk analysis involves working capital and solvency ratios.

In Republic of Moldova in a post-Soviet period has appeared in 1996 *Law on Bankruptcy nr.786*, and then, to January 14, 2001 be repealed and adopted a new law - *Insolvency law* [3], that is deemed insolvent debtor's financial situation characterized by an inability to honor its payment obligations.

Insolvency of the debtor is unable to meet its obligations to creditors both in lack of liquidity, as well as other assets to satisfy claims of the debtors. Practical, debts are greater than total assets. Therefore, insolvent is a state of bankruptcy, while insolvency is a

temporary state that can be improved through sound financial management. [2]

Solvency is the reverse of insolvency and economic agent is the ability to overcome the risk of failure, i.e. to satisfy its obligations in time, any disruption can determine the damage payments. Therefore, maintaining in the long run solvency is an essential condition for the existence of the economic agent. Like the in the case of the relatively sized indicators of liquidity, solvency, indebtedness indicators are calculated based on the information summarized in the balance sheet or statement of heritage. In principle, solvency means an economic agent's ability to honor the obligations to creditors due to its.

In the diagnosis system financial analysis firm ability to be solvent and to overcome the risk of failure is central. Any failure on payment obligations generate damage and require urgent correction. In the economic practice, it is conceivable that a company is in a difficult period to give up certain objectives of growth, economic or social objectives. In contrast it may not waive the insurance of the solvency objective, which is the financial condition of survival.

Solvency is the ability of the firm to meet its financial obligations, namely to honor payments respective due dates. In this case a comparison interferes between assets and liabilities, respectively obligations and availability.

The optimum level of economic solvency is in the range of 30% -50%, depending on the sector, indicating that the company may face in the long run payments.

Solvency reflects the company's ability to pay all obligations using all of the liabilities.

The optimum level of liquidity of the general solvency is 1. Thus follows, that as company's general solvency exceeds 1, it is much more financially stable. The reverse of this indicator is the leverage. Financial leverage is obtained by comparing the economic profitability of the enterprise with the cost of borrowed capital and the ratio of borrowed capital and it's called "financial leverage" or "lever arm". If the economic profitability of the enterprise is greater than the cost of borrowed capital,

we have the positive effect of debt; otherwise we have negative or unfavorable leverage.

Financial leverage is an important economic argument of business strategy by working to prevent or minimize financial risk and this indicator is to maintain a high and positive value. Companies that have a high lever arm is in a position of enormous losses, but also have the opportunity to make profits equally great. The equality of economic rate of return and the average interest rate company shows stability, optimal leverage of the company.

Substituting in the above report indicates the amount of debt, reach *a common level of coverage of capital*. As the calculated in%, this report shows that the 100% company assets are financed at the expense of its own sources, and others - by attracting borrowed funds. Over 200% increase in this ratio reflects the plight of the firm's financial independence.

In order to assess the company's financial stability or degree of dependency of the company attracted and borrowed sources, one of the most important factors of the structure of financing sources is *the coefficient of autonomy.*

It reflects the share of assets made on own account means the total amount of company assets. Currently recommended level of autonomy is the largest coefficient of 0.5. In this case half of the company's heritage, which is formed from its own sources, serves as security for payment of all debts to creditors.

The coefficient of attraction borrowed sources characterizes the structure of financing sources of assets from the viewpoint the share of borrowed sources. This factor dimensioned the level of indebtedness (solvency) of the company and normally varies within 0 - 0.5.

The correlation coefficient between the borrowed and own funds reflects the amount of investment involved in a lei of equity capital, also called *the rate of gross debt*. The larger its size, the more risky is the financial situation. Critical to the evaluation the correlation coefficient is equal to 1.

Next we will determine the degree of the financial independence / dependence of SRL "Agro - Tiras" in the analytical table below:

Table 1. The analysis of solvency coefficients S.R.L. "Agro-Tiras" in 2008-2010

Indicators	Years			Deviations (±) of 2010 to:	
	2008	*2009*	*2010*	2008	2009
Equity capital, thous. lei	1179	2048	2499	+1320	+451
Total liabilities, thous. lei	4484	4981	4794	+310	-187
Total debts, thous. lei	3305	2934	924	-2381	-2010
Permanent capital, thous. lei	2525	2985	3272	+747	+287
Long-term liabilities, lei	1347	937	772	-575	-165
Overall coverage rate of equity	3,80	2,43	1,92	-1,88	-0,51
The coefficient of autonomy	0,26	0,41	0,52	+0,26	+0,11
The coefficient of attraction borrowed sources	0,74	0,59	0,19	-0,55	-0,40
The coefficient of correlation between its own and borrowed sources	2,80	1,43	0,37	-2,43	-1,06
Overall solvency ratio	0,26	0,41	0,52	+0,26	+0,11
Patrimonial solvency ratio	1,37	1,70	5,19	3,82	3,49

Source: prepared by author based on the financial report (2008-2010) of SRL "Agro-Tiras"

Analyzing the data which characterizes coefficient of autonomy in 2010 we see that it reaches the theoretical amount, which serves as security for payment of all debts to creditors. The coefficient of attraction borrowed sources varies within the limits set from 0.19 to 0.74, which is reduced in 2010 compared to 2009 by 0.4 and 0.55 from 2008, which demonstrates a level minimum of indebtedness of the company. Analyzing the coefficient of correlation between its own sources and borrowed its reduction is observed during the investigated period 2.43 and 1.06 respectively, which is assessed positively, since it reduces the amount of attracted funds returned to a lion equity Regarding solvency ratio, we observe an increase in its dynamic in the period 2008-2010 is estimated as positive because it shows the coverage of borrowed sources with total assets. But its magnitude is smaller than the size of the company analyzed theoretically [2]. The increase in the rate of economic solvency, which means that assets can meet its own obligations to pay.

The size, composition and evolution of debt directly determine the financial stability and independence of the enterprise business partners and creditors. For this purpose we perform analysis of debt in SRL "Agro-Tiras". (Table 2)

Table 2. The analysis of size and evolution of debt in SRL "Agro-Tiras" in 2008-2010

Indicators	Years			Deviations (±) of 2010 to:	
	2008	*2009*	*2010*	2008	2009
Total datorii, mii lei	3304	2934	924	(2380)	(2010)
Total liabilities, thous. lei	4484	4981	4794	310	(187)
Income from sales, thous. lei	6162	6142	6449	287	307

Source: prepared by author based on the financial report (2008-2010) of SRL "Agro-Tiras"

Performing analysis results in Table 2 we observe first debt reduction in dynamic USD 2.38 million in 2010 compared to 2008 and 2.01 million lei compared with 2009. In addition there is an increase in sales revenue with 287 000 lei in 2010 compared to 2008 and 307 000 lei more than in 2009, which welcomes the. This trend shows a reduction of our degree of indebtedness of the enterprise.

For analysis the stability of financing sources and long-term degree of indebtedness will be the calculation of indicators in Table 3.

Table 3. Stability analysis of financing sources and long-term degree of indebtedness.

Indicators	Years			Deviations (±) of 2010 to:	
	2008	*2009*	*2010*	2008	2009
Rate of financial stability	0,56	0,60	0,68	+0,12	+0,08
Rate of long-term debt to the permanent capital	0,53	0,31	0,24	-0,29	-0,07
Self financing rate of the permanent capital	0,47	0,69	0,76	+0,29	+0,07
The leverage ratio	1,14	0,46	0,31	-0,83	-0,15
Rate of long-term debt to the social capital	249,35	3,59	2,95	-246,4	-0,64

Source: prepared by author based on the financial report (2008-2010) of SRL "Agro-Tiras"

Calculations given in the table demonstrate an increase in the rate of of financial stability by 0.12 and 0.08 respectively in 2010 compared to previous years, which led to the reduction of long-term debt to the the permanent capital of 0.29 and 0.07. On these changes influenced

the rate increase permanent capital Self financing, which exceeded the 2009 and 2010 its theoretical minimum of 06. A positive aspect is the debt and reducing long term staff to the 246.4 and 0.64 respectively.

One of the fundamental conditions of successful carrying out an activity is to maintain financial balance of assets and sources of its financing. Another aspect is aimed at ensuring of financial balance in financing long term assets due to stable sources (permanent capital) and current - the current account of financing sources.

In reality, it is necessary that current assets exceed the sum of short-term debt, providing a safety margin, which is called *net working capital* (net current assets).

The revolving fund is a financial safety margin that allows enterprise to face, without difficulty, various short-term risks, the expression of long-term achievement of financial balance and its contribution to achieving financial balance in the short term. Calculation of working capital will be made in table 4.

Table 4. Calculation of net working capital of SRL "Agro-Tiras" for the period 2008 - 2010

Indicators	Years			Deviations (±) of 2010 to:	
	2008	2009	2010	2008	2009
Current assets, thous. lei	1959	1807	1774	(185)	(33)
The short term debts, thous. lei	1958	1996	1522	(436)	(474)
Equity capital, thous. lei	1179	2048	2499	1320	451
Long-term liabilities, thous. lei	1347	937	772	(575)	(165)
Long-term assets, thous. lei	2525	3174	3019	494	(155)
Net working capital (1-2), thous. lei	1	(189)	252	251	441

Source: prepared by author based on the financial report (2008-2010) of SRL "Agro-Tiras"

The data obtained in 2009 noted that only the working capital showed negative values, which reflect our enterprise's unstable financial situation of default for a short time.

But in 2010 the value of working capital increased by 441 thousand lei than in 2009.

The need of working capital to permit assessment of incidence decisions and procurement, storage, credit - clients, suppliers Palti terms of financial investments, etc.

Within the of working capital needs there stands a stable component to be financed with stable, ie either from equity or from borrowings on long and medium term. In a general way, in proportion as operating cycle is longer, the more need for working capital is higher. Also, increasing the size of net working capital is not always current enterprise needs. In this regard it becomes necessary to analyze compliance with the normative net working capital, which will be in table 5.

Table 5. Calculation of the normative of the working capital in SRL "Agro-Tiras" in the financial cycle time for the period 2008 - 2010

Indicators	Years			Deviations (±) of 2010 to:	
	2008	2009	2010	2008	2009
Rotational speed of goods and materials stocks, days	86	124	114	+28	-10
Rotational speed of short-term receivables, days	3	3	3	-	-
Rotational speed of the accounts payable, days	933	4506	4217	+3284	-289
Financial cycle time, days (1+2-3)	-844	-4379	-4100	-3256	+279
The average daily sales, thous. lei	17	17	18	+1	+1
The working capital requirements, thous. lei (4*5)	-14348	-74443	-73800	-59452	+643

Source: prepared by author based on the financial report (2008-2010) of SRL "Agro-Tiras"

The basis of data in Table 5 can be concluded that working capital needs of the SRL "Agro-Tiras" has registered negative values in the analyzed period. Also there is a tendency to reduce the the normative working capital in 2010 than in 2009 with 643 thousand lei. For the normal operational activity of SRL "Agro-Tiras" in 2010 needs a net of working capital totaling -73.8 million lei.

After the confrontation actual size of its working capital requirements we shall determine the surplus / deficit the net of working capital. An optimal way to consider the case when it coincides with the actual amount requirements. *The working capital deficit* entails: stops in the conduct of operational activities, fines, penalties related to violation of terms of payment and finally to bankruptcy. *The working capital surplus* also attract some negative consequences: reduced profitability due to inefficient use of capital invested in stocks, surplus inventory obsolescence, maintenance and insurance costs of extra surplus stocks.

Next we appreciate the assurance of SRL "Agro-Tiras" with the net working capital (Table 6).

Table 6. The analysis of concordance between the actual cash and The working capital requirements in SRL "Agro-Tiras" in the years 2008 - 2010

Indicators	Years			Deviations (±) of 2010 to:	
	2008	*2009*	*2010*	2008	2009
Effective amount of the net working capital, thous. lei	1	-189	252	251	441
The working capital requirements, thous. lei	-14348	-74443	-73800	-59452	+643
The net treasury, thous. lei	-14349	-74254	-74052	-59703	+202

Source: prepared by author based on the financial report (2008-2010) of SRL "Agro-Tiras"

The data of Table 6 is observed excess of working capital during the years 2008-2010, which is reduced in 2010 with 202 thousand the previous year. The excess in the working capital indicates that the actual amount of the net working capital is higher than the amount necessary, calculated on the basis of the financial cycle time. This shows that the company effective amount of The working capital is higher than the norm.

CONCLUSIONS

Development and implementation of strategies for effective financial restructuring may not be possible without careful analysis and economic situation - has financial company in the order to identify the causes that led to economic decline. Such analysis needs to be done before the onset of the restructuring process, however, depending on the severity of the crisis, there are cases when it is done in parallel with the financial restructuring process itself. The most effective is to make a firm diagnosis but overall, where the reasons mentioned it is not possible, analysis of the company must include: financial ratio analysis for the last 3-5 years, the main financial ratios calculation and comparison of company history cash flow analysis to determine how has company reached a liquidity crisis, sales trend analysis and their seasonality, customer analysis firm analysis of complaints to the goods sold by the company, analysis of human resources and their productivity, marketing research and market shares for particular commodities company, etc.

Regarding the economic and financial analysis enterprise can mention that coefficient values solvency of SRL "Agro-Tiras" for the years 2008 - 2010 has a low financial dependence on borrowed sources, it is up to the end of 2010. Coefficient values of autonomy increase during the 2008-2010 period been positive and show that its long-term commitments and short equity are guaranteed. Overall solvency ratio indicates a low level of indebtedness of the company at the end of 2010.

The analysis of long-term debt of SRL "Agro-Tiras" conclude that the amount of permanent capital in the amount of borrowed capital predominates. In particular cash flow rate has permanent capital throughout the period analyzed is increasing.

All the results of our calculations indicate an increase in the entity's solvency analysis, the situation is improving from year to year.

The rate of overall liquidity of SRL "Agro-Tiras" shows us that there is difficulty in paying the current debt.

In the analyzed period the company recorded a surplus of working capital. This shows that

the company effective amount of the working capital is higher than the norm.

All these allow us to say that the company analyzed the risk of bankruptcy is imminent, since the company the liquidity absolute magnitudes are within theoretical, degree of indebtedness is low, which indicates the company's financial autonomy.

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POPULATION AS A FACTOR OF SUSTAINABLE DEVELOPMENT: A COMPARATIVE STUDY OF UPPER DANUBE, CARPATHIAN AND METROPOLITAN AREA

Zoran NJEGOVAN[1], Radovan PEJANOVIC[1], Nikola NJEGOVAN[2]

[1]University of Novi Sad, Serbia, Phone: +318648465060, E-mail: njegovan@polj.uns.ac.rs, mirelat@polj.uns.ac.rs
[1]University of Belgrade, Serbia, Phone:+38163263513, Email:nikolanj@yahoo.com

Corresponding author :njegovan@polj.uns.ac.rs

Abstract

A growing number of researchers throughout the world are recognizing the fact that there is a strong link between population, its number and structure and the plans of sustainable development. For that reason, intending to contribute to sustainable development, improving the quality of life and poverty reduction, development strategies must never overlook the importance of the population factor. Only a study that encompasses all population aspects such as population number, its structure by sex, age, education, economic and the structure of agricultural population as well as households may be of use when considering priorities in the process of defining a development strategy. The paper is based on the results of an comparative study which focuses on the regions of Upper Danube, Carpathian and Metropolitan area. Its main goal is to indicate any potential problem related to population; problems which should, in near future, be the subject of economic and other policies such as social or demographic policy.

*Key words***:** *population, agriculture, education, rural development, sustainable development.*

INTRODUCTION

The connection between population and economic growth and development very often represents a subject matter among the researchers. Some of them has a standpoint that population growth is a stimulative factor for the economy. They are explaining such opinion having in mind that human resources, information and knowledge are of inevitable importance for stimulating the progress of technology and represents the base of sustainable development on the global as well regional and national level[5]. Other researchers are much closer to Maltusian[6] stand point. They are seeing the population growth as a threatenings for the mankind survival in the contex of limited resources. There is another so called neutral grope of researchers besides those already mentioned. Its views could be dangerous having in mind the fact that they are underestimating or excluding the population factor in the development programes. Luckilly a huge number of people are accepting the fact that population parametars couldn't be excluded or examined sollelly. They have to be the integral part of any development effort. Therefore it is obvios that there is a strong relation between population and the plans of sustainable development[7]. It is very clearly underlined at the International Conference concerning population and development heald in 1994. So development strategies couldnt overstate the importance of population in the process of sustainable development, improvement oh life quality and reducing of poverty.

The population growth is important and that is a reason for beter and more rational use of resources especialy those that are not renewable. That way it could be used much

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[5] Schultz, W. T., (1982) *Investing in People; The Economics of Population Quality*, University of California Press, Barkley, Los Angeles, London 1982.
[6] Well known economist and demographist *Thomas Robert Malthus* has formulated so called *Law on population* in the book Eseji o principima stanovništva (translated in serbian) written in 1798.

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[7] Sustainable development is understood as a development that won't harm future generations.

longer. On the other hand the renewable sources must be used in a sustainable manner as well.

Also it could be pointed out that population couldn't be examined by using only the apsolute values of parametars. It is needed to connect them and put them in relation with resources of particular country i.e. economy, its level of development, its technology, social and cultural conditions etc. Having in mind that developed countries has reached significant value of development by using the knowledge, education to raise the skillness of its people, it is imperative for the less developed countries to follow such streems. Knowledge based economy must be the main priority of any country particularly less developed in spite that a big portion of educated and trained people from those countries are siking for the jobs in developed countries. So it is important for the less developed countries to create different programmes for its own people to find the reason to stay within its bounderies.

MATERIAL AND METHOD

The paper approached the topic of the link existing between population, its number and structure and sustainable development plans based on various population aspects such as population number, its structure by sex, age, education, economic and the structure of agricultural population as well as households, which could be considered priorities in the process of defining a development strategy. The paper is based on the results of an comparative study which focuses on the regions of Upper Danube, Carpathian and Metropolitan area. Its main goal is to indicate any potential problem related to population; problems which should, in near future, be the subject of economic and other policies such as social or demographic policy.

The paper presents the results of the Project 46006 financed by Serbian Ministry of Education and Science.

RESULTS AND DISCUSSIONS

The main Demographic Tendencies in the Republic of Serbia can't be judged as a favourable. The number of the people is in constantly decreasing (by Census 2002). According to the first result of the 2011 Census it is estiitmated that there are 300.000 people less than it was by previous Census. It represents 5% of the whole population[8].

Such problems are indicating serious problem of depopulation[9]. That is confirmed somehow by the negative rate of population growth (-4.6‰)[10]. The same situation is concerning the structure of maturity. The Republic of Serbia belongs to elderly nations with average of 41.4 years per person. The relative portion of elderly people older than 65 years is 17,2% out of total population and it is bigger than portion of a children up to 14 years (15,7%). It is bringing us to conclusion that the people in Serbia is being older and older[11]. This problem is even more stressed in the Central part of Serbia wher older population above the 65 makes 41.2% out of total population. This tendency will remain and create even a further senilization in the recent future. That will harm working power potential and paralely bringing a problems with retirements fund and pension system.

Looking at the structure by sex, it could be seen that more than 50% of the population (51.4%) are women. It is ussual situation in european countries. The tendency of growth in the number of women is due to the average life expectancy comparing to the man population.

[8] As the Census 2012 has only some preliminary results, all data that will be presented refer to the Census 2002.

[9] There are some indications that decrease of 377.000 people represents the fact that most of the Albanian people doesn't participate in the Census as well emigration toward different countries.

[10] Republic of Serbia Government has adopted named *Strategy of birth stimulation* on January, 31. 2008. It is obvious that results of the implementation of such strategy couldn't be seen quickly, but it could be concluded that up to now it didn't bring any significant results.

[11] Even preliminary results of the Census are suggesting that the mortality rate in the Republic of Serbia is higher than birth rate.

Expected life of the children born in the period 2007-2009 is 70 years for man (71.11) and round 76 (76.40) for women. Fertile female population aged from 15 to 49 years represents 47% of total women population in Serbia.

Talking about basic demographic characteristics of Danube Region Counties in the Republic of Serbia, it could be said that they do not differ significantly in comparison with other parts. That is mainly a tendency during 80-ties and 90-ties. The prolongation of that tendency of population senilization, low level of natural births, relatively bad educational level of the population, low level of employment and permanent concentration of the people in the developed and urban parts of the country (Ciries of Belgrade and Novi Sad) are representing the huge problems that are harming Danube Region Counties

Population Structure by Age and Sex. Examination of age and sex structure of the population is important because it could show future potential of the chosen region according to biological reproduction and formation of working power as a factor of economic growth and development. In the Upper Danube Region the situation is much better than in the other two regions. The number of people is increasing and that is due to the positive tendencies in the South Bačka Region. The simmilar tendency is registered in the Metropolitens Region. The increasing number of population is obviouslz the cause of imigration, especially in the most developed Municipalities. In the same time in those regions is registered negative birth rate. The Carpatian Region is on the same position as is registered at the National level.

In the upper Danube and Metropoliten's regions the situation concerning relative proportion of young population (up to 14 years) and elderly popuation (over 65 years) is similar. Any of this two gropes represents 15.5% of total population. Average maturity in the Metropoliten's region is the same as it is on Republic Serbia level while at the lover level of Counties, for instance South Bačka County it is a bit lower (under 40 years) and in West Bačka County it is at the level of 42 years on average. In the Carpatian region data are showing poorer performance. Elderly population represents 21% of total population and younger population 15.5% while average maturity is same as in the Republic of Serbia.

Structure by sex is showing the tendency simmilar to the data for the Republic of Serbia too. In the Metropoliten's region there is a slightly higher number of women and that covers 52.3% of total population. Life expectancy of children born in the period 2007 – 2009 is like in the Republic of Serbia. The only difference is in the stratum of male population where it is shorter for one yaer on average. Talking about fertile age of wimen population it is ubder the Reublic of Serbia average except Carpatian region (42% of total wimen population in comparison with 47% at the national level).

Population Structure by education.
Educated population represents one of the major growth and development factor of national economy. So it is needed for education to be one of the main priorities in the overall planning documents[12]. Education of the population is bringing beter competences of the working power raising the productivity of employed, lovering the period of population beeing unemplyed but also through efficient technology and knowledge transfer from educational system (especially higher education) and science to the practice (socio-economic system). Beside that the higher degree of population education could be connected with lower costs on the side of Government for the financing of public sector like health, social protection and care but also system of law and order in the country (less criminal, better security, less diseeses, social needs, etc.).

Examining the segment of population older than 15 yaers according to the level of formal education, it could be said that worstest situation is in Carpatian region. There are a high percentage of population that doesn't

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[12] The main feature of the situation in Republic of Serbia is that education of the children and youth can't represent the only approach. Education of elderly people also has to be considered because a huge number of workers over 40 years old became unemployed under the tranzition process and need further education and training.

finished school almost similar to the number of people that have primary education. The only good thing is that in this region there is a highest percentage of population with primary school compared with other regions. Within Carpatian region in the Municipalities Golubac and Kučevo its portion is biggest (over 40%). In the same time there are relativelu low portion of the population with secondary school, higher and university level of education. In the Upper Danube region the situation doesn't differ significantly then it is at national level except the higher and university level that are a bit lower. On the other hand it is quite different situation at Metropoliten's region. It is obvious that space disbursement of high educational and research institution make a significant impact on migrations of population toward bigger industrial and development centres. So in capital of Serbia city of Belgrade and Authonomous Province Vojvodina city of Novi Sad there is the biggest portion of population with higher and university education and lower portion of those who do not have primary or even any education.

Economic Structure of Population

The key indicators of labor market are important for the identification of factors that are making highest influence on the employment data. Therefore it is important to have in mind that data could measure frequency of the conditions and show the relations among them but not causal dependancy. Besides it could not be forgotten that in the countries under tranzition a huge importance is on the side of informal employment. Those data and indicators is rather difficult to monitor so public data could differ significantly out of realistic ones. So the data concerning active population, employment and unemployment at the municipality level as well other important aspects of the labour market are on the disposal only for the previous Census made in the year 2002[13]. So

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[13] The data of Last Census made in 2011 are not published yet. There are only some insufficient preliminary data. There are some recent data collected by the Research on working power so th ose one will be also analyzed.

it'll be difficult to compare two or more periods and reckognize the dynamics and changes. Some comparisons shall be made with data on national level in order to get a better picture about tendencies and possible ways of expression at the municipal level. Generaly expressed it could be said that the basic contingent of working power (population from 15 to 64 years old) its rate of activity and employment were in constant decrease in the period 2004 to 2010. In the same period the data on unemployment was chageble. Also during that period the data on activity show decrease of almost 20% so the rate of activiry in Serbia was significantly lower than in 27 EU countries (a bit lower than 59% in Serbia while in EU27 it was round 71%). Employmet was also decreasing and come up to the minimum in 2010 (almost 10% in six years) when every citizen in the working age was employed. Comparation of those data with EU and neboring countries it could be said that the rate of employment in Serbia was 65% and always fare more than the rate of 70% targeted by Lisbon strategy. The number of unemployed in the same period has been decreasing but the rate of unemployment was raised according to the decrease in number of employed. At the very beginning of tranzition process a huge number of people (especially elderly) lost their jobs. Very soon a smaller portion of them find the job after privatization of the companies and its initial growth (so in the period 2007/2008 it is registered a slight decrease of unemployment). But after the return of economic crizis the situation was worsened. Number of unemployed people was grown for new 60.000 and that has raised the rate of unemployment up to 20% in 2010. The effesct of such tendency was not continuos and the same in every region. Si the analysis will be continued concernig tne same data within three regions.

Working contigent in the Upper Danube region is 70% of total population in the region (68.7%). In the Metropiten's region it is 71,7% while in Carpatian region it is a bit lower than 60%. Only the Braničevo and Bor counties expressed higher tendency than 60% within Carpatian region (respectively 63,5% and

66,2%). As the saidspotted tendency was the same at the national level one could make only remark was it equally disbursed. The rate of acticity within the regions calculated as a relation between active and the people in the working age, is relatively the same like at the national level (68%). For the Upper Danube region it is 65% and for the Metropiten's region 63%. In the Carpatian region it is at the level of 74%. It could be commented for the lsat one that a lower portion of the population in the working age is within the total population.

In every one of three regions there is raound one third of the total population that are economically dependant.   Also the huge number is employed outside the country (mostly in Carpatian region - 0,4%, whil in other two round 0,15%). The dinamics of activity rate is also of poor performance (10% at national level during six years). There are no data for lower level except for the year 2002 so calculation of relative indicators like rates isn't possible. Only absolute figures are comparable at the municipal level and for the different years. The data are expressing tendency of decreasing of number of emplyed people in all regions. The economic crizis in last few years brought even more dificulties. That could be shown by comparing the date before and after crizis. The employment has constantly decreasing in all except Metropoliten's region wher it was higher. It is logic as we now that Metropoliten's region is most developed one.

It is interesting to comment that the number of unemployed people was lower in all regions but also it could be said that the rate of unemployment actually has been raised[14]. The rate of unemployment in Metropoliten's region is even lower (-2% in the period 2008 to 2010). Concerning the informal emplyment it could be mentioned that one third of unemplyed people are those who seek for the jobs for the first time (The portion of the Metropoliten's region is also lower than in other regions, 29%. The portion of the working people without any qualification in this region is also lower – 21%). In the remaining fields of analysis the big portion of workers without any qualification is

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[14] Refere to the methodology of calculating the unempled population.

very concernig (round one third of total people unemployed compared with 43% in Carpatian region).

Structure of Agricultural population

The starting point for evaluation of the man power in agriculture at the level of the municipalities of the three regions are statistics data on agriculture and active people in agriculture within total population as well data on age of this population at the households according the settlements. According to the Census 2002 there are 817.052 of agricultural people in the Republic of Serbia. It represents 11% of total population. Out of that there are 65% of active people in agriculture (almost 60% of total agricultural population are farmers and 35% economically dependant). In the Upper Danube region the situation is worser than average at the national level. There are only 7.5% of agricultural people out of total and 56.5% of them are active (43.5% economically dependant and 42% of them are farmers). At the lower level of counties, West Bačka region has better performance (10% of agricultural people and municipality of Sombor 12%). In Soth Bačka region the situation is worser (less than 7% are agricultural population while at the level of the municipalities in that region – for instance municipality of Bač and Bačka Palanka, the situation is quite different. Those municipalities are closer to the national average – in the municipality of Bač there are 18% of agricultural people). Carpatian region is quite different than national average. The portion of agricultural and active agricultural people is higher as well farmers. The biggest portion of agricultural population is in the municipalities of Golubac in the county of Braničevo and municipality of Negotin in the county of Bor (34.5% and 22.2% respectively). On the other hand the lowest portion of agricultural population in the same region is in the municipality of Kladovo and Majdanpek (less than 9%). Portion of active people within that is 79% in the municipality of Majdanpek (65% on average at the national level). The share of economically dependant is 35% on average for the region and in the municipality of Golubac while in the municipality of

Majdanpek is quite lower – 21%. In the most developed region – Metropoliten's region there are municipalities with very small share of agricultural population (in some municipalities even 0.5%). On the other hand, in the municipalities that are partly agricultural ones (municipalities of Mladenovac, Obrenovac, Sopot, Irig Pecinci, Ruma, Smederevo) the structure of agricultural population is not so good.

Figures for the three regions and its representative municipalities are not comparable with latest data. So it is rather difficult to provide more precize conclusion but based on possible data it could be concluded that quantitative figures of agricultural population and its structure by age, sex and activity does not be judged as unfavourable in spite of constant decrease of vital parametars. Investing in the people could be the way of continuoing the growth of agricultural production and the prodactivity of labour. Combined with improvement of the quantitative parametars, this qualitative approach could widen the agricultural and of course sustainable rural development perspective.

Agricultural Households

As it was assumed that Republic of Serbia is facing a huge problem of depopulation combined with senility it is obvious that the number of family members at average househod has been decreased from four or even more up to three according to the Census 2002 (round 15% on average). Analused regions doesnt have significant variability but at the level of counties and municipalities the diferences could be better examined. The main explanation is overall. It could be said that socio economic development of the sociesty is followed with decrease in number of children per household on average and increase of pregnacies that are not expected. In the same time the raising of the educational level of wimen is bringing the wilingness for smaller number of children (converting the quantity in the Maltusian manner to the quality as a Schultz manner). In all developed municipalities it could be seen such tendency (one, two or three members of the household).

On the other side a bigger number of familly members are proportionaly lower then those previously mentioned. In the Upper Danube region the average familly members are 2.85 as well in Metropoliten's region.

It is expected that the number of family members will further decrease after the data from last Census 2011 will be published. It could be assumed as a wast problem of the rural regions. The critical mass of population for any growth and development will be lost in many settlements. It is expected recent disapearing of more than 500 in the Republic of Serbia. It will make a significant impact on its survival. Having that in main any future strategy in the field of regional rural development as well agricultural development must count of that and provide mechanisms for better reproduction of population.

CONCLUSIONS

Population is actually of vital importance for the sustainable development. As the world population is under the pressure to produce more food, agricultural land is all the time considered as a resource with diminishing yields. That was the essence of Ricardo's theory of rent. On the other side Malthusian theory on population was also in play for the centuries. But in the new circumstances our opinion is that those theories are not valid eny more. People developed Technology and it has supstituted land raising its quality as well as the worlds population is spite of lovering of its number engaged in food production are bringing huge progress by improvement of populations quality through education and training. So investment in people is a new factor of sustainable development and it bring up new structure of qualified people by age, sex, activity and by education.

Such tendencies are present on the local level of three regions that are subject of the paper. Only the actual level of development as well the current economic situation in the conditions of recesion that are present in the Republic of Serbia are influencing and producing the negative tendencies. Combined with huge problems of depopulation and senelity in the

rural areas of analysed regions they are bringing low pace of development even negative tendencies and substantionaly are harming its sustainability.

As a potential factor of better development results it could be mentioned structural adjustment of the economy and connected to that investment in people. That is bringing in place the raising significance of working capital. This could be a main factor of change and relatively quick reparation of economy, raising the sustainability of development and its regional spreading.

ACKNOWLEDGEMENTS

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ANALYSIS OF THE EDUCATIONAL METHODS AND CURRICULUM REQUIREMENTS FOR RENEWABLE ENERGY SOURCES

Zuzana PALKOVA, Janette GUZMICKA, Norbert FLORIS

Slovak University of Agricultural in Nitra , Tr. A. Hlinku 2, 949 76 Nitra, Slovakia
Phone: +421 37 6415 019, Email: Zuzana.Palkova@uniag.sk, Janette.Guzmicka@uniag.sk, Norbert.Floris@uniag.sk

Corresponding author: Zuzana.Palkova@uniag.sk

Abstract

Article is dedicated to the sources, analysis and output of the project ECEVE - Implementation of E-learning Content for Energy Saving Farm into Vocational Education. The project is solved in the period 2010 - 2012 within the program Leonardo da Vinci - Transfer of Innovation. Its coordinator is the Slovak Agricultural University in Nitra, and one of the strategic objectives is to analyze training needs in the area of vocational education and training in the field of renewable energy sources. The members of research group analyzed needs in the field of education, and have regard to evaluation, expansion and improvement of educational programs for the current labor market needs and modernizing didactic methods and resources for selected target groups - especially those members involved in vocational education and training.The paper also describes a new instructional design, course development and learning process management methodology based on new learning principles making e-learning more efficient by shifting from the "passive" book paradigm to a new "active" e-learning content structure and information workflow conveying the knowledge.

Key words: *needs analysis, e-learning, renewable energy resources, vocational education and training, project ECEVE*

INTRODUCTION

The project ECEVE – Implementation of e-Learning content for energy saving farm into Vocational Education is an international project in the framework of Leonardo da Vinci - Transfer of Innovation grant scheme. The main aim of the project is to create a new VET School Education Program and learning materials for supporting and expansion of vocational education in the area of RES. The fundamental emphasis is focused on the implementation of modern way of learning and Web 2.0 technologies in training. These aims are linked with the European politics in the field of education and training as defined in "Council Conclusions on a strategic framework for European cooperation in education and training – ET 2020" in Brussels, May 12, 2009 and Lisbon Strategy. In both of these documents, the vocational education and training have a crucial role in the area of socio-economy, environmental or technology. To achieve the strategic goal was set the following specific objectives:

-**Analysis of educational needs** - analysis aims to identify the educational needs of students in secondary vocational schools and vocational education and training and to define of new educational programs. It takes place in two stages. The first phase included the creation of three types of questionnaires and own research. The second phase involved data processing and practical implementation of the results as a new school curriculum.
-**Creating a new school education curriculum** – Creating a new school curriculum - vocational education and training in the agricultural sector is currently focused mainly on education on the area of environment, ecology, sustainable development, healthy lifestyles and quality of rural life. Thanks to the new school education program, students are familiarized with the principles of energy production from renewable sources, ways to reduce energy consumption, energy audit procedures, but also the causes and impacts of climate changes and the possibilities of reducing greenhouse gas emissions. The school

education program includes among others syllabus of individual subjects and their relevance to content of education and new objectives supporting the development of key competencies, methods and forms of education, study literature and the final evaluation forms.

-Development of educational materials – educational materials in English and Slovak languages, based on modern educational practices include the latest knowledge of renewable energy and are supported by modern information technology, Web 2.0 technologies and shared multimedia content. The project is focused on two target groups. First of all are the students vocational education and training, but developed educational materials are intended for participants of any level and forms of education. The aim is to provide those students education in area of renewable energy sources and possibility of their use.

MATERIAL AND METHOD

Vocational education and training in area of renewable energy sources

This part aimed the actual situation in the vocational education and training in Slovakia. Main emphasis is oriented on the education and training in the area of renewable energies and relative areas.
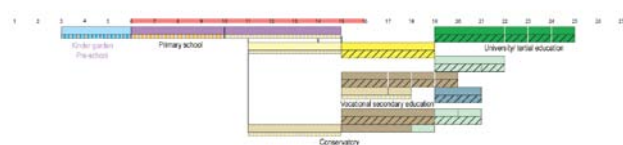

Fig.1.Below chart shows the structure of education in Slovakia [1]

Vocational education in Slovakia has been divided into general and vocational by the Millennium Program (National Program for Education in the Slovak Republic for the next 15 to 20 years) in 1998. The professional education and training develops knowledge, skills, habits and other skills of students acquired in lower secondary education. The result of this education is vocational education, which is part of professional qualifications. It allows to students engage in employment as a skilled workforce or continue their studies. Professional education can be distinguished from two perspectives:
achieved by degrees:
vocational education and training where the certificate is indenture;
secondary vocational education, where certificate is school-leaving exam;
by type of vocational training that bind the certain groups of occupations, for example chemical education, economic education, engineering, clothing industry etc.
National Qualifications Framework [2], a tool for the distribution of all qualifications within the national education system, whose acquisition is, carried out according to a set of defined criteria for each level Specifies the relationship of the acquired learning outcomes for each level qualifications framework.
National System of Qualifications [3] is a publicly accessible register of all complete and partial qualifications, validated, distinguished and respected in the Slovak Republic. **National system of professions** [4] is an integrated information system of the labor market demand standard description for particular jobs. Indicates requirements for professional knowledge, skills and practical experience necessary to carry out working activities on jobs in the labor market
The **formal education** is conducted within the framework of primary schools, secondary schools and universities, organized and structured view of the location, objectives, time and resources. It refers to the institutions for education and training. Leading to a qualification and award officially recognized documents.
The **informal education** runs alongside the formal system of education and professional training and usually don´t end formalized with official issuing qualification certificates. The aim of the teaching activities of non-formal education is to complement, extend or deepen the knowledge, skills and competence of the individual. It can be organized in schools outside their core activities, in organizations that were created to complement the programs

of education in the formal system, at workplaces, interest organizations, etc.

Assessment and subsequent inclusion of educational programs, a study program and educational activities within the professional training takes place on the professional outcomes from the working groups and EQF descriptors. Belonging to the corresponding levels of the EQF determines Ministry of Education, Science Research and Sport of the SR.

Accreditation is state verification of an educational institution competence to realize accredited educational program carried out under the conditions laid down by law no. 568/2009 on lifelong learning and amending certain laws. Ministry of Education, Science, Research and Sports of the Slovak Republic decides on the granting of accreditation on the basis of Accreditation Commission opinion for further education. At the Ministry of Education, Science, Research and Sport SR accreditation is realized in several areas. The

o accreditation of continuing education provides
o public educational institution verifying the competence to carry out the educational activities in accordance with legally established conditions.

Vocational education and training conducted within their competence the schools, school facilities and after school educational institutions. There are:

- primary schools, secondary grammar schools, high schools and school facilities, educational institutions,
- educational institutions or other legal persons and natural persons and they may realized in further vocational education and training accredited and non-accredited educational activities.

Educational institution issuing to the graduate of education that is accredited under this Act a certificate of the education, with the nationwide validity. Graduate of education, by which participants to obtain the level of education in addition to undergraduate, graduate and interest education, civic education and other training to be issued a certificate of completion.

Certification for the technicians to be employed in renewable energy power systems

Workers in the energetics and electro-engineering must undergo complete regular training and testing so that they are familiar with safety regulations, decrees and regulations applicable to the energy and fire requirements. For this purpose are on the Slovakia issued the Slovak technical standard STN:

- IEC 61140 – standard for electrical equipment with the European directive.
- STN 33 2010 – standard for electrical equipment - there are distribution of electrical installation, equipment according to the purpose, voltage, frequency, number of phases and danger.
- STN 33 0120 –standard for normalized voltage:
  o AC systems 100 – 1000 V (standard AC power is 230/400V),
  o AC systems upon 1kV,
  o alternate sources and appliances to 1kV,
  o alternate sources and appliances up to 1kV.
- STN 33 2000-4-41 – standard to protect against electric shock,
- STN 34 7411 – standard on the labeling and use drivers,
- STN 33 2180 –standard for connecting electrical equipment and appliances, switches on, commutator, drivers, sockets and fork,
- STN 35 9704 – standard for hand tools (all of them and requirements),
- STN 34 1390 – standard of protection against lightning by lightning conductor,
- STN 34 2820 – standard of antennas and antenna connections with lightning conductor
- Order No.508/2009.

The order deals with ensuring the safety of pressure, lifting, electrical and gas appliances and professional competence. Decree No. 508/2009 of the Ministry of Labour, Social Affairs and Family of the Slovak republic for safety and occupational health and safety of technical equipment entered into force on January 1, 2010.

The decree provides:

- which technical devices are considered to be reserved,

− safety ensure of technical equipment,
− ensure of safety and health (OSH),
− competences of electricians.

Professional qualification

Activity (work in manufacturing, assembly, operation, servicing, repairs, maintenance and technical inspections and tests) for technical facilities should be performing only a professionally qualified person. According to the professional competence of the person carrying out activities in the technical facilities are distributed:

– § 20 - educated worker,
– § 21 – electrician,
– § 22 - independent electrician,
– § 23 - electrician for service or management activities,
– § 24 - electrician specialist.

Accredited educational programs

On the website of the Ministry of Education, Science, Research and Sport is available Information System of other training (Fig. 2), which was established under the Act. 568/2009 on lifelong learning and amending certain laws and serves as information - consulting tool that supports the development of further education in the Slovak Republic. The mentioned information system provides the participants of education with basic information on accredited education programs of the further education in the form of the provider educational specifications, types offered educational programs and training modules.
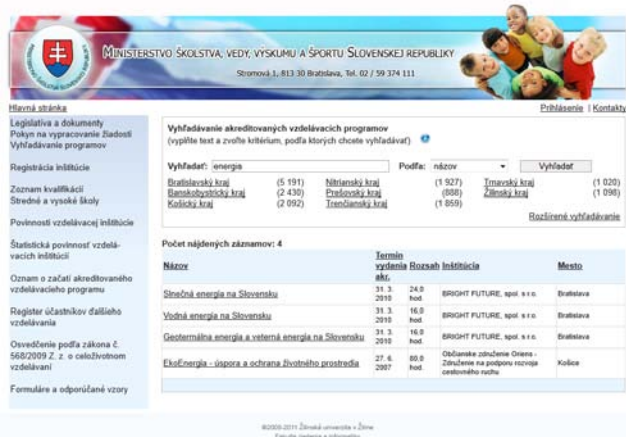
 Search tool of accredited education programs
Except upper mentioned professional qualifications, on the ministry's portal should

be find only four accredited courses from the area of renewable energies provided by company with the main interest in advertising and marketing. Some activities in these area provides Agroinstitut, state enterprise Nitra, but its learning activities in the renewables are oriented on lifelong learning for agriculture employees.

Existing school's education programs in this area, offered by secondary vocational schools in the Slovakia, are first of all oriented on the production and processing of biomass. They do not look at the problem from a wider perspective. There is lack of knowledge about the reasons for climate change, the principles of electricity and heat or other types of renewable resources that can be effectively used in agricultural practice - geothermal, solar, water and wind power and become familiar with the theory of climate change as a result of anthropogenically induced greenhouse gas emissions.

Main aim of the ECEVE project is to prepare school education program in the area of renewable energies, climate changes and energy audit.

RESULTS AND DISCUSSIONS

The content analysis of vocational education needs and training in area at the renewable energy sources

Analysis of educational needs focused on identifying of participants training needs vocational education and training in terms of the current situation in the field of renewable energy sources. Implementation of the analysis was conducted in two stages. The first involved the creation of questionnaires, particular exploration and evaluation of survey results. Questionnaires were distributed to three educational institutions in the field of bioenergetics, respectively electrical engineering. The second phase focused on the analysis of the situation in the use of renewable energy sources, legislative framework for vocational education and training and available education courses in this area in condition of the Slovak Republic.

 The use of renewable energy sources in condition of the Slovak Republic - Background

Fossil fuels cover 95 % of primary energy needs in Slovakia, and more than 90% of primary energy sources are imported. About 40 % of primary energy consumption is used for heat production and roughly half of the households are served by district heating. The main energy source for district heating is natural gas (more than 70 %), seldom used in combined heat and power production and registering a remarkable increase. Large-scale hydro energy is the only RES electricity with a notable share in total electricity consumption, but Slovakia has a great potential to use biomass from own forests and agriculture as well. Slovak's primary energy sources were 27 704 GWh [5], with thermal accounting for 39,55%, hydro for 14,82% and nuclear for 55,63% in 2010.
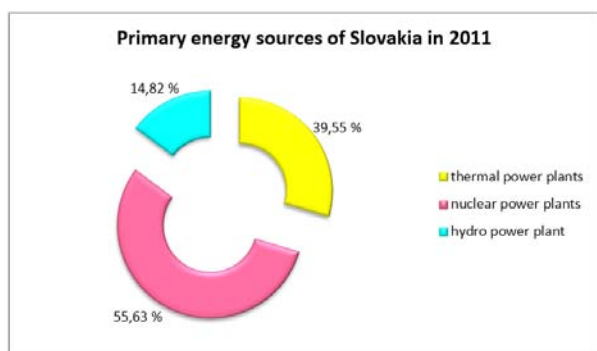

Fig.2.Slovakia's primary energy sources in 2011

The Directive on renewable energy [6] in 2009 sets ambitious targets for all EU Member States, such that the EU will reach a 20% share of energy from renewable sources by 2020 and a 10% share of renewable energy specifically in the transport sector. Draft of the Energy Policy was approved by SR Government Resolution no. 29/2006 of 11.01.2006. The RES legislation was developed as a response to the EU Renewable Energy Directive. This strategy outlines how the Slovak republic can reach its 2020 target which is 14 % of energy from renewables by 2020. A major role will play a biomass heat production and promotion of the combined biomass heat and power production.

Despite to the current, relatively low share of renewable energy sources in the energy mix of the Slovak Republic, it is clear that in the near future we will have increasing energy recovered from other than fossil sources. As it follows from strategy document entitled Energy Policy, one of the national strategies of the Slovak Republic is to ensure maximum economic growth in terms of sustainable development, which is subject to the reliability energy supply at optimum cost and adequate protection of the environment [7].
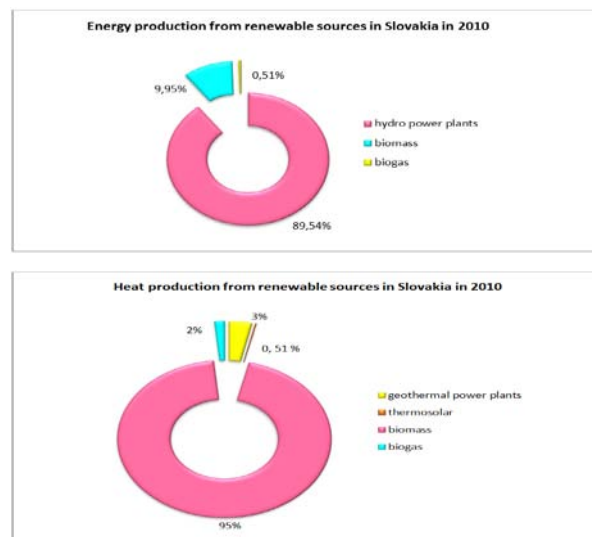

Fig.3.Slovakia's energy and heat production from renewable sources in 2010

Realized a survey of professional documents, reports and available data supporting the opinion of investigators that in condition of the Slovak Republic have the greatest potential in renewable energy sources solar energy - photovoltaic and thermosolar technology, hydropower, biomass and biogas The potential for wind energy SR is estimated at 600 GWh /y, which is compared with the potential of other renewable energy sources such as biomass or water, very low. In addition the site with the complying wind conditions is found mainly in mountainous areas that are particularly valuable inland-conservation and environmental terms. Despite this fact, the benefits of wind power - no production of greenhouse gases and other emissions, a wide range of installed capacity by some 100 W for home use, up to several MW of power generation to distribution systems, wind power belongs to a group of renewable energy sources, which in terms of this analysis significant

Questionnaire survey

The role of the questionnaires was to support the findings of the project leaders through the

views of environment from vocational education and training.

Questionnaires were distributed among students of educational institutions which implemented education in such fields:Agribusiness, Bioenergetics, Agroforestry, electrical engineering, wood processing.

The questionnaire survey was conducted between November 2010 and February 2011. To reduce the impact of subjectivity we have as answers to each question offered two clear answers - yes and no. Aim of this method was to find out students' interest in renewable energy sources topics and compare it with the conclusions of authors based on the survey relevant documents, statistics etc.

Topics of the questionnaires have been divided into four groups: renewable energies in general, biomass and biogas, energy efficiency, passive buildings.

The following table specify area in each group. The questionnaire was accompanied by a detailed description of the content areas.

Table 1.Questionnaire's topics by group

Renewable energies in general	Biomass and biogas	Energy efficiency	Passive buildings
Biomass	Animals	Energy	Insulation
Solar energy	Bio fuels	Heat	Motions prevention
Wind energy	Wastes, handling with waste	Thermal analysis of buildings	Passive buildings
Hydropower		Fabric transmission loss heat	
Geothermal energy		Ventilation heat losses	

The results of the graphs show that students are interested most of the presented topics. Positive response was first of all in particular relating to the general knowledge of renewable energy sources, where 90% of the students expressed their consensus on solar and geothermal energy. A little of less - 88% of them inclined for water energy and consistently for 86% of them to wind energy and biomass energy.

Almost identical results were also obtained for answers to specific types of biomass. The need to acquire knowledge of the animal waste biomass was positively expressed 80% of students, on the biomass from industrial and municipal waste, 82% of them, and 86% of them biofuels
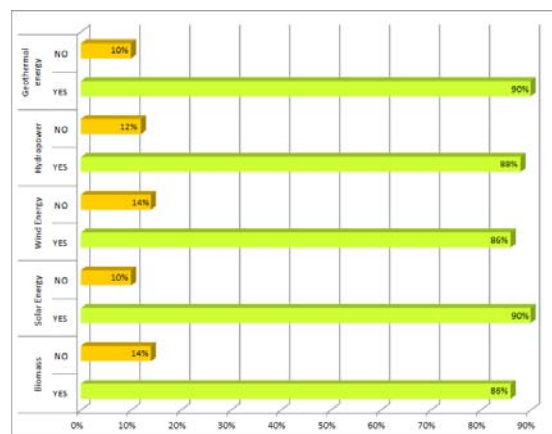
Fig.4.Statistically processed answers for renewable energies
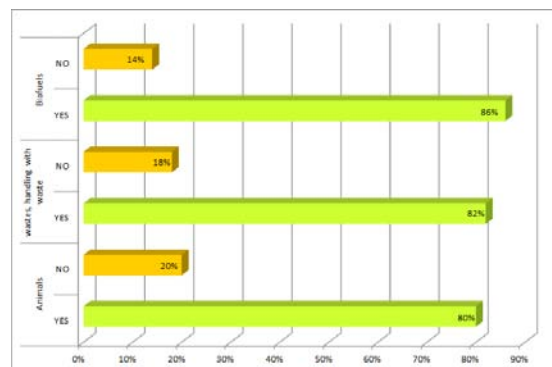

Fig.5. Statistically processed answers for biomass and biogas

Of less clear results of the questionnaire brought in the last two groups, of educational headings, where the dissenting position of participants was around 30 percent – general knowledge about energy – 22%, for heat 22%, thermal analysis of buildings 38%, fabric transmission loss of heat 30%, ventilation heat losses 28%.
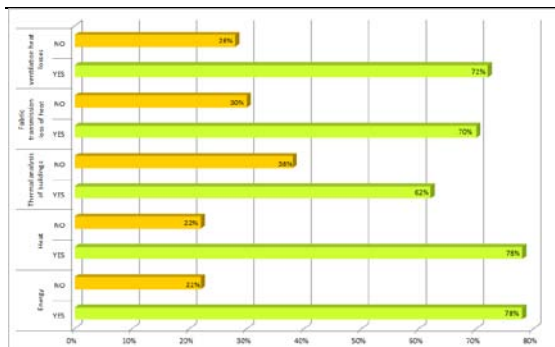
Fig.6. Statistically processed answers for energy efficiency

Most responses were negative in the last part of the educational headings - passive buildings. The important findings in the field of insulation is considered only 58% of them, 62% so understands motions prevention In the future the passive building will use the effective technology and renewable energy sources. Up to 40% of the students are not persuaded that passive buildings are promising way to save energy.
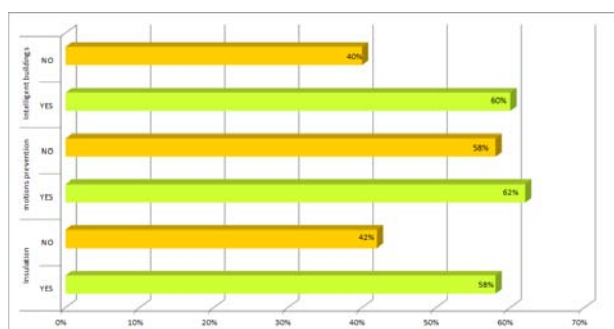

Fig.6. Statistically processed answers for passive buildings

As a conclusion of this part we can say that students in generally agree with all the suggested topics, except for insulation, motion prevention and passive buildings (although these results were almost positive). These facts should be as a result of not clarified content meaning of these items.

Based on results of this survey and questionnaires results, we start to prepare school education program and content of learning materials. The content of education materials is created by basic knowledge how to obtain energy or heat from renewable sources, which types of RES can be effectively used in the Slovak Republic and what are the possibilities of their use in the field of agricultural sector with the main emphasis on rural development. The main points of content can be defined as follows:
− basic knowledge about energy,
− climatic changes,
− energetic audit,
− low energy buildings, intelligent buildings,
− renewable energy sources - solar power, hydro power, wind energy, biomass and biogas

The intention is to provide VET students with the education in the area of renewable energies and possibilities for their effective using. The learning process becomes attractive and effective for young people by being supported by Web. Multimedia, social networks, blogs or podcasts browsing by iPhones or iPads present way how to advance learning process into new dimension. Using methods of e-learning 2.0 and ICT in the vocational education and training in the lifelong learning as well give possibilities to consider specific conditions of these forms of education.

CONCLUSIONS

The European Union as a whole is more than 50% dependent on imports of primary energy resources which are imported often from politically and economically not very stable regions.

The commitments made in the field of climate change have the same impact on the EU energy strategy. Therefore, the strategy of the EU's energy focused primarily on energy efficiency and renewable energy sources (RES) while their potential in Member countries is not negligible. From this perspective it is very important to target on education and training to gain professional knowledge in renewable energy sources and technologies that relating to this area. The support benefiting from renewables to generate electricity,

heat and hot water, as well as support for the use of biomass energy, energy efficient buildings (in the form of thermal insulation of residential buildings, construction of energy efficient building, etc.) provides, in addition,

the development of innovative technologies, transfer of significant energy sources savings and economic growth in job opportunities. These new economic needs mean the changes in the content of education systems.

ACKNOWLEDGEMENTS

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BASIC PRINCIPLES, IMPORTANCE AND DISTRIBUTION OF ORGANIC GRAINS GROWING GLOBALLY AND IN THE REPUBLIC OF SERBIA

Svetlana ROLJEVIĆ [1], Radojica SARIĆ [1], Biljana GRUJIĆ [1]

[1] Institute of Agricultural Economics, Volgina Street no. 15, 11060 Belgrade, Republic of Serbia, Phone: +381(0) 11 29 72 842, fax: +381(0) 11 29 72 858

Corresponding author : svetlana_r@iep.bg.ac.rs

Abstract

Cereals cover about 32% of the world's arable land and represents the basis of direct and indirect food of most countries population, so the way and amount of these crops production is very important factor in the management of natural resources and the global population food security creation. As the organic farming itself is defined as a viable, productive, economic and socio acceptable system of food production, such as in the greatest volume could contribute to the protection of human health and the environment when it comes to corn growing. Surfaces covered with the grain grown by organic technology represent only 6% of world organic farmland, so there is significant potential for expansion of production. This paper presents the basic principles of wheat growing based on organic technology, shows the countries, currently the largest producers of organic grains and presents the situation in the Republic of Serbia.The aim is to show the presence of surfaces suitable for organic wheat growing globally and in the Republic of Serbia, but also to emphasize the importance of these crops organic production technologies spread in order to preserve natural resources and the sustainability of agricultural production

Keywords : *Organic agriculture, grain, surfaces*

INTRODUCTION

Organic farming is a system of safe food production in compliance with environmental protection, simultaneously maintaining soil fertility, conservation of ecosystems and human health [3]. Because of the role it plays in the conservation of natural resources, organic farming as an alternative to conventional one, is gaining in importance.

Due to its high genetic variability and the existence of a large number of species, subspecies, varieties etc., grains have been adapted to different climatic conditions which enabled them growing in almost all agricultural areas. As corn represents basic of the most countries food security and cover about 50% of the world organic area (according to FAO harvested area under cereals in 2009. amounted to 708.494.768 ha), one can rightfully argue that the expansion of organic farming systems of wheat significantly contributed to the preservation of natural resources and public health. Since the beginning of the organic agriculture development till now a significant number of scientific papers dealing with the possibilities of growing wheat in low-input and organic farming system has been published. In addition to science, we achieved significant results in practice. Today, the global organic wheat is grown at about 6% of the total organic area. The largest area covered with organic grains is in Europe, and European countries such as Austria, France, Germany, Italy and Spain. Regarding growing corn on the principles of organic technology in R. Serbia, according to the Ministry of Agriculture, Trade, Forestry and Water Management, these crops cover 5.9% of organic surfaces as compared to the potentials at our disposal is very modest.

MATERIAL AND METHOD

For the purposes of this study primary and secondary literature was used. Secondary data were used to show the growth of organic land at the global level, representation of the area covered by cereals in the total organic agricultural land at the regional level and their representation in the Republic of Serbia. The primary literature was used to refer to some of important scientific research in the field of

organic grain production in the world and in our country. The paper reports the desk method for capturing, processing and analysis of results.

RESULTS AND DISCUSSIONS

Since the beginning of 90's of last century, the idea of organic farming has developed rapidly around the world, so the area with this way of managing natural resources grew significantly. According to the International Federation of Organic Agriculture Movements (IFOAM) in 1999. there were 10, 993, 852 ha or 0.52% of global agricultural lands covered under organic production, while in 2009. the organic farming encompassed 37,172,635 ha or 0.85% of agricultural land [11]. According to data collected in 2009. the most significant percentage of the world's organic land is in Australia (32.7%), Europe (24.8%) and Latin America (23%).
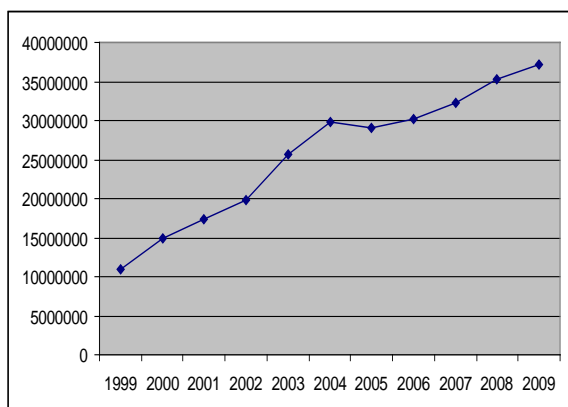

Fig.1.Organic Agricultural Land (In-Conversion and Fully Converted) in period 1999-2009

The growth in world population and expanding urban areas has caused less arable land available for food production and this is one reason for slower growth of the area under organic production in the period after year 2004. comparing to the period 1999.-2004. (figure 1). In addition, conventional agriculture is still the dominant production system and the organic production is in constant competition for agricultural land.

Abundant crops on organic arable land currently are grains, oil seeds, plants

harvested green and sugarcane. Cereals cover about 6% organic surface on a global scale and the largest area are in North America and Europe (Table 1).

Table 1: Share of area under organic cereals in total organic agricultural land at the regional level, year 2009.

	2009	2008	2007
Africa	0,52	0,73	0,54
Asia	1,12	2,83	2,33
Europe	17,05	17,95	18,9
Latin America	0,53	0,51	0,4
North America	20,65	22,39	21,66

Source: [11]

Among the most common grains are wheat, barley, oats, corn and rice. As wheat is one of the most important crops for human race and livestock in many countries, the table below shows the ten leading countries in the world of organic corn and wheat production.

Table 2: The world's leading grain growers on the principles of organic agriculture

Country	% organic	% grain surfaces in organic	% wheat in areas under cereals
Austria	18,50	17,27	28,78
Canada	1,04	29,44	51,46
France	2,47	15,34	35,70
Germany	5,59	21,31	24,78
Italy	8,68	22,77	57,78
Spain	5,35	13,79	no details
Sweden	12,56	19,65	31,52
Turkey	1,29	35,50	85,26
Ukraine	0,65	49,42	79,52
USA	0,60	18,85	45,81

* organic surface area include certified and those in the process of conversion, Source: [11]

Austria is one of the leading countries in the world by the use of organic in total agricultural land. The cultivable organic land are covered by common wheat (grown mainly wheat, rice and triticale), plants harvested green and protein crops. Between years 2008 and 2009. this country recorded a growth of organic area for 5%. In France, about 56% of the organic agricultural land is used for arable crops, notably fodder (160,000 ha) and wheat (103 000 ha) and perennial crops, but still dominate the area under vines. The highest relative increase of the areas covered between the 2008, and 2009. in France was reported just regarding cereals. Cereals are a key category of crops that are grown on organic surfaces, and in Italy which cover an area of 251 900 ha (data from 2009.). The 2008 and

2009. recorded a growth of cereals covered area by 21%. In Spain, grain legumes are grown within an area of 113 304 ha, with no data on the exact amount of land under individual species. With a share of 0.7% organic certificated the total agricultural land in Ukraine is leading one in the region of Southeast Europe. The cultivation of cereals, pulses and oilseeds are represented. The grains cover 134,080.0 hectares where wheat is grown on about 80% of the area (Table 2).

What is typical for organic production of all crops, and grains simultaneously, is represented in notably reducing grain yield at the stage of transition from conventional to organic system of cultivation. The level of losses depends on the biological characteristics of the farm, the knowledge and skills of farmers and the extent of external inputs use before switching to organic growing system. These losses can exist for years until the restoration of the ecosystem reach the point where organic production becomes profitable. But later, after establishing a balance in organic farming, agro crop yields are often lower than in conventional production of the same crop. According to investigations developed in the UK conventional varieties of wheat that were grown on the principles of organic production yielded inferior results compared to conventional farming [10]. This refers to the yield (yield in organic production is less than 25-75%), and quality of grain. The results can be explained by the fact that the varieties selected for cultivation in organic farming require external inputs ensuring control of diseases, pests and weeds and score genetically predetermined level of return. Without the input of external inputs this sort have the potential to cope with natural conditions and give very low yields and grain quality. The results of four studies in the UK have shown that triticale gave the largest and most stable yields while the yields of wheat varied significantly. Similar results were obtained by Kovacevic et al. in trials in Serbia [2].

Directing agricultural production towards sustainable development in Serbia started in its northern parts in the late eighties of the last centuury. Since 2000. a new period of rapid development have began and it is still in progress. Organic agriculture is present to some extent in different locations all over Serbia. Based on information provided by the association of TERRA'S, in Vojvodina in 1997. the organic production is performed on only 156 ha and is comprised primarily of arable crops. According to recent data collected during 2010. the Ministry of Agriculture, Trade, Forestry and Water Management, National Association for Organic Production "Serbia Organica" [9] have reported that organic farming is practiced in Serbia in 8643 ha, of which 7,000 hectares are certified, and 1640 ha is in the process of conversion. Expanding the concept of organic production in Serbia contributed to the regulation of the legal framework. The first law on organic farming was adopted in 2006. and second in 2010. year. The legal framework of organic agriculture in our country is in accordance with European Directive 2092/91. In addition to the law regulating the rules of organic agriculture, initiative for farmers to became organic operators can be found also in state subsidies given to producers per hectare of certificated surface, but these incentives are much lower than the same in the European Union. In addition to these measures, growth in demand and market development of organic products in Serbia has significantly influenced the growth of agricultural area under organic production (Table 3).

Table 3: Basic data on organic production in Serbia in the period 2006-2010.

Years	Area (ha)	% Organic	Producers
2006	739,71	0,01	35
2007	829,69	0,02	0
2008	4.493,82	0,09	224
2009	8.660,88	0,17	2.969
2010	8.634,71	0,17	3.887

Source: [12]

Regarding the representation of the organic crop acreage (surfaces certified and in the process of conversion) the highest area is covered by fruit

(3452 ha), followed by grains (574.5 ha), oilseeds (507.7 ha) and vegetables (309 ha) (Table 4). Grain crops are indispensable on an organic farm in Serbia, mostly in the region of Vojvodina, with the present cultivation of wheat, corn, barley and oats. The representation of the grain crop structure on organic farms in Serbia can be explained by a valuable collection of genetic material. A part of grain gene bank is stored on farms, a much larger part is kept in the scientific research institutions. One of the major grain gene banks (primarily wheat and corn) in Serbia is located in the Institute Zemun Polje. Germplasm collections are stored in several research centers: the Institute of Field and Vegetable Crops Novi Sad, Center for Small Grains Kragujevac, Center for Agricultural and Technological Research in Zaječar PKB in Belgrade, Faculty of Agriculture in Zemun, Department of Plant and Animal Resources with the Ministry of Agriculture, Forestry and Water Management [5]. The potential of this genetic material can be used for the production of new genotypes for both organic and conventional production, and also for the restoration of the old varieties.

Table 4: The surfaces in the system of organic agriculture in Serbia by major crops (2009.)

Categories of crops	Crops	In total (ha)
Perenials	Apples	1.330
	Raspberries	515
	Strawberries	127
	Plums	1.089
	Cherries	150
	Others	241
	Fruit total	**3.452**
Anuals	Maize	334
	Wheat	234
	Barley	6,5
	Cereals total	**574,5**
	Soybean	506
	Sunflower	1,7
	Oilseeds total	**507,7**
	Beans	8,5
	Beet	7,1
	Cabbage	2,4
	Tomatoes	0,1
	Pumpkin	1,6
	Lettuce	0,4
	Vegetables total	**309**
Grassland		3.800
TOTAL		**8643**

Source: [9]

The research made by Kovacevic et al [2] that included a growing alternative and conventional varieties of wheat in low-input system reflected the results showed that the conventional NS 40S had higher yields during the three years of research and that alternative types of wheat have more stable yields by year. Among the tested alternative species (Triticum spelta, Triticum durum and Triticum aestivum ssp. Compactum) and their varieties, the highest yield gave the species Triticum spelta (4.78 t/ha) which is a significantly higher yield comparing to the species Triticum compactum and Triticum durum. Inevitably also is the question of grain cost and production based on the principles of organic production, where these crops usually give significantly lower yields. Based on the analysis of economic parameters Vukoje and associates et al. [6] concluded that the production of spelta in an organic farming system can be very profitable (cost-effectiveness ratio: 2.24; return rate: 55.4%). But also it is underlined that the conventional production of spelta is still cost effective in local conditions (cost ratio: 3.3; return rate: 69.9%). Incomes from subsidies from organic production (25,000 din/ha) were significantly higher than those in conventional one (14,000 din/ha), but are still quite modest, and this method of production has lack of favoritism.

BASIC PRINCIPLES OF WHEAT GROWING IN ORGANIC FARMING

The organic production of cereals is based on the use of crop rotation with a greater share of legumes, crop residues, green stuff fertilization, the use of microbial products, mechanical cultivation and biological control of diseases, pests and weeds [1]. The use of these methods leads to satisfactory fertility and maintain good physical and chemical soil structure. Production of cereals based on the principles of organic cultivation technology does not differ greatly from conventional production. The most important difference is in relation to natural resources, that organic farming is not exhausting, but it protecting and allowing their sustainable use.

The soil tillage in organic farming is based on the number of passes reducing in order to

preserve the physical structure of the soil, minimize the potential for erosion and increase the diversity of flora and fauna in the soil and its microbial activity, and therefore fertility. Such an approach contributes to the creation of conditions for the natural regulation processes in the soil. Besides these advantages conservation tillage system has its disadvantages. According to Kovacevic [1] and his investigation conducted in Serbia, conservation tillage systems compared with conventional, are obtaining the lower biomass yield in the examined wheat (winter wheat, spring barley, corn) and soybeans. In addition, conservation tillage has not shown success in controlling weeds, especially perennial, and reduced the effects in the fight against diseases and pests. It is therefore necessary to adapt existing and introduce new technologies of crops that would crop protection problems exceeded and achieve satisfactory yields in organic production.

The selection of varieties. Yield and grain quality in organic production is primarily dependent on the selection of varieties. Selection of appropriate wheat varieties suitable for organic farming requires a different approach than that used in selecting varieties for conventional breeding. In organic production the selection of varieties of crops will determine ability to fight disease, lack of nutrients in the soil, by competition of weeds and very changeable environmental conditions [7]. When selecting varieties for organic production the advantage have varieties adapted to the agro climatic conditions and are characterized by traits such as yield stability and grain quality, resistance to lodging, disease and abiotic factors resistance, and competitive ability against weeds. These properties have mainly old varieties and local populations where genetic variation accumulated over the years acquired resistance to biotic and abiotic factors. However, because of the new varieties adapted to conventional growing conditions these old varieties have lost in importance, and are very little used or not used at all, and are popular as the alternative ones. Malešević and associates [4] reported wheat varieties that are considered as alternative and as such are eligible for

cultivation in organic farming: Triticum spelta L., Triticum monococcum L., Triticum dicoccum and T. turanicum L. ((Triticum turgidum L. ssp. Turanicum (Jakubz) - archaic free-threshing wheat species)).

The grains need for feed. The presence of sufficient amounts of easily available forms of nutrients in the root zone is critical for yield and grain quality of wheat [4]. Establishment and maintenance of soil fertility in organic farming systems are based on improvement of biological, physical and chemical properties of soil by increasing organic matter and microorganism activities which is achieved by establishing adequate crop rotation. The effect of crop rotation as a complex measure is multiple beneficial: the structure of soil, water, air and heat regime, soil biological activity, the balance of organic matter, content and availability of minerals and protection of soil against erosion, all of which contribute to creating a favorable microclimate for crop development and reduce the competitive ability of weeds, diseases and pests. Good preceding crop for the grains are: Grain legumes (soy, beans, peas), poppy seeds, winter oilseed rape, winter feed for the green fodder production, potatoes, hemp for fiber, tobacco, early mixes of grain to feed livestock, the hemp seed, sunflower and early hybrids. The presence of legumes is essential for soil fertility in organic farming, and should therefore cover an area of 30-50% of organic farms. Legumes contribute to the increase of nitrogen content in the soil, improving its microbial activity and physical structure.

Sowing. One of the most delicate phase in the technology of growing cereals is determination of the optimal planting dates adapted to specific environmental conditions. The quality of planting is also very important. Znaor [8] reports that the sowing of wheat in terms of organic growing technology use by 10% to 15% more seed than in the conventional production. This will, later in the growing season, ensure adequate crop density, with the sowing of the seed used in organic production if legal provisions permit. Plant density will greatly affect its ability to compete with weeds for environmental conditions.

Weed Control. As the grain on organic farms is always part of a wider crop rotation and are not composted by large amounts of easily available nutrients, disease and pest outbreaks is not a big problem, but the fight against weeds is considered as the most pressing problem. Weed control in terms of organic wheat cultivation technology is based on preventive measures aiming to impeach the arrival of weed seeds and vegetative parts on production parcels. Some of these measures are: sowing of pure seeds, maintenance of agricultural space and proper management, good use of burned manure, timely plowing of crop residues. In addition to prevention the proper and timely application of direct (primary tillage, seedbed tillage, fertilization and irrigation), physical (flame application, mulching) and biological control agents against weeds (based on increasing biodiversity in agro-ecosystems) is very important.

Recently, the organic farming practices the cultivation of wheat in the mixture (polyculture) which means that the same parcel simultaneously grow two or more species together, and the main advantage of this way of crops growing is the overall producing stability. Increased diversity in cultivated plant communities contributes to a better redistribution and use of natural resources, increasing biomass production and yield, reducing the damage from the attack of weeds, pests and diseases and provide socio-economic benefits (greater system stability, secure income, better and more varied diet) etc. Numerous obstacles against broader use of breeding systems in large areas are represented in the fact that the means of high technology (agro-chemicals, varieties, machinery) are custom to the farming system of only one plant species. The production of organic cereals are particularly well for the combination of wheat and oats, barley and oats, wheat / barley / oats, but joint cultivation of different varieties of a crop proved to be very productive. The method often applied is under sowing by other grain crops. For under sowing leguminous herbs, grass-leguminous mixtures and plants that are normally used as green manure are commonly used.

Production based on the principles of organic agriculture is making the lower yield of crops compared to conventional one, but lower yield can be compensated by the numerous benefits that organic farming is giving. For agriculture these are: increase soil fertility, high quality food reduced with disease and pests, stable production; for the environment include: reducing pollution, preservation of agro-ecosystems, compatibility of environment and production: for the economy: stronger local economy, income security, reduced risk; improving the health of the population is the starting point and ultimate goal of organic production

CONCLUSION

Organic farming is increasingly important in the present world. However, limited natural resources, mainly agricultural land, as well as the growth of world population creates a sharper competition between organic and conventional food production, as can be seen from the slower growth of the area covered by organic production. As grains are the main nutritive raw to the population of many countries in the world, largely dictated by the intensity of natural resources use (cereals cover about 50% of the world organic surfaces), it can be concluded that the diffusion of organic production of these crops contributed to the development of the concept of sustainable agriculture. Some countries are really working on the total organic area acorn in which the dominant position have the area occupied with cereals. According to data collected in year 2010. in Serbia organic crop production is practiced on 574 ha, which is very modest considering the availability of surface area and species diversity of wheat varieties that can be grown in organic agriculture. As justification lower yields and often lower quality grain obtained in organic production is given, which can be confirmed by scientific research. However, concept of organic agricultural production in exchange for lower returns provides many

environmental, economic and 'social benefits. In this sense, it is necessary to pay more attention to research that contribute to the adaptation of technology growing at a local level and finding new measures that would mitigate the aforementioned drawbacks.

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GLOBALIZATION AND ITS IMPACT ON PAKISTAN'S AGRICULTURE

Rashid SAEED[1], Rana NADIR IDREES[1], Humna IJAZ[1], Marriam FURQANI[1], Syed Husnain SAJID[1] , Raziya NADEEM[2]

[1] COMSATS Institute of Information Technology, Sahiwal
[2] University of Agriculture Faisalabad

Corresponding author : rashidsaeed@ciitsahiwal.edu.pk, dr.rashidsaeed@gmail.com

Abstract

Globalization is the term used for multidimensional set of transformative processes and outcomes that work together with spaces and people .It is indeed an issue of prime importance in today's world. Issues of food shortages have been with the mankind from a long time. Owing to a small number of technological advancements, the food requirements of rapid increasing populations were traditionally fulfilled through cultivating more area. The world is experiencing scarcity in fertile and irrigable lands at large, additional development will rely on fallow-based farming and bringing cheaper and lesser yielding land into cultivation (Smith, 1998). The job gave the impression of all the more overpowering as progress in medication and health escorted to longer life anticipation and superior fecundity rates.

Keywords: *sustainable development, agricultural productions, Pakistan*

INTRODUCTION

The issue of globalization has gained noteworthy worth since the beginning of the 21st century. Analysts view its merits and demerits as well as its sound effects on all kinds of variables. Talking about the variables, globalization affects almost each and every perspective and concept of the underlying fields. It affects the culture, the society, the technology and the grounds of education on top of the food sector and many others. The usage of this terminology is believed to have started from the Uruguay Round of GATT which means that it is quite an aged phenomenon. Even by the late 20th century criterion, the world financial system was well incorporated in the start of the 20th century as revealed by O'Rourke and Williamson (2000). During the period of moderation of the 19th century, this observable fact started its journey and became comparatively steady subsequent to the First World War and the golden era between 1950s and 1960s.

Globalization provides a number of features and contains much different sociable, political and also monetary significance. It mainly signifies increasing integration with the countrywide economic climates, openness to be able to business, economic runs, and overseas primary purchase. "Globalization furthermore indicates internationalization regarding creation, syndication and also marketing and advertising regarding items and also companies. Global integration indicates the meticulous usage regarding frequent procedures from the personal nations around the world". Among 1870 and also 1914, the entire world has been incorporated into an individual phrase economic system focused simply by a single strength: Britain. The US government capabilities have been inhibited and also experienced several limitations just like rare metal common and also not enough flexibility to be able to follow natural economic coverage.

Afterwards the prevailing authorities have been loaded simply by executing several competencies just like good results regarding macroeconomic targets - total job, monetary progress and also value stableness. Flexibility regarding the use of macroeconomic procedures triggered better incorporation about countrywide economic climates yet concurrently they will generate global disintegration and also interdependence.

There is a central role of agriculture in global environmental change.

MATERIAL AND METHOD

We used secondary data for our study, on the basis of existing framework we further tried to probe facts & figures and furnished our suggestions & recommendations for future researches. Data is collected from statistical bureau of Pakistan, World Bank, Pakistan Agriculture Research Council (PARC). Web is the main source of the secondary data in the study. Further study is concluded from published articles in research journals and data available on the web.

RESULTS AND DISCUSSIONS

The aim of this paper is to assist in improving knowledge of the consequences with progressive and also perceptive way of globalization with regards to agricultural issues inside Pakistan. Firstly, hunger and malnutrition is present in several countries. Secondly, regular increases in the demand of agricultural products with ever increasing population growth, increasing trend in urbanization as well as mounting per capita incomes will call for regular raises in agricultural output in various nations. However it appears that acquired growth is sinking in several main bread-bin areas. It is also a matter of concern that no more areas will be available for irrigation and farming. Thirdly, rising environmental issues linked with agriculture could impose a great challenge to upcoming requirements of agricultural yield at all levels. It will also cause dangerous health related problems along with the losing ecosystem services (Cassman, K & Wood, S., 2005).
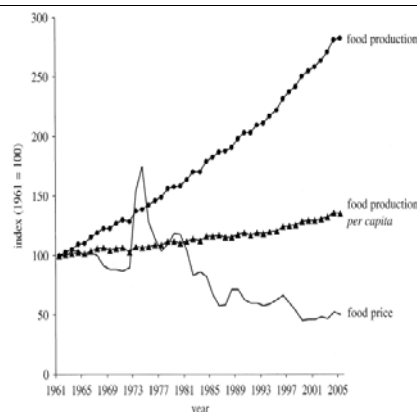

Figure 1. Global trends in food production and prices (index 1961–2005). Data from FAOSTAT (2006), IMF Yearbooks and World Bank (2005).

Fig.1.Global trends in food production Prices (index 1961-2005). Data from FAOSTAT (2006), IMF Yearbooks and World Bank,(2005)

Difference in per capita income is being used to categorise the people of the countries under two heads: one who eat healthy food and the other who do not. Some of the variables have been identified to distinguish among many ways of agricultural expansion. These include differences in (1) cultivation processes and procedures; (2) yielding capacity, population pressure and growth; (3) rising demands for food, infrastructure development and easy and speedy access to market; (4) the ability of a country not only to import food but also to spend money for bringing advancement in agriculture and environmental factors.

Globally, agricultural buying and selling has gone almost 10 fold from the 60s because of openness in trade and commerce policies and practices, growing requirement for more fineness and reliable foodstuff, rising quantities of food, growth in transport and communication sector coupled with liberalizing markets in most of the developing countries. Many local, national and international markets are interconnected and are controlled by some big international trading corporations; these revolutionary changes have created important modifications in the harvest mix up in nations thus opening the boundaries. Some budding nations are getting benefits of new trade and commerce avenues by engaging in selling abroad of non conventional products like fish, flora and also fruits.
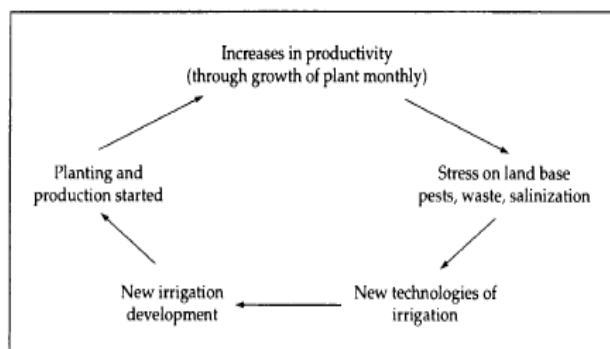
CONCLUSIONS

In a nutshell, despite globalization factor and rising trade volume in agriculture, societies lack in ability of nourishing themselves and to guard the sustainable productive capability of their god-gifted reservoirs.

Researchers, practitioner and educators must now pay full attention to support and guide farmers community towards the development of more sustainable and localized mechanisms of production and efficient ways of doing marketing instead of mere focusing on the development of industrial and commercial technology, including biotechnology. The role of all multinational companies have been both to make profits and provide financial resources in developing   commercial and industrial technologies so that ways could be devised to serve the mankind in the long run. The private sector organizations are playing their justifiable role in doing number of good things for the betterment of the society but the real task is to direct public funding in research and education to this noble cause also. One of the major issues with private economy is that it does not propose incentives for ecological integrity and social responsibility, or even long term economic   sustainability. Public   sector organizations   should   assume   their responsibility for sustainable development especially in the field of research and education. Public research in production and marketing of horticultural crops yields larger benefits than any other public research in sustaining small family farms in both developed and developing countries of the world.

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MIGRATION AND ITS ENVIROMENTAL EFFECTS

Rashid SAEED[1], Rana Nadir IDREES[1], Humna IJAZ[1], Marriam FURQANI[1] , Raziya NADEEM[2]

[1]COMSATS Institute of Information Technology, Sahiwal.
[2]University of Agriculture Faisalabad.

Corresponding author :rashidsaeed@ciitsahiwal.edu.pk, dr.rashidsaeed@gmail.com

Abstract

Migration can be ongoing shifting of a particular person from one location to another. The reason of shifting depends on selected thought deficiency, shock, difficulties, hopes, enthusiasm. Case study ended up recognizing the extent to which in turn migration can be relying on the specifics especially natural environment. This particular document expects to research the actual linkages between the atmosphere as well as migration using secondary data. Lots of investigation may be completed with this area to date, and the research is supposed like an intensifying method of the actual evaluation from the environment sizing associated with migration.

Keywords: Migration; Environment; Economy; Pakistan

INTRODUCTION

Migration is a phenomenon as outdated as historical past as regards humans. It is a tendency of a particular individual to relocate from destination for a one more. Migration could be the everlasting movements of men and women from area of the region to a new portion inside the identical region. It may also be the movement from region to another country due to various reasons that might be political, sociable, economic etc. It appears to be so that one can take up a fresh living in one more spot.

Matthew S. (2010) explained the current status of worldwide immigration in under developed economies which are giving rise to significant queries about the results of immigration for individual wellbeing. But, there is planned diversified national data about the global impact of migration on level of person development levels in the regions which receive migrants in under developed economy. Sanderson concluded that greater amount of worldwide migrations are linked to less scores on the Human Development Index (HDI), net of controls, but relative affect of worldwide movement is diminutive. People wish on consistent basis to migrate as they are discontented with what they have got. The

particular human history coming from old examples filled up with the certain testimonies of many migrations. Archaeological substantiation demonstrates considering that the divorce regarding diverse lenders added from the previous Ice Age group finishing 50,000 years back; humans have been around in shift. These types of movements or might be migrations have got variety of functions. Sometimes it was completely an outcome of deficiency concerning foods, battles, and search for good living standard and because of a character about the journey somewhere. However it is a truth in which migration has been in times past the foundation as regards world from the blend of civilizations and also body regarding information, since folks transferred, come together, and also sold tips and also items (Magill, 1999). Immigration gets one more dimension when environment change causes to migration. The author illustrates and finds out new ideas linked to environmentally induced migration. It has been explained along with analyzing the relevant policies. Environmental events or modifications are classified into faster or slower ongoing procedure and policies for each class, and replies to each category are more discovered and exemplified. However, some vicinities are bound to deal with an influx of migrants because of required

scenarios, the greater amount of vicinities explored have policies that solely answer to this fact (Koko W., 2010).

Stillwell J., Boden P. and Dennett A. (2011). Providing the huge categories of migrations with various types of motivations at various levels, it is clear that multiple data sources subsist giving brief and credible knowledge about the volume, complexion and distribution of flow of migration. The fact is that data related to migration is recovered from multiple sources, most of which were not developed with the intention to give migration statistics per se. The study delineates the core areas of census, survey and administrative data on worldwide and national migration prior illustrating the three types of information system related to migration made at the University of Leeds that serve as 'one-stop shops' for consumers to reach multiple types of data related to migration.

MATERIAL AND METHOD

We used secondary data for our study, on the basis of existing framework we further tried to probe facts & figures and furnished our suggestions & recommendations for future researches. Data is collected from World Migration Report 2011, International Organization for Migration Switzerland. Web is the main source of the secondary data in the study. Further study is concluded from published articles in research journals and data available on the web.

RESULTS AND DISCUSSIONS

Quotes served by the particular US Human Population Split reveal in which at present, 175 thousand folks have a home in any region in which we were holding not necessarily created, nearly all of which come in The European union (56 thousand), Parts of Asia (50 thousand) and also United States (41 thousand)-astonishing quantities which underscore the necessity regarding correct details and also examination about styles that may influence coverage selections influencing

the long run. These kinds of statistics contain refugees (which designated 12-13 thousand inside the mid-1980s) along with momentary and also long lasting migrants.

Taking into consideration the romantic relationship in between migration and also the atmosphere, 2 primary queries appear to be appropriate plus some additional appropriate inquiries is going to be tackled within the document such as:

i.By which method environmental surroundings as well as migration work together?

ii. Do you know the well being as well as plan ramifications of the conversation?

The partnership involving the surroundings and also migration will be twofold: environmentally friendly aspects may well affect the choice to be able to migrate and also migration subsequently may well influence the surroundings.

Table 1. Government views on the level of immigration; 1976, 1986, 1996 and 2009.

A. By level of development							
	Number of countries				Percentage		
Year	Too low	Satisfactory	Too high	Total	Too low	Satisfactory	Too high	Total
World								
1976	11	129	10	150	7	86	7	100
1986	6	125	33	164	4	76	20	100
1996	4	148	41	193	2	77	21	100
2009	9	152	34	195	5	78	17	100
More developed regions								
1976	1	27	6	34	3	79	18	100
1986	0	26	8	34	0	76	24	100
1996	1	31	16	48	2	65	33	100
2009	4	41	4	49	8	84	8	100
Less developed regions								
1976	10	102	4	116	9	88	3	100
1986	6	99	25	130	5	76	19	100
1996	3	117	25	145	2	81	17	100
2009	5	111	30	146	3	76	21	100
Least developed countries								
1976	2	39	1	42	5	93	2	100
1986	1	40	7	48	2	83	15	100
1996	0	41	8	49	0	84	16	100
2009	0	41	8	49	0	84	16	100

The surroundings feature a strong monetary benefit inside equally creation and also intake. Inside countryside creating economic climates, the surroundings could be the essential way to obtain income; environmentally friendly sources will be the major aspects regarding creation inside crucial routines for instance agriculture, horticulture, forestry, cows elevating, doing some fishing, vitality, and also vacation. Exogenous bumps for the surroundings, for instance water

damage or perhaps drought, or perhaps the particular progressive wreckage regarding normal sources connected with human population strain and also individual routines, for instance deforestation or perhaps desertification, may lead to a great impoverishment regarding countryside locations and also push visitors to shift and also find far better options. Subsequently, size immigration probably will inflict several strains around the economic system as well as the normal useful resource foundation inside the parts of vacation spot.

A later survey carried out by Pew in 2007 found that, with the exception of Japan, the Republic of Korea and the Occupied Palestinian Territory, majorities in the 47 countries surveyed said their countries should further restrict immigration very much in line with earlier reported findings that most people would like to see migration levels decreased. Yet a United Nations survey (see table 1), expresses the views of governments rather than the community.

Figure 1: Number of persons resettled, by region of departure, 2001–2010
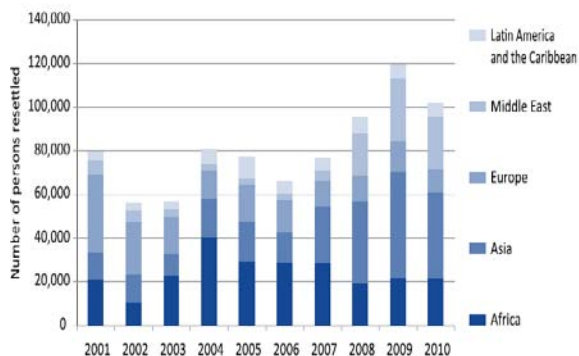
Source: IOM, 2011.

The Migration Health Assessments and Travel Health Assistance Programme (HAP) is one of the largest migration management services provided by International Organization for Migration (IOM), in terms of migrants served, number of staff involved, and operational costs.

IOM has provided health assistance in various emergency and post-emergency contexts throughout the last 10 years, notably in Afghanistan, Haiti, Indonesia, Kenya, Kosovo/UNSC 1244, Myanmar, Pakistan, Sierra Leone, Sri Lanka and Sudan.

Migration health assistance to crisis-affected populations[7]

Migration health assistance to crisis-affected populations	2001–2010	2010
Countries covered	22	17
Number of projects/programmes	98	53
Total expenditure	USD 44 million	USD 7 million

CONCLUSIONS

The report investigated this scope to help which often the environmental variables usually are determinants connected with migration from the Southern region; the effects connected with migration within the setting is usually explicitly studied. As a gradual technique, this report targeted on central migration within an acquiring state, in addition to explore this purpose of which the environmental variables engage in causing migration in of which state. Absolutely some sort of fewer country-specific technique would well be far more useful, although lacking precise empirical facts to help know this migration heritage of folks all over macro-regions in order to characterize this natural environment many people have a home in, possesses concentrated the target because of anyone state: Pakistan. Pakistan, which is specific socio-economic in addition to market facts with central migration, together with precise local weather in addition to the environmental facts are offered, is usually a farm acquiring financial system featuring sizeable central ability to move in addition to endowed that has a breakable in addition to various natural environment.

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STUDY ON BIODIVERSITY OF LIVESTOCK FOR FOOD RESOURCES

Mariana SANDU[1], Daniela Ruxandra ANDREI[2], Stefan MANTEA[3], Mihaela KRUZSLICIKA[4], Vergina CHIRIȚESCU[4]

[1] Romanian Academy, Center studies and agro biodiversity "Acad. David Davidescu", 13, Calea 13 Septembrie st., 5th district, Bucharest, Postal code 050711, Romania, Tel. / Fax. + 4.021.318.81.06, Mobile: +4.0745.461.412, E-mail: marianasandu56@yahoo.com
[2] [1] Romanian - American University , Avenue Expoziției nr.1B, 1th district, Bucharest, Postal code 012101, Romania, Mobil: + 4 0744.878.131, Fax: 021.318.24.11, E-mail: ruxandrei@yahoo.com
[3] Romanian Group for Investments and Consultancy, str Comana nr.19B. sect.1.Bucharest. Mobile: +4.0744.328.083 E-mail: stmantea@gmail.com
[4]Romanian Academy, Institute of Agricultural Economics, 13, Calea 13 Septembrie st., 5th district, Bucharest, Postal code 050711, Romania, Tel. / Fax. + 4.021.318.24.11, Mobile: +4.0744.818.086, E-mail: kruzli@yahoo.com; v.chiritescu@yahoo.com;

Corresponding author: marianasandu56@yahoo.com

Abstract

One of the major problems currently facing zootechnical production in Romania is the reduction of number of animals and breeds. Many animal farms have a small number of animals, and technological conditions of exploitatation are influenced by lack of financial resources of farmers. This study aimed to identify populations of animal species and breeds of economical interest as resources for diversification of food production. For romanian farmers the sheep and goat farming can be a chance to compete with EU farmers because the milk of sheep and goats is not subject to quotas, and in Romania are large areas suitable for this activity. The diversity of production, low power consumption and nature of feed they consume, provides to growth and exploitation of sheep and goats a character of future sustainable activities. Currently, animal biodiversity is ensured mainly by farmers with small and medium holdings, or pastoral environmental conditions that shape their animal populations based on interest and preferences. In contrast, growth-intensive industrial action against biodiversity, requiring specialized breeds with high productivity and high uniformity.

Keywords: agro-food production, biodiversity, animal populations.

INTRODUCTION

At the moment when mankind begins to reconsider his stance on agriculture, when there is an increased preference to traditional and organic products, maintaining biodiversity is a guarantee for future challenges (growth and diversification requirements, climate change, potential disasters) because the force of life has his origin in diversity, not in uniformity [1 ,3 ,7].

Biodiversity loss produces economic losses and threatening food security, which is a component of national security leading to serious social dysfunction [2, 5, 6].

During the time, biodiversity has declined due to reduced number of races which corresponded to zootechnological and economic requirements. The rapid evolution of technology and civilization of the last century, involved a massive replacement of extensive production systems, primarily pastoral with intensive systems [3, 4].

The purpose of this study was to identify populations of species of economic interest as resources for food production diversification. In this respect have been identified and studied populations of sheep and goats.

MATERIAL AND METHOD

Based on the purpose of this work, the study was conducted in two stages. In the first stage we made several field trips in Caras-Severin region, in various household or holdings in pastoral system with the aim to identify

different populations of sheep and goats that will be the object of this study.

In the second stage questionnaires were developed on how breeders have chosen to make the selection and improvement of these populations, growth and operating conditions, type of products obtained and how are they used, popular beliefs or preferences and other criteria which determine the maintainence of these populations. The datas collected from discussions with growers and on-site observations in households are outlined in the next chapter.

RESULTS AND DISCUSSIONS

The representative breeds for Caras Severin area are the breed Turcana in sheep and Banat white in goats, but due to different factors have emerged different populations which are varieties of these breeds. Turcan sheep varieties adapted to environmental conditions in Caras-Severin are Turcana white, Turcana bucălae, Turcana black, Turcana varosa, Ratca. These varieties generally have the productive characteristics of the breed Turcana, which is a mixed race, for the Caransebes area, namely: meat- wool, meat - milk and wool.

The selection process practiced by different breeders is not a scientific one, because they did not use designing, modeling and statistical assurance, instead of these there are observed and used for breeding products that comply owners desires. Often these criteria are subjective, based on observations and popular belief and not on scientific substantiation with precise determinations and correlations. For example, such a conception is widespread among the shepherds, that there is a direct correlation between tail length, ear size and milk production in sheep. According to this theory (still unchecked by a competent study) breeders are making selection for this criterion, situation observed in sheep of Varos variety bred by John Marta from Firliug village. It is true that these sheep had large, well shaped udders, with well developed nipples, what is recommended for mechanical milking, but even that farmer assured us that

he obtained very good milk production, the lack of reliable information from official records, make hard to argue that such popular belief is true.

Another criterion considered important for selection by breeders and those who practice mainly pastoral system is the resistance of animals to physical environmental factors. From this point of view we can say with certainty that populations of sheep varieties Varosa, Creata Caransebeşeană and Alba de Banat, have a high resistance to climatic factors, are less demanding and could be raised on rudimentary shelters and facilities, or even outdoors. This resistance is manifested by these sheep varieties even for disease, the frequency of pododermatitis is much lower compared with imported specialized breeds to improve meat production (German sheep with black face).

An important factor is related to food quality. It is undisputed that in the case of rational nutrition schemes with good quality feed, the breeds express their improved genetic potential and give high levels of production, but on poor maintenance and feeding conditions, these highly productive breeds react brutally, strongly decreasing production and disease resistance. In contrast, indigenous populations of the varieties under study requires no special diet or scientific calculated recipes and good quality forage, grazing usually free and ensuring food sometimes from hard to reach areas, like wild species and the level of production is maintained reasonable.

Animal behavior and appearance are also criteria for breeders who prefer a certain variety and make the selection of individuals which correspond to them. From this point of view, the varieties of Varosa and Creata de Caransebes have a submissive behavior, are well suited to group maintaining and are easily handled by the shepherds, responding promptly to signals and sounds.

Ratca breed is grown on a limited geographical area, as a reserve of genes, a total of 1708 animals are raised in Caras-Severin area. Being a sedentary sheep inappropriate for migrations, the herds are a

nucleus in their area of origin, most commonly exploited as pure breed for milk production. Many growers prefer to grow this type of sheep, which is one of the explanations for survival and preservation of this breed.

The economic benefits are significant due to reduced maintenance costs during the year, beeing continuously maintained and fed on pasture, except during calving period, and the registration of production records will remain the main objective of holders of genetic heritage in Caras-Severin.

Ratca breed is maintained by the farmer John Paul from Doclin village, mainly on aesthetic criteria (as horns) and docile character, and keeper Gena Tasić from Ticvani village has a population of goats from Alba de Banat variety, making selection for milk production, resistance to environmental factors and aesthetic criteria (smooth and soft white fur).

Goat raising is of great socio-cultural importance, this species being raised in every household from ancient times, regardless of area and climate, providing the livelihood of a family, food, clothing, ornaments made from horns, image of goat beeing present in popular tapestries and ceramic objects. Because of their number and the ability to multiply rapidly, higher production potential and low investment costs, maintenance and marketing of these animals, compared with the requirements of other species, goats can contribute appreciably to assure the food protein for human population.

Milk processing and obtaining products, is the main concern of livestock farmers, being the main resource to ensure their income. It is noted that in Romania during processing, the goat milk is mixed with the sheep or cow milk. Although in the milk industry products have diversified and expanded greatly, traditional products are required by consumers who appreciate originality and authenticity and the taste characteristics, given by the traditional manufacturing process and climatic conditions and vegetation of the area.

Our country's potential in sheep and goats and thus obtaining traditional products from them is very high, but the fact that farmers are not organized in strong associations leads to lower prices for such products.

CONCLUSIONS

Livestock raising, still take place in holdings with a small number of animals, and the technological conditions of exploitation are influenced by lack of financial resources of farmers. All animal products are of national interest, being necessary in the structure of food goods needed for consumption and for exports. Currently, animal biodiversity is ensured mainly by farmers with small and media holdings, or pastoral environmental conditions that shape their animal populations based on interest and preferences. In contrast, intensive- industrial system action against biodiversity, requiring specialized breeds with high productivity and high uniformity. The traditional practices for selection are based mainly on using for breeding of specimens with different characters, according to the following criteria:
- Resistance to environmental factors;
- The answer to feed quality;
- The purpose and level of production (milk, meat, skins, mixed, etc.);
- Resistance to disease;
- Behavior;
- Aesthetic preferences;
- Social factors (property system, access to grazing, the role of food in the community).

All these preferences and criteria are leading to existing populations, varieties and animal breeds that meet these morpho-productive requirements and assure conservation and management of genetic resources in traditional communities.

In this moment, when mankind begins to reconsider his position on agriculture, when there is an increased preference to traditional and organic products, maintaining biodiversity is a guarantee for future challenges (growth and diversification requirements, climate change, potential disasters) because the force of life rooted in diversity, not in uniformity.

From this point of view, the effort of private breeders of Caras-Severin to maintain rustic

varieties of sheep and goats is outstanding, but we believe that is necessary a more determined attitude of the government and academic authorities in the identification, preservation and support of such valuable genetic resource for all species. Stimulation of the goat farming in the private sector, requires preparation and implementation of programs of technical and organizational measures, mainly to consider:
- Accelerate the genetic improvement procces, using the most efficient breeding biotechnology, the artificial insemination;
-Improvement of nutrition, maintenance and care of goats, to obtain the level of technical performances according to the specific genetic potential;
-Endowment   the farms with specific equipment for distribution of feed, watering, milking;
-Stimulate the organization of goat breeders who have large livestock in different forms of professional associations.

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CORELATIVE ASPECTS OF SUSTAINABLE DEVELOPMENT OF THE AGRICULTURE AND FOOD SECURITY

Olga SÂRBU [1], Elena NIREAN [2]

State Agrarian University of Moldova, Chisinau 42 Mircesti, sector Rascani, MD-4224, Chisinau, Republic of Moldova, Phone: +373 69032671, e-mail: osarbu@mail.ru
[2] State Agrarian University of Moldova, Chisinau 42 Mircesti, sector Rascani, MD-4224, Chisinau, Republic of Moldova, Phone: +373 68364646, e-mail: ni-lena@mail.ru

Corresponding author: osarbu@mail.ru

Abstract

At the present time agrarian sector faces, more than ever, the challenge not only to food producing in a sustainable manner, but also to make them available. This involves increasing the degree of food safety that in contemporary society is not only a vital interest for much of the world population, but also a major requirement for the normal international life.

Keywords: sustainable development, food security, integrated agriculture, consumption of food products

INTRODUCTION

Under the conditions of energy crisis and world food supply, the prior development of agriculture, as well as energy production, became a major desideratum of the economic growth as a whole. Agriculture is a vital branch of the economic growth; it is an important source of raw material for the processing industry. At the same time agriculture is an important outlet for non-agricultural products, it plays a decisive role in the progress of the whole economy.

According to the statistical analysis of 114 countries, presented by the UNO, in 61 states agriculture contributes more than20% of GDP, in 35 states over 1/3 of GDP is the contribution of agriculture and in 18 states agriculture has the biggest share in GDP formation. [3]

Agriculture has always been the main source of food for the population especially during "demographic explosion" that takes place in poor countries. According to some studies of the Food and Agriculture Organization (FAO), food crisis is determined by many factors: low agricultural yields in some poor countries; population increase faster than agricultural production in some regions and non-industrialized countries; abandonment of agricultural area of some portions of arable land; high cost of attraction to agricultural circuit of some land from non-agricultural regions of the world; lack of correlation between the resources allocated to agricultural growth and those allocated to other domains including the allocations to military expenses and others.

MATERIAL AND METHOD

In order to relate the given problem it was analyzed the literature by specialty, the Statics National Office. As methods they were utilized the analysis, synthesis, table method, analytical method of calculation.

RESULTS AND DISCUSSIONS

The economy of the Republic of Moldova depends in great measure on the activity of the agrarian and agro-industrial sectors that assure over 1/3 of GDP and 2/3 of the Republic's exports. Agriculture has always had a special part in the national economy. Agriculture, being a branch of the national economy, cannot function independently and efficiently within economic environment influenced only by market laws. Agriculture includes some biological, social and technical processes that

form the space and conditions specific only to this branch. The demand for agro-alimentary products is rigid or a little elastic to prices or consumers' incomes.

In order to obtain high production results in lasting energy crisis and not to damage the environment and public health, the specialists of the agricultural sector, the ecological sector and the animal hygiene sector have to design optimal technologies of plants growing, to assure productive comfort for the animals and food security. The sustainable agriculture, that is integrated and ecologic, gives the solution; it allows having safe and steady profits with minimum negative effects on the environment, assuring food security of the population. Unlike organic farming, the sustainable agriculture uses fully but reasonably fertilizers, herbicides and pesticides that permit to maintain high production potential, high yields and the stability of agricultural production. FAO considers that, in order to maintain sustainable development, we must preserve natural resources, land, waters and zoo genetic and biogenetic heritage, we also must use safe means not to destroy the environment.

The food security of the Republic of Moldova is closely linked to the promotion of the sustainable agriculture. The sustainable agriculture has three strategic objectives:

-food security of the population for short-term, medium-term and long-term

-economic efficiency in order to assure high incomes of farmers

-ecologic stability through biodiversity restoration and conservation

Agricultural sustainable development in our country must take into account many important objectives among which there are: fiscal stimulation and other specific kinds of stimulation of small agricultural farms; the widespread development of profitable small family businesses that would supply agricultural products to home and foreign markets; the development of agricultural family businesses and of managerial-type firms that would produce agricultural products competitive on the international market and that would have a significant share in GDP.

The sustainable agriculture must assure economic viability, a good state of the environment and the acceptance by the society of agricultural production systems.

According to the modern ecologic conception, the alternative agriculture is the strategy and the sustainable agriculture is the objective, soil quality having the role and the position of a pivot. That's why there exists a widespread and accepted idea that the key of agricultural sustainability is the quality of the soil.

The sustainable agriculture presupposes economically viable technologies for a long period of time with high yields obtained at more reduced costs. Any agrarian system must have a long-term high productivity, which is conditioned not only by the quality of the resource base but also by the economic and social framework. That's why the sustainability of agricultural production systems has physical and socio-economic dimensions. More specifically, in order to be sustainable and viable, a system must satisfy the following conditions: the maintenance and the improvement of the physical environment and the resistance to exterior pressures or to strong disturbance; the satisfaction of the society's requirements for food products; the assurance of economic and social well-being of the farmers.

The problems of Moldavian agriculture must be solved to a certain specific. In the Republic of Moldova the objectives of the sustainable development must be harmonized with the intensive development but within the limits of the environmental protection and qualitative products obtaining. The main orientations of the sustainable agricultural development and the development of rural area are similar to those of the European Union and are the following: a better management of natural resources and landscapes; the use of the environmental protection measures by means of the aids granted to less-favored areas and by means of more coherent rural policy; crops diversification in order to assure economic and ecologic stability of agricultural enterprises; the use of rotation systems and natural fertilizers in combination with chemical fertilizers; the diversification of income sources and the creation of new jobs for farmers and their

families in the rural area; the orientation of the agricultural policy to the needs of commercial family businesses and to some alternative income sources; the application of some incentive programs to attract the young to rural areas; the application of some programs of a forestation on the land unsuitable for agricultural production etc.

The contribution of the agriculture to satisfy social needs may be evaluated using the indicator of self-supply degree or food security degree. This indicator expresses, on one hand, to what extent the food independence of the country is assured and, on the other hand, it highlights the existence of export availability. The concept of food security, elaborated at the end of 1970's, includes a range of measures meant to assure the access of all people, at any moment, to sufficient food. Food security must include the security of all the component parts of the agricultural system: production, transfer, distribution and food consumption.

Food security must be carried out in a pyramid structure of national, regional and global measures. Therefore, the concept of food security circumscribes to the modern general security concept which means that in actual conditions the security must be achieved at three levels: national, regional and global. Achieving food security as a component of economic security must lead to the achievement of three objectives: the assurance of adequate food production; upgrading the stability of agricultural products flow; the access to agricultural resources available to those who need them, thus the purchase of the food necessary for human health is being realized. [1] The essence of food security is the existence of the agriculture capable to offer high and certain production every year, and the people who need these products must have the necessary incomes to buy them. From this point of view, the food security of the Republic of Moldova is in danger. The average monthly incomes of an inhabitant of the Republic of Moldova are smaller than the subsequence level.

Table 1. The correlation between the subsequence level and the average monthly incomes available to an inhabitant of the Republic of Moldova

Years	Subsequence level			Average monthly incomes		
	Total in the Republic	Urban area	Rural area	Total in the Republic	Urban area	Rural area
2006	935,1	1034,0	865,6	839,6	1000,6	723,6
2007	1099,4	1189,2	1036,3	1018,7	1210,0	878,9
2008	1368,1	1482,1	1287,6	1188,6	1463,3	987,0
2009	1187,8	1295,3	1112,4	1166,1	1477,1	939,1
2010	1373,4	1498,1	1285,2	1273,7	1574,7	1054,7

Source: [4]

According to the data from the table, in total in the Republic during the analyzed period the subsequence level overcomes the average monthly incomes available to an inhabitant. Anyway, there are gaps between the average monthly incomes available to an inhabitant from the rural area and the one from the urban area. In the urban area the correlation between the subsequence level and average monthly incomes available to an inhabitant is the improper fraction, this fact shows us the income level superior to the subsequence level. In the rural area the situation is different. The correlation between the subsequence level and the average monthly incomes available to an inhabitant shows lack of food security.

Lack of food security may lead to social seizures and tensions, it affects physical and psychological health of the population, it may create the state of economic and political instability in the country, and at the international level there may appear various diplomatic, economic, political pressures from the part of the forces that result in the destruction of the national security.

Agro alimentary agriculture and industry are some of the most important resources of the development. The objectives and main priorities concerning the food security are the increase of the agricultural production and productivity in order to form an open and competitive market, as well as the maintenance or the improvement of the best methods of food resources increase for the future generations preserving the environment. The economic problems of the transition period has had their impact on the deconstruction of agriculture that at present cannot either meet consumer needs of the population or offer quality, and the production structure is characterized by strong imbalances

between sectors and branches, as well as between branches and crops.

The appreciation of food security is also determined by the evolution of consumption expenditure. For the most part, the structure of consumption expenditure of the farms is influenced by the level of the available incomes.

Table 2. The evolution of consumption expenditure of the population of the Republic of Moldova, leis

Years	Consumption expenditure (monthly averages per an inhabitant)		
	Total	Urban area	Rural area
2006	953,3	1100,7	847,2
2007	1119,1	1304,7	983,4
2008	1227,5	1475,2	1045,8
2009	1217,4	1512,5	1002,5
2010	1371,7	1712,4	1123,8

Source: [4]

The dynamic increase of consumption expenditure is a positive tendency if simultaneously incomes increase. Average monthly consumption expenditure per an inhabitant in 2010 constituted 1371, 7 leis. The urban area has a higher level of expenditure that amounted to 1712, 4 leis, and in the rural area the population's expenditure amounted to 1123, 8 leis per month. The largest part of the expenditure covered the necessary food consumption (40, 8%), followed by the dwelling expenditure (17, 8%), clothes and shoes (10, 8%). The other expenditure covered medical and health care (6, 4%), transport (5, 0%), communications (4, 6%), dwelling equipment (3, 9%) etc.

The structure of consumption expenditure is also determined by the residence environment of the firm. Thus, while the enterprises from the rural area orient the major part of its expenditure towards food products (44, 1%), in the urban area the share of this expenditure is 37, 8% making possible some other additional expenses for various non-alimentary goods and services.

If we make comparative analysis of the evolution of the available incomes of the population of the Republic of Moldova with the consumption expenditure, we can see that the latter increase with higher rhymes than the former, this fact determines the reduction of food security level. The assurance of food security in the modern society isn't only vital for the main part of global population, but it is also a major requirement for normal international life. According to FAO, the number of the persons affected by famine increased to about 925 million last year, it is about 7 milliard of people of the global population. The statistics shows that the global population will grow to over 9 milliard of people till 2050. For the Republic of Moldova the average norm of consumption, according to FAO, is about 2700 calories/a person/ a day and minimum 55gr. of protein, of which at least 50% of animal origin. [3]

Table 3. Food consumption of the population of the Republic of Moldova expressed in calories on average, leis

Years	Food consumption (daily average per person) expressed in calories		
	Total	Urban area	Rural area
2006	2413,4	1983,0	2722,9
2007	2273,1	2015,7	2461,1
2008	2203,7	2072,3	2300,1
2009	2240,3	2133,1	2318,4
2010	2210,7	2100,8	2290,6

Source: [4]

If we compare FAO's average consumption norm to the real consumption of the population of the Republic of Moldova, we can observe a significant difference that has the tendency of continuous growth. The average daily food consumption per person in 2010 was about 2210, 7 calories, bread and bakery products prevailing with 42, 7% calories. The annual consumption of bread and bakery products was about 110, 4 kg/person with significant variations from 123, 5 kg/person for the retired people and till 98kg/person for the persons from non-agricultural sector. Meat and meat products consumption, as well as fresh meat was on average 33, 7 kg/person, the largest consumption being registered in the firms from urban area and in less numerous firms. In the urban area the population also consumes more dairy products, eggs and fruit, and in the rural area there is larger consumption of potatoes, vegetables, bread and bakery products, vegetable oil.

The consumption of food products in quintiles stresses the dependence of the consumption and the financial resources of the population. The most significant gaps between the consumption of the least assured population

and the best assured one are registered in meat, milk and dairy products consumption, eggs, vegetables.

Agriculture satisfies one of the primary man's necessities-food. The national interest of Moldova, as well as the role of the state as being the exponent of the nation's power and will, is to assure good functioning of economy, agriculture being one of its branches, in order to assure food security of the population. This is the condition that determines in the last instance its political and economic independence.

For the Republic of Moldova agriculture represents one of the most important resources of development, taking into consideration the large number of people who live and activate in the agriculture sector, as well as this sector's contribution to GDP creation. Consequently, the most important objectives and priorities are to increase agricultural production and productivity in order to form an open and competitive market.

The production structure of the agriculture of our country is characterized by the imbalance between the vegetable sector and the animal sector, between various branches and crops and the tendency of extension. Besides the internal conditions, the agriculture of the Republic of Moldova is characterized by big gaps in comparison with highly developed countries. These gaps depend on the general level of economic growth and on the differences between agricultural structures which are: ownership structures; production structures; economic organization structures; dimensional factors of production structures; the structure of agricultural production services; marketing and financing structure; the system of the State support of agriculture etc. If we correlate firm's property with economic and financial results linked to the size and function of this property in agriculture, the economic efficiency of using the property expresses the relation between the effect expressed by a range of economic and financial indicators of the whole activity and the effort expressed by the property of the given firm.

Favorable geographical conditions, the landscape, the climate, fertile soil, qualified work force, rural population's love for the soil and animals, adequate institutional administrative system may make Moldavian agriculture attractive and profitable.

Rural economy significantly differs through the regions, according to specific demographic, social and economic traits. This difference is obvious especially when regarding poverty in rural areas; it is expressed by low living standards of the population and the lack of alternative income sources.

The European Union and its state-members are the main supporters of the extension process and the application of the principles and practices of the sustainable development at the global level; they also support food security in order to reduce poverty and economic-social discrepancies and to promote responsible policy of the preservation and rational use of the planet's natural resources. The State must encourage through economic-financial ways the development of both processing agricultural products industries and of the industries that offer the essential factors of modernization such as agricultural machines, fertilizers, herbicides, insecticides, medicines etc., without which agriculture won't be able to overcome the actual level of subsistence. The promotion of financial fiscal and credit policies is necessary which would allow the of food industry to start mutual profitable economic relations. [2]

An essential measure of food security policy refers to the change of the dimensions of minimum incomes and especially the guaranteed minimum wage, correctly evaluating the essential needs in direct correlation with the prices for products and services strictly necessary to have a decent life for the individuals and their families. That's why we must establish fair correlations between the wages and the work performed, between big and small salaries, between salaries and pensions, scholarships, allowances for children, social aids; these correlations would fill in the existing gaps that affect the largest part of the population. We mustn't also neglect the necessity of improving the access and the participation of the vulnerable groups on the labor market through a range of

additional measures, favoring focused and personal approach including special actions concerning rural population issues.

Another important intervention tool of agricultural and food policies, that guarantee food security, is the elaboration of some consumer protection measures such as subsides granting to the consumers concerning the access to food, especially of the population with low incomes.

Another element, that should be revised, refers to the development of small and medium enterprises and the units that render services in the villages, as well as the creation of crafts cooperatives and consumption and credit cooperatives to make them contribute to the improvement of living conditions of the population in the rural areas. Moldavian villages must have continuous renewal through the promotion and support of governmental programs to revive educational and cultural institutions, health and social assistance. Special attention should be paid to the adjustment of the tax system transferring a part of taxes from the work force to the consumption of material and energy resources. The use of this fiscal tool may determine and stimulate savings by reducing the tax listing of the reinvested profit in order to encourage the investments aimed at competitiveness increase and at Eco efficiency of the goods and services by modifying actual rules concerning the taxation of interest rates on deposits by taxing the differences between interest rate and inflation.

Another national objective is to decouple economic growth and environmental degradation by reversing the ration of resource consumption, to create added value, to come close to average performance indices of the EU concerning the sustainability of consumption and production.

CONCLUSIONS

The conclusion is that food security is of specific importance; its lack may lead to social seizures and tensions, it affects physical and psychological health of the population; it may create economic and political instability in the country. At the international level there may appear diplomatic, economic and political pressures that would have undesirable and dangerous effects on the national security.

We can talk about food security when a state has availability of agricultural vegetable and animal products, being able to satisfy the needs of the whole population of basic agricultural products, to supply necessary raw materials to industries and to create the conditions, to make stocks necessary in critical situations.

Consequently, the countries with the climatic conditions, favorable for growing agricultural products, reserve to agriculture not only the main role in assuring food security they also create currency surpluses by exporting agricultural products.

Guaranteeing food security cannot be reduced only to the quantitative assurance of the necessary consumption, it may also be reduced to the establishment of a certain structure of availability. Food security should continue being a priority of global and national policies. We should focus on the actual tendencies at the global scale concerning population growth, the growth of energy and raw material demand, as well as climatic changes and limited resources of some countries. In order to protect food security for the growing world population we need a very productive agricultural sector at the global scale adopted to specific conditions.

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DEGRADATION AND RECOVERY OF BIOTA IN ERODED CHERNOZEMS OF THE REPUBLIC OF MOLDOVA

Irina SENICOVSCAIA

"Nicolae Dimo" Institute of Soil Science, Agrochemistry and Soil Protection, Chisinau 100 Ialoveni, MD 2070, Chisinau, Republic of Moldova, Phone: + (373 22) 28-48-50, Fax: + (373 22) 28-48-55, E-mail: ipaps_dimo@mtc.md

Corresponding author: irina_sen@mail.ru

Abstract

The biota's state of the ordinary chernozem located in the southern zone of the Republic of Moldova has been investigated. Arable chernozems with different degrees of erosion (slightly, moderately and severely eroded) have been compared to the chernozem with the normal profile and eroded soil which was under 58 year's old fallow. The biological degradation of soils occurred as a result of water erosion processes. The parameters of the biota very depending on the erosion degree and decrease in the following sequence: chernozem with the normal profile→ slightly eroded chernozem→ moderately eroded chernozem → severely eroded chernozem. Losses of microbial carbon amount to 107-248, 305-433 and 513-535 kg C ha^{-1} according to the erosion degree. The loss of species and families of invertebrates in moderately and severely eroded chernozems is of 63 - 100%. Diversity of the Bacillus family decreased from 14 species to 7 - 10 species. The decline of enzymes activities in moderately and severely eroded chernozems reaches 29.2-55.6% for dehydrogenase and 85.7-94.3% for urease. A scale of biological parameters has been proposed to assess the stability of biota of the ordinary chernozem and to develop the national soil quality standards. The recovery rate of the biota and fertility of eroded arable chernozems that moved to the category of fallow soils has been determined. In this context, the management of fallow land areas has been recommended aiming to regenerate the edaphic fauna and microorganisms and to restore the natural quality of eroded chernozems.

*Keywords***:** *biota, eroded chernozems, degradation, fallow*

INTRODUCTION

Erosion is the most widespread form of the soil degradation in the Republic of Moldova. The damage to the arable land caused by erosion increased from 28.1% in 1965 to 39.8% in 1997 and presently constitutes about 40% [8]. Soil's crop-producing power decreased by 20-60% depending on the degree of erosion compared with zonal soils [8]. It has been observed a considerable deterioration of the physical and chemical properties of soils. The humus lost by soils because of erosion processes are considered to be disastrous. One of the most significant negative manifestations of the erosion is the biological degradation of soils.

The biota in eroded soil is under stress for a long time and requires to be restored. Soil biota needs an easily available carbon with a simultaneous optimization of moisture, aeration, chemical and physical parameters of habitat. This may be achieved by leaving the eroded soils to self-recover with the help of natural fallow.

As a result of a multiannual interaction between biota and the plant's root system, the humification process in the eroded soil will prevail over the mineralization process and the biological properties as well as the soil quality in general will improve. The purpose of this research was to determine the biota' state in eroded chernozems aiming to develop the scale parameters of their stability and to estimate the regeneration processes of soil invertebrates and microorganisms under multiannual fallow.

MATERIAL AND METHOD

Experimental site. The experimental site is located in the southern zone of the Republic of Moldova, on the South Plains steppe area, in the district no. 13 of ordinary and

calcareous chernozems of the South Bessarabian steppe plains, in the Ursoaia village of the Lebedenco district, Cahul region (photo 1).

Photo 1. Fragments of natural and agricultural landscapes located in the Southern Zone of the Republic of Moldova

Soils. The soil of the site is an ordinary chernozem. Chernozems with different degrees of degradation caused by (slightly, moderately and severely eroded) erosion processes have been compared to the chernozem with a normal profile and the eroded soil which was under 58-years-old fallow. Soil samples were collected from the 0-30 cm layer of the experimental plots during the period of time between 1997 and 2008.

Status of invertebrates. The state of invertebrates was identified from test cuts by manually sampling the soil layers to the depth of soil fauna occurrence. The identification of invertebrate's diversity at the level of families and their classification according to nutrition was conducted by Gilyarov and Striganova's method [7].

Microbiological properties. The microbial biomass C (MB) was measured by the rehydratation method based on the difference between C extracted with 0.5 M K_2SO_4 from dried soil at $65\text{-}70^0C$ within 24 h and fresh soil samples with K_c coefficient of 0.25 [1]. K_2SO_4 – extractable organic C concentrations in the dried and fresh soil samples were simultaneously measured by dichromate oxidation. The quantity of K_2SO_4 – extractable C was determined at 590 nm with "Specol-221" spectrophotometer (Germany). Stocks of MB have been calculated taking into account the carbon content of the microbial cell and the bulk density of soils.

Counts of microorganisms (heterotrophic bacteria, fungi, actinomycetes and bacilli) were obtained on agar plates [5, 6].

Enzymatic activity. The (potential) urease activity was measured by estimating the ammonium released on incubation of soil with buffered urea solution by colorimetrical procedures [3]. The (potential) dehydrogenase activity was determined by the colorimetric technique on the basis of triphenylformazan (TPF) presence from TTC (2, 3, 5-triphenyltetrazolium chloride) added to air-dry basis of soil [3]. The (potential) polyphenoloxidase (PPO) and peroxidase activities were determined by the colorimetric technique with the use of hydroquinone as a substrate [4].

Soil chemical properties. Organic C was analyzed by the dichromate oxidation method. The humus content was calculated using the coefficient of 1.724. Humus reserves were calculated taking into account the bulk density of soils.

The microbiological and enzymatic indices were evaluated statistically by the variance and correlation analysis.

RESULTS AND DISCUSSIONS

The impact of erosion on biota's state. The humus loss as a result of erosion causes a sharp decline in the abundance, biomass and activities of soil biota. Indices of invertebrates' activities decreased in slightly, moderately and severely eroded soils by 15-30%, 31-62%, 63-78% respectively in comparison with the chernozem with a normal profile. The number of saprophagous decreased by 1.5 - 4, predators – by 2-3. An increase in phytophages activity has also been observed on the basis of their absolute values. Their number may reach 40-48% of the total number of invertebrates. The ratio between saprophagous and phytophagous amounts in the ordinary chernozem with normal profile to 7.3, slightly eroded – 3.4, moderately eroded – 1.3, severely eroded – 1.0.

The diversity of invertebrates in eroded soils decreases sharply. The complex of invertebrates is simplified, saprophagous from the groups of *Diplopoda* and *Diptera* families and predatory forms of *Carabidae* and *Staphylinidae* families are dominating. Representatives of only 2-4 families, usually *Lumbricidae, Elateridae, Scarabaeidae, Chilopoda* families inhabit the severely eroded chernozems [2].

The total loss of invertebrates amounts to 30.9%, 49.9% and 68.4% (table 1). Erosional loss of *Lumbricidae* and *Enchytraeidae* families is quite significant and constitutes 31.7% and 79.5% in slightly eroded chernozems, 62.7% and 100.0% in moderately eroded chernozems, 66.0% and 100.0% in severely eroded chernozems. Some species from the *Formicidae, Curculionidae, Carabidae* family are not encountered in eroded soils.

Table 1. The losses of invertebrate's diversity in the ordinary chernozem with different degrees of erosion (n = 12)

Family	Normal profile	Slightly eroded		Moderately eroded		Severely eroded	
	mean values, ex m^{-2}	mean values, ex m^{-2}	losses, %	mean values, ex m^{-2}	losses, %	mean values, ex m^{-2}	losses, %
Lumbricidae	48.2	32.9	31.7	18.0	62,7	16.4	66.0
Enchytraeidae	40.0	8.2	79.5	0	100,0	0	100.0
Diptera	0	8.2	0	0	0	0	0
Scarabaeidae	3.9	3.6	7.7	3.2	18,0	4.1	0
Curculionidae	1.8	0	100.0	0	100,0	0	100.0
Elateridae	3.9	11.7	0	20.0	0	8.2	0
Gryllidae	3.9	3.6	7.7	7.0	0	0	100.0
Chilopoda	3.9	8.2	0	7.0	0	8.2	0
Carabidae	7.1	3.6	49.3	0	100,0	0	100.0
Staphylinidae	3.9	0	100.0	3.2	18,0	0	100.0
Formicidae	+*	0	+	0	0	0	0
Total	116.6	80.0	30.9	58.4	49.9	36.9	68.4

* Many

The content of microbial biomass in the severely eroded chernozem amounts in average to 110.0 μ g C g^{-1} soil, which is 2.6 times less than in the soil with normal profile (table 1). The variation coefficient of the microbial biomass index increased from 16.8% to 46.3%, which indicates that the equilibrium and natural resistance of the soil microbial association decreases being higher in the chernozem with a normal profile and lower in the severely eroded soil. The losses of the microbial biomass as a result of erosion processes ranges from 213.6 to 496.2 kg ha^{-1} in slightly eroded, from 609.6 to 866.8 kg ha^{-1} in moderately eroded and from 1025.5 to 1070.5 kg ha^{-1} in severely eroded chernozems. The share of microbial carbon in the organic content falls from 1.66 % for soils with normal profile to 1.16% for severely eroded soils. A similar trend in decrease has been noticed in the confidence intervals of this index. These negative changes reflect the catastrophic effect of erosion processes on soil microorganisms, destruction and loss of the most valuable compounds of soil organic matter – the microbial carbon.

Table 2. The microbial biomass in the ordinary chernozem depending on the degree of erosion (n = 12-25)

Degree of erosion	MB, μg C g^{-1} soil			V, %	Losses of MB* (0-30 cm), kg ha^{-1}	
	mean values	min values	max values		mean values	confidence intervals (P ≤ 0.05)
Normal profile	288.3	176.9	360.9	16.8	-	-
Slightly eroded	224.6	112.6	336.9	31.6	354.9	213.6-496.2
Moderately eroded	159.4	74.8	264.5	36.1	738.2	609.6-866.8
Severely eroded	110.0	0	178.1	46.3	1048.0	1025.5-1070.5

* MB – microbial biomass

The erosion degradation is manifested in the extreme loss of systematic groups of microorganisms and in the considerable reduction of their biodiversity (table 3). Diversity of the *Bacillus* family reduces from 14 to 7-10 species. Sorensen's indicator decreases when the erosion degrees increase from 1.0 to 0.66 and Shannon's diversity index – from 4.18 to 2.05 accordingly. The diversity of fungi species narrows; plant pathogen species of *Penicillium funiculosum, Penicillium purpurogenum, Aspergillus ochraceus* accumulates. *Trichoderma lignorum* species disappear completely in the severely eroded chernozem. The simplification of the actinomycetes species diversity and the accumulation of *Streptomyces* genus occur in eroded soils.

Table 3. The impact of erosion on counts of culturable microorganisms in the ordinary chernozem (n = 20, P≤0.05)

Degree of erosion	Bacteria, CFU*10^6 g^{-1} soil	Fungi, CFU*10^3 g^{-1} soil	Actino-mycetes, CFU*10^6 g^{-1} soil	Bacilli	
				total, CFU*10^3 g^{-1} soil	number of species
Normal profile	4,5±0.2	35±2.9	3.3±0.5	1282±49	14
Slightly eroded	3.3±0.3	27±3.1	2.7±0.2	1004±46	12
Moderately eroded	2.6±0.2	19±2.5	2.3±0.2	1033±45	10
Severely eroded	1.9±0.2	11±1.5	1.9±0.2	844±38	7

Eroded soils have a low enzymatic activity (table. 4). The urease activity decreases by

17.5, dehydrogenase activity – by 2.3, polyphenoloxidase and peroxidase activities – from 1.4 to 1.5 in the severely eroded soil compared to the chernozem with normal profile. The losses of the urease activity constitute 68.6-94.3%, dehydrogenase – 19.1-55.6%, polyphenoloxidase – 6.5-32.8% and peroxidase - 10.9 to 28.7% depending on the degree of erosion. The declines in the enzymatic activity caused by erosion represents a complicated process conditioned by the deterioration of physical, chemical and physico-chemical properties of eroded soils, destruction of organic compounds, abrupt reduction in the microorganisms' biomass. When a mass of soil layers are washed away, eroded soils are not only losing the enzymes but also the conditions for their synthesis, immobilization and stabilization in remaining horizons are deteriorating.

Table 4. The losses of enzymatic activities as a result of erosion in the ordinary chernozem (n = 6-23, P≤0.05)

Degree of erosion	Mean values	Confidence intervals (P ≤ 0.05)	Losses of enzymatic activities, %	
			mean values	parameters
Urease activity (mg NH$_3$ 10 g^{-1} soil 24 h^{-1})				
Normal profile	3.5	3.0-4.0	-	-
Slightly eroded	1.1	0.5-1.7	68.6	57.5-83.3
Moderately eroded	0.5	0.2-0.8	85.7	80.0-93.3
Severely eroded	0.2	0.1-0.3	94.3	92.5-96.7
Dehydrogenase activity (mg TPF 10 g^{-1} soil 24 h^{-1})				
Normal profile	1.78	1.33-2.23	-	-
Slightly eroded	1.44	0.85-2.03	19.1	9.0-36.1
Moderately eroded	1.26	0.69-1.83	29.2	17.9-48.1
Severely eroded	0.79	0.59-0.99	55.6	>55.6
Polyphenoloxidase activity (mg 1,4-p-benzoquinone 10 g^{-1} soil 30 min^{-1})				
Normal profile	18.6	17.1-20.1	-	-
Slightly eroded	17.4	15.3-19.5	6.5	3.0-10.5
Moderately eroded	17.3	16.3-18.3	7.0	4.7-9.0
Severely eroded	12.5	11.6-13.4	32.8	32.2-33.3
Peroxidase activity (mg 1,4-p-benzoquinone 10 g^{-1} soil 30 min^{-1})				
Normal profile	34.8	34.5-35.1	-	-
Slightly eroded	34.8	34.5-35.1	-	-
Moderately eroded	31.0	30.3-31.7	10.9	9.7-12.2
Severely eroded	24.8	23.1-26.5	28.7	24.5-33.0

Urease and dehydrogenase indices are characterized by medium and significant variability. The variation coefficients of the enzymatic activity in eroded chernozems are higher than in chernozems with a normal profile. The variation coefficient for urease constitutes 24% in chernozems with normal profile, 70% – in slightly eroded, 65% – in moderately eroded and 102% – in severely eroded chernozems. An analogical regularity has been observed in the dehydrogenase activity. The variability in peroxidase and polyphenoloxidase activities of eroded soils is either medium or insignificant. The increase of the coefficients of variation indicates a low natural resistance of the eroded chernozems.

Recovery of the biota and humus status under fallow. The eroded chernozem in conditions of a long-term fallow (58-year-old) is characterized by a higher number, biomass, activity and diversity of soil invertebrates in comparison with arable chernozems which are as eroded as a normal profile (fig. 1). Invertebrates (95%) are concentrated in the upper layer, the number and biomass indices decrease sharply in the soil profile to a depth of 20 cm. In arable eroded soils the base mass of invertebrates is concentrated in the 0-10 cm layer, while in the arable soil with the normal profile – in the layer 0-30 cm.
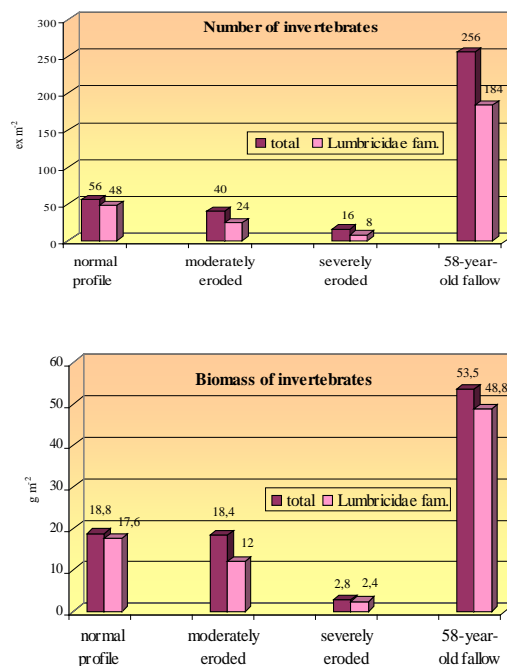

Fig.1. Soil invertebrates in the ordinary chernozem in conditions of arable and multiannual fallow

The fallow soil is characterized by a greater diversity of invertebrates. In addition to the *Lumbricidae* family, in samples of invertebrates, the species of the *Formicidae, Enchytraeidae, Elateridae* families were found as well as other ones. The biomass of the edaphic fauna is represented predominantly by the *Lumbricidae* family in arable chernozems.

The volume of invertebrates' biomass accumulated during a 58 years period constitutes 507 kg ha^{-1} or 8.7 kg ha^{-1} annually, biomass of the *Lumbricidae* family – 464 kg ha^{-1} or 8.0 kg ha^{-1} annually. The application of the natural cover of wild grass, led to the restoration of the total number of invertebrates and the *Lumbricidae* family, the annual growth rate is of 4 and 3 ex m^{-2} accordingly.

The application of fallow contributes to the increase of the microbial biomass and humus stocks in eroded chernozem. The microbial biomass content in 0-30 cm layer increased by 2.5, humus content - from 1.57% to 3.14% that represents an increase of 0.027% on average per year.

The reserves of the microbial biomass in 0-170 cm layer increased from 1.6 to 4.3 t dry matter ha^{-1} (fig. 2). The microbial biomass accumulation in the soil was registered in amount of 2.63 t ha^{-1} which represents an average of 45.4 kg ha^{-1} per year. Humus reserves in the 0-100 cm soil layer increased from 74.4 t ha^{-1} to 192.8 t ha^{-1}; the annual growth rate was of 2 t ha^{-1} (fig. 2).

The fallow soil in humus reserves corresponds to moderately eroded chernozem under arable, while in the microbial biomass reserves it comes closer to the arable soil with a normal profile. The chernozem under fallow significantly exceeds the soil with a normal profile regarding the indicators of the number and biomass of invertebrates. Thus, the transition of the eroded chernozem from the category of arable land to the category of fallow land promotes regeneration of soil invertebrates, increases microbial carbon stocks and carbon sequestration. This procedure is based on the gradual restoration of natural activities of invertebrates and microorganisms in the soil at the expense of root exudates and vegetal residues of sod-forming grass. The humification processes intensified as a result of the interaction between the root systems and the soil biota.
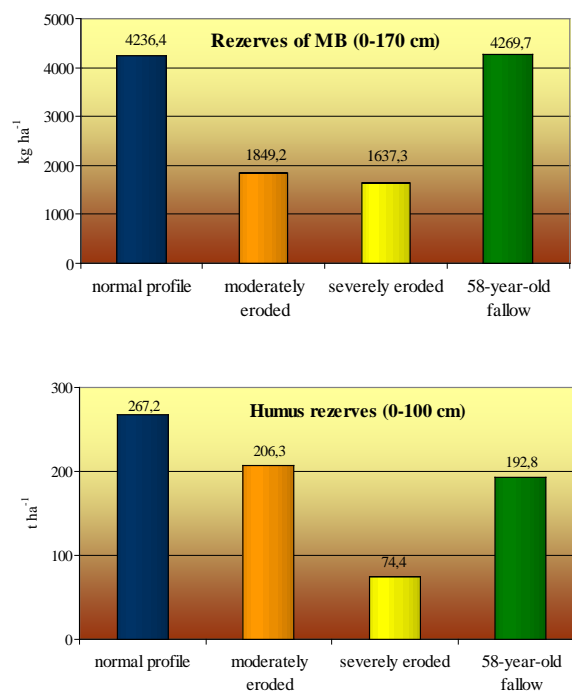

Fig. 2. The reserves of the microbial biomass and humus in the ordinary chernozem

The evaluation of biota resistance to the erosion processes. The correlation analysis of the interdependence between the biological indices and the humus content demonstrated their close connection. The correlation coefficients constitute 0.81-0.97. Five of twenty indicators have been selected. They were more closely linked to the humus content and reflected the degrees of the ordinary chernozem erosion more thoroughly. The biological parameters of soils have been grouped according to the humus content. A scale has been developed to estimate the biota' stability as a result of the erosion processes impact on the ordinary chernozem and its ecological certification (table 5). The scale of the biological parameters can also be used to assess the quality of eroded soil.

The degree of the soil stability decreases with the raising of the level of its degradation. The size of homeostasis zones and biota's natural resistance in the ordinary chernozem decreases consecutively: chernozem under fallow→ chernozem with the normal profile→ slightly

eroded chernozem→ moderately eroded chernozem → severely eroded chernozem.

Table 5. The estimation scale of biota' stability of the ordinary chernozem following the impact of erosion processes

Degree of stability	Humus content, %	*Lumbricidae* fam.		MB*, µg C g⁻¹ soil	Dehydro-genase, mg TPF 10 g⁻¹ soil 24h⁻¹	PPO**, mg 1,4-p-benzoquinone 10 g⁻¹ soil 30 min⁻¹
		number, ex m⁻²	biomass, g m⁻²			
Very high	>3,2	>50	>8.6	417-474	>2.2	>4.0
High	2,9-3,2	43-50	6.0-8.6	266-311	1.3-2.2	3.0-4.0
Moderate	2,4-2,8	35-42	4.2-5.6	184-265	0.9-2.0	0.5-1.7
Low	1,8-2,3	17-21	3.6-4.6	123-196	0.7-1.8	0.2-0.8
Very low	<1,5	10-15	2.7-3.5	<123	<0.7	<0.2

* MB – microbial biomass; ** PPO – polyphenoloxidase activity

The level and size of homeostasis zones and therefore the biota stability reached the maximum levels in the fallow soil. Severely eroded chernozems have the lowest resistance.

CONCLUSIONS

Erosion is disastrous for the soil's habitat: invertebrates and microorganisms. The current state of the eroded chernozems biota is characterized by a decline in indices of numbers, biomass, activities and diversity compared to the soils with a normal profile. The biological indicators of chernozem depend on the degree of erosion. The growth of variation coefficients once the erosion degree increases indicates the reduction of the soil's biota resistance.

The catastrophic loss of biomass, of the edaphic fauna diversity and microorganisms represent a particularity of eroded chernozems. The considerable loss of enzymes and their inactivation is one of the typical manifestations of the erosion process. A scale of biological parameters has been proposed to assess the stability of biota of the ordinary chernozem and to develop the national soil quality standards.

Multiannual fallow soils under natural vegetation are a source of the conservation and reproduction of different species of invertebrates and microorganisms; they have a high level of biomass and enzyme activity.

In order to achieve a sustainable management of eroded soils in the southern zone of the country, it is required to carry out an intensive root activity, which will stimulate the growth of microorganisms, and to enrich the soil with plant residues and colloidal organic compounds. This is especially important in the light of the mitigation of carbon losses, the compensation of the carbon dioxide emissions by eroded soils and the enhancement of carbon sequestration. In this context, the management of fallow land areas has been recommended aiming to regenerate the edaphic fauna and microorganisms and to restore the natural quality of eroded chernozems.

ACKNOWLEDGEMENTS

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EVOLUTIONS OF THE HOUSEHOLD THROUGH AGRICULTURAL COOPERATIVE AND COMMON AGRICULTURAL POLICY

Adrian SIMION

University of Agricultural Sciences and Veterinary Medicine, Bucharest, 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 721419016, E-mail: aditurars@yahoo.com

Corresponding author:aditurars@yahoo.com

A*bstract*

The aim of the present paper is to seek to develop ways of developing the agricultural households into the stage of agricultural farms. Based on the agricultural households' peculiarities in relation to the implementation of the Common Agricultural Policy and its positioning to the market (the association for the production and sale of the products), sides that directly affect the transformation of agricultural households into farms have been highlighted: the structure of the concept of agricultural household (through its complexity and dynamics); the commercial evolution of the household-farm after the EU accession; the household-market and price-quality interaction; indicators that increase the holding; the association for the production and sale of agricultural products; the focus on obtaining traditional and ecological products; pesticide norms used in obtaining holdings in relation to obtaining traditional and organic products; the promotion and sale of traditional and ecological products at a community level through cooperatives; the conformity designation and obtaining traditional brands of household status; obtaining traditional and organic certification at cooperative level; the national subsidies for the production of traditional and ecological products; the character and the need to implement the Common Agricultural Policy in households; the direct payments for holdings within the Community Agricultural Policy; the implementation of the Community Agricultural Policy at household level; the absorption of CAP direct payments.

Key words: agricultural household, commercial family farm, traditional/organic products, agricultural cooperative.

INTRODUCTION

The necessity of the evolution of the household to the stage of agricultural farm on the community market involves, on the one hand, the national economic dimension and, on the other hand, the growth of the competitiveness in the agricultural community sector.

The competitiveness of the national agricultural sector should be closely correlated with the community agricultural sector, while the latter requires growth in the global economic downturn.

The growth of the productivity of the national agricultural sector is in close correlation with the transformation process of the households into competitive agricultural farms peasant farms, after the Western model.

The integration process of the households into the Common Agricultural Policy is related to the existence of the market mechanisms in rural areas and also to the market opening for these holdings.

The failure of the CAP implementation at commercial and household level shows the lack of commercial behavior and of most household-peculiarities contact with the market – features that must be understood before the elaboration of the Community Agricultural Policy in the South-Eastern EU countries.

In the absence of a mature food market, the households have a reluctant behavior in regards to the market and, thus, to the evolution of the farm state.

An intermediate stage of the contact with the market and the evolution of the household to the rank of farm is represented by the creation and development of agricultural cooperatives (especially retail ones).

The contact between the household and the agricultural cooperative is a research one, based on the understanding of market mechanisms - a first preparatory step for the operating of the agricultural farm.

The household, as a form of subsistence, is the oldest human activity: the family acts as a

holding, while the holding feeds the family, therefore the household is an enclosed system. The household has a subsistence character and applies the unpaid work. Within a household, the main investment is the productive effort, the family's contribution to the agricultural production – it is limited, taking into account the number of family members fit for work and their capabilities.

In Romania, the main type of holding is represented by the household (the small holding of a family is of a 2.5 ha average). The agricultural associative forms print a business optic to the households, leaving, consequently, the area of household self-consumption. The option of the household for the associative forms in agriculture is an alteranative to renting; nowadays, the rent is not satisfactory due to the lack of land market maturity.

The associative option (including leasing) of households comes also through the fact that 30% of the land belong to those who cannot work for various reasons (the lack of equipment and capital, old age, or urban heirs). The consenting for associative forms is the only direction where the families' to move from subsistence to the market is to be seen.

In the EU there are households in most of the countries that were part of the Soviet bloc. The peasant perennity in these countries is explained by the fact that they saved themselves from any state intervention, likewise the forced collectivization and then the state intervention measures in the structural adjustment process of agricultural holdings. The household is an enclosed system (family + holding) that reacts positively or negatively to external factors, including towards the market: if the market is friendly (non-restrictive or exhaustive for household products), then the family decides to participate in the market with products even though it has satisfied its needs. After having satisfied all its needs, the family decides not to convert the excess of the agricultural production into profit. In a household, the situation of the stocks is very important. If most of the households, the agricultural surplus remained after the family needs have been satisfied is storaed in household barns because of two reasons: the uncertainty of success regarding the

following agricultural year and the low price of the agricultural products at the harvest time. Within a household, the decision of the stock selling products for profit is made when a good harvest for the following year is anticipated and when the price is rising (almost never immediately after the harvest is gathered, when the market is abundant and prices low). A household endowed with important stocks is strong even if the market or economic situation is changing orhostile: it is at anytime available for product exchange, the so-called agricultural barter. The households from a village exchange agricultural products between themselves, without the state intervening in terms of taxation. The most frequent exchanges in Romania, in the form of barter, are made by households in the hills and the plains: fruits against grains.

The Romanian households' chance for a sustainable development is provided by the financial support received (the national and Community direct subsidies payments to farmers) in conjunction with obtaining the organic agricultural products in an organized village-level agricultural cooperatives.

This paper seeks that the household within the EU common market should find opportunity for development through: the specialization and sale of the products on the traditional-ecological sector; the EU funds absorption; the transition to a commercial competitive behavior – the Western-agricultural farm.

MATERIAL AND METHOD

The research was based on the knowledge of the household behavior with respect to associative forms in agriculture and EU financial support programs, for example Sapard.

The socio-economic indicators of the Agricultural Cooperative "Bio Food Nucet", Dambovita, have been considered in our analysis – the joint production and sale cooperative of organic products. "Bio Food Nucet" is an association established as a rural household in 2010 in Cazaci village, Nucet, having legal personality. The common cooperative is a free association of households, open to new members; it now counts 15 peoplee, while starting with 5. The slow rhythm

of increasing the number of partners emerge from the fact that the solitary households expect the sales of the associated ones.

Table 1.The activity domains of ”Bio Food Nucet”

Field of Activity	Cumulative %
Production	70.00%
Sale	30.00%
Total	100.00%

The above table shows that ever since its founding, the cooperative began its activity with a disability – a small percentage in the sales activity, a problem resorbed from the associate households. Even if the household would have established the cooperative selling as its sole activity, it still would not have been able to find the sale niches in a short time and within a market where it is increasingly difficult to penetrate.

The household, with its cooperative nature of producing organic food, attempts to prevent the hardship regarding the selling process, having as target a more expensive, but growing market, with penetration potential for the common market.

The table given below shows a production increased by more than 50%, which encourages the growth and modernization of their holdings, but also the increasing number of associates.

In Table 3 there is a noticeable increase in sales by more than 100%, therefore a higher sales rate than the production growth.

 A slight increase in the price per kg of 2 lei in 2010 to 2.5 in 2011 can be noticed, indicating a slight increase of the productivity.

Table 2. Agricultural production in 'Bio Food Nucet'

Activities	2010		2011	
	Quantity (kg)	Value (Ron)	Quantity (kg)	Value (Ron)
Pro-duction	3000	6000	5000	1250

Table 3. Sales of “Bio Food Nucet” products

Activities	2010		2011	
	Quantity(kg)	Value(Ron)	Quantity(kg)	Value (Ron)
Pro-duction	1000	2000	2000	5000

Tables 2 and 3 show that more than half of the agricultural production has been kept in one's own household, for self-consumption, fact which indicates the cooperative's representative for joint households and a retrograde positioning in regards to the commercial agricultural farm. When the difference between self-consumption and sales will be negative, then the cooperative will be 100% commercial and may be described as agricultural farm.

The data from the two tables are daunting for borrowing and carrying out projects such as SAPARD, fact which foresees a slow increase in the turnover.

Table 3. The absorption of foreign funds

Sources of founds	Cumulative %
Subsidies from the national budget	45
Direct payments on agricultural area (U.E.)	45
Ongoing project - Community structural funds such Sapard	10

The data from the above table are taken individually for the cooperators members and are representative for the community. The cooperative has not yet contracted community funds and aims to obtain contracts for the sale of its products in hypermarket chain stores in the country or abroad (willing to pay a higher price for organic products).

Once the first contract with a local supermarket would be obtained, other households might be interested to enroll in the cooperative. The contracts with chain stores are in relation with the constant and qualitative stocks, something very difficult to achieve through households. The lack of Romanian agricultural products (even from farms) explains the massive imports of agricultural products in hypermarkets. The importance of the consumption of organic food, in terms of health reasons, is not included in education campaigns for consumers – which would not be an impediment for the lack of uniformity with respect to Romanian products.

The Agricultural Cooperative, besides serving the commercial interests of its members, has also a positive role in the social development of the rural area. Paragraph ”f” from the 5th Article of the cooperative status of ”Bio Food Nucet”

mentions: "The cooperative developing commercial activities, manufacturing agricultural goods and services, pursuing in its goal the economic and social development of the countryside", while Article 38 specifies that 5% of the profit is allocated for social and cultural activities.

These cooperative tasks are part of the efforts of the national programs (the National Rural Development Program) and of the rural development policies of the Ministry of Agriculture.

Therefore, the agricultural cooperatives increase the modernization and the attractiveness of the Romanian rural area and, together with households, have a positive role in preserving the traditions and customs. The cooperatives have a direct contribution to the rural socio-economic life also by means of agro-tourist development in rural areas, contributing to the cultural diversity and bringing added value for the EU culture and traditions.

RESULTS AND DISCUSSIONS

One may say that the national and community financial support (meaning grants and direct payments) given to the agricultural cooperatives returns to Romania and the EU in the form of cooperatives investing in the socio-economic development in rural areas, through socio-cultural activities. Supporting the transformation of peasant households into family farms and the formation of households in cooperatives must be supported starting from the understanding of the peculiarities of the household and, thus, of the agriculture itself.

The state and the EU's encouraging of the cooperation results in the diminishing of the village-city exodus and reduction the migration from one state to another within the EU.

CONCLUSIONS

The evolution of the household to the stage of agricultural farm must pass through an intermediate stage of research and knowledge of the market mechanisms, which can be achieved within the agricultural cooperative.

The household formation in agricultural cooperatives brings more economic value to the cooperative members and social and cultural value to national and community levels. The transformation of peasant households in Western-style commercial farms is a necessity, but cannot be done by means of national policy or community economic coercion.

The Common Agricultural Policy implementation among Romanian households is heavy and limited to absorbing the Community financial support (direct payments per area).

One must bear in mind, when implementing the Common Agricultural Policy, the particularities of the Romanian household and the state of the rural market functioning mechanisms. Bank loans for cooperatives should be done easier, even if their work is at its beginning. The appearance of new Community structural programs, developed strictly for associations and agricultural cooperatives, should materialize, together with the bureaucratic drawback of the granting structural funds programs for an easier access by associations and cooperatives.

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AGRICULTURE IN TERMS OF EUROPEAN UNION STRATEGY FOR DANUBE DELTA ADOPTION

Cristiana SÎRBU [1]

[1]University of Agricultural Sciences and Veterinary Medicine, 59 Marasti, Sector 1, 011464, Bucharest, Romania, Phone: +40 740 055 221, Fax: + 40 251 411 300/ +40 31 107 27 64, E-Mail: cris _sirbu@yahoo.com

Abstract:

This paper shows how the adoption of the EU strategy for the Danube will affect agriculture in areas along the river and the main objectives of the strategy for agriculture. Among the Danube's states, Romania has the largest area in the Danube basin, Danube strategy aims a macro-regional development and is also an action plan for the river areas and neighbouring countries. The people from the Danube delta have a way of life unchanged for centuries and agriculture remains a vital sector for the Danube region. Farmers will need support for adopting and maintaining systems and agricultural practices that will contribute to achieving the strategy's objectives for the environment and climate changes.

Keywords **:** *Danube Strategy, agriculture, sustainable development, co-operation, objective*

INTRODUCTION

Danube, the second largest river in Europe, covers about 2850 km, linking the Black Forest to the Black Sea, across ten countries and has tributaries from other four countries.[1]
An ideal location for placement of hydroelectric power plants, a pan-European transport corridor and a refuge for the rarest species in Europe - the pressures on the river are often in conflict with each other and political changes in the region also influenced the way the difficulties are dealt. Following the example of the EU Strategy for Baltic Sea, which was the first macro-regional approach, the EU strategy for the Danube was based on stakeholder efforts in the region, allowing them to create a region where all 115 million people to enjoy security, prosperity and equal opportunities. [2]
EU Strategy for the Danube is a model of regional cooperation at European level. [3]

MATERIAL AND METHOD

Strategy - a tool for integration and better use of EU funds - is also a political innovation and a new stage in EU regional policy. The

EU Strategy's principles are solidarity and cooperation.
Strategy is EU's commitment towards job creation, sustainable and inclusive growth. It supports sustainable growth aimed at reducing energy consumption, increased usage of renewable energy, upgrading transport sector by streamlining and improving its environmental impact and also ecological tourism. The EU Strategy helps to eliminate internal market barriers and improve the business environment.

RESULS AND DISCUSSIONS

Among the Danube states, Romania has the largest area, part of the Danube Basin and the Danube Delta, which is the second largest wetland in Europe.
Regarding the course of the Danube in Romania, we can mention the following: it flows through 4 development regions, 12 counties with 25 municipalities and 56 cities, growth poles such as Constanța and Craiova or development poles such as Brăila and Galați. The counties in the Danube region represent 30, 1 percent of Romania and 33, 8 percent of Romania's population. The socio-economic situation of the Danube region is the result of several factors including,

demographic factors, level of education and training, remunerations and unemployment, the overall level of economic activity and economic structure by sector, activity level and promotion of SMEs (Small and Medium Enterprises), the local taxation, foreign investments, etc..

The Strategy for the Danube Region is a macro-regional development and is an action plan for areas and countries close to the river and also for Romania. In addition to the sustainable development of the micro-region, the strategy aims to the nature protection, the protection of the landscapes and cultural heritage.

For Romania, the consolidation of the Danube's cooperation is a priority taking account of the potential for sustainable development of the region and we want to contribute at making the Danube a backbone of the European area as part of the Rhine-Main-Danube corridor.

The problems we face are numerous and the dimensions of regional cooperation are multiple: transport, energy, tourism, agriculture and environment.

The economic and social development of the Danube region must be a sustainable development, which respects the European legislation regarding the environmental protection.

Romania supports this approach given that manages most of the climate change's reserves and the need to protect villages against natural disasters and national parks in the Danube region are extremely important aspects and need to be considered in the current strategy.

The Strategy's projects can be financially supported by developing strong synergies between different EU policies: cohesion, transport, tourism, agriculture, fishing, social and economic development, energy, environment, neighbourhood and development policies.

The people that live in the Delta have a way of life unchanged for centuries. Human implantation allowed discrete survival of the Delta's amazing ecosystems.

The great expanse of water explains the small number of inhabitants. Fishing is a constant of human activity in the region. The continuous usage of reed and bulrush is another branch of human activity. In some banks people practice plant culture and on others are green lands for livestock.

The navigation on Danube's arms and the transportation on its channels are other concerns of the inhabitants.

Agriculture remains a vital sector for the Danube Region, which includes 5,07 million hectares of agricultural areas - arable land, pastures, meadows, and orchards, representing 34, 5% of total national agricultural areas.

In the developing regions which include the counties in the Danube region, namely South East, South Walachia and South-West Oltenia, the agriculture, hunting and fishing have a higher share than the regional Gross Domestic Product (GDP) share of agriculture in Gross Domestic Product of Romania.

The development of hydraulic structures and those for the recovery of water along the Danube basin were related to the economic development and thus protecting settlements and population.

Flood protected areas were expanded and under the protection of dams was developed a stable agriculture, and manufacturing centres, buildings for agricultural products, households.

Over the years and especially lately, changes occurred in dams profile (and the land of their foundation), and some portions of the dams were weakened because of erosion, which could lead to their collapse and flooding in the remaining unprotected areas.

The policy focused on the Danube embankment to reduce the risk of flooding and to provide the land for agriculture, led to a dramatic decrease of fish stocks. Embankment at the same time reduced the sediment carried by the Black Sea, thus changing the landscape of the Delta and increasing the risk of shore erosion.

Sustainable exploitation of living aquatic resources by practicing rational fishing is necessary for improving quality of life in fishing communities, conservation and

restoration of fish stocks, improving and professionalizing the workforce and creating alternative occupational opportunities.

Supporting the sustainable development of fishery and improving quality of life in these areas, creating opportunities for alternative incomes for residents in the fishery areas, developing the specific infrastructure, training of qualified personnel, ensuring the equipment for exploitation and manufacturing and encouraging the formation of partnerships, are important actions in the new Strategy.

The Danube Region is an ecosystem of interlinked and interdependent, providing invaluable environmental goods and services (food, fibber and fresh water, adjusting the quantity of water in a given territory and soil protection).

In this region there are the largest wild areas of Europe, which offers essential ecological health of the European environment as a whole. Industrial development, deforestation and pollution put hard pressures on the region. The proposed actions to be taken include: implementation of bumper strips along the river to capture nutrients, usage of latest technologies for treating hazardous waste sites, helping restore wetlands as a way to increase flood protection and implementation of protected areas network.

A common theme through the whole process, proved the need to promote efficient use of resources to an intelligent sustainable and favourable growth for the inclusion of EU agriculture and rural areas, in line with Europe 2020.

It became more pronounced the market orientation of agriculture, while ensuring for producers an income support, also the integration of environmental requirements and the strengthen support for rural development as integrated policy for rural development across the European Union.

At the same time, agriculture and rural areas are invited to intensify their efforts to achieve the ambitious goals of climate change and energy and the implementation of the biodiversity strategy.

Farmers together with the foresters, are the main managers of the land and they will need support for adopting and maintaining agricultural systems and practices that contribute to the achievement of particular environmental and climate changes, because the provision of public goods is not reflected in market prices. It will be essential to maximize the diversified potential of rural areas, contributing to inclusive growth and cohesion.

In the past 20 years there has been register a significant improvement in the quality of the Danube's water. Appropriate treatment of waste water in all communities, usage of detergents without phosphates, agricultural production to protect water resources and fish bypass channels in hydropower and other dams - all this will have an important role.

The measures give the river more space, creating additional wetlands and protecting biodiversity. Therefore the balance of land usage is restored, no longer used exclusively for cultivation, but also as meadows and stock raising. Overall economic impact is in the benefit of agriculture and increases opportunities for nature tourism and recreation activities.

It is strongly highlighted the multifunctional role of agriculture in terms of food security, employment in rural areas, ensuring a fair standard of living for farmers and mitigation of climate changes effects.

EU Strategy for the Danube Region provides the European agricultural model, characterized by viable exploitation structures close to the market, along with rural development and environmental protection. Are needed measures to be taken to support agriculture producers to adapt to the consequences of climate change because these changes will influence the variability and size of agricultural production and livestock.

Particularly, the EU Strategy for the Danube River is focused on developing recess agricultural and nutriment production and also ecological and traditional products in those areas where there are favourable conditions. It will be needed measures to protect the name of Romanian products, recipes and cooking procedures on European Union's and third countries single market, in compliance with

food safety and appropriate promotion of food safety.

Part of the new sustainable approach on river engineering includes river restoration, rebuilding at the same time the connection between the Danube and tributaries whose course are now discontinued. These conditions, similar to natural ones, protect and establish new habitats for flora and fauna, creating a more attractive environment for all river users.

CONCLUSIONS

Danube Strategy projects are financially supported through structural funds allocated for 2007-2013 and the support of the European Investment Bank (EIB) and European Bank for Reconstruction and Development (EBRD), both as project preparation and implementation.

By implementing the EU Danube Strategy, our country will get a number of benefits such as quality of life development, increasing competitiveness and attractiveness of cities and villages of the Danube, and obtaining economic advantages through business partnerships and cooperation between the public and private sectors. Although the strategy will provide additional EU funding, the region already has considerable funding through a number of EU programs. The objective is to capitalize further the available support - not less than 100 billion euro were allocated to cohesion policy (European regional development fund, cohesion fund, European social fund) between 2007 and 2013 - and to show how cooperation can contribute to macro local problems.

Looking at the strategy in terms of regional development perspective, it is the framework that can ensure the overcome of regional disparities, being created at an opportune moment, the beginning of the end of the current programming period and start training for 2014-2020. Strategy may change the way we approach regional development. Thus within the framework of this project by collecting projects and existing results, we can draw the lessons from the current period at regional level and make proposals for the future.

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EVOLUTION OF THE AGRICULTURAL SYSTEMS IN THE REPUBLIC OF MOLDOVA

Alexandru STRATAN, Victor MOROZ, Eugenia LUCASENCO

Institute of Economics, Finance and Statistics. 45, Ion Creanga str., MD-2064, Chisinau, Republic of Moldova, tel: +37322 501119, fax: +37322 743794, email: alex_stratan@yahoo.com, vmoroz27@gmail.com, eugenia_lucasenco@yahoo.com

Corresponding author : vmoroz27@gmail.com

Abstract

The paper aims to analyze the evolution of the agricultural systems in the Republic of Moldova and to assess the impact of the structural changes over the national economy. In order to achieve this, there were used the following research methods such as: analysis of the economic indicators, methods of comparative analysis, analysis of the public policies' impact on the agri-food sector and rural area. Moldovan agriculture is based on three agricultural systems: conventional, of subsistence and ecologic, which do not provide the performance of the sector and competitiveness of the agricultural products on the internal and international markets. In comparison with the neighboring countries which have recorded greater rates of agricultural production growth since 2001, Moldova has recorded more modest results, showing a stagnation in agriculture. This situation is associated with the major risks related to the structural changes that may affect the rural area and the economy as a whole, such as: the sharp decrease of rural population in some localities, aging, inefficient use and depreciation of assets in rural areas, decrease of the usage level of the bio-climatic potential. Currently , the agricultural systems that are based on farm products diversification, reducing dependence on imported resources, ecological agriculture and the trend towards the high value added products are under discussion and development.

*Keywords***:** *agricultural systems, uncertainty, adaptation, bio-climatic potential*

INTRODUCTION

Together with the changes that occurred within the cultural and socio-economic environment, policies and theoretical thinking about the agricultural sector suffered many changes.

In the recent decades development of the agricultural sector as an academic and political subject has had many definitions and there is still no common understanding as to the way of adjusting the national development policies in the Eastern Europe to the requirements of the Common Agricultural Policy (CAP) of the European Union.

In Europe, in the agriculture area, depending on the used technologies, their level of intensification, specialization, biomass quantity and quality, relationships with the environment, etc., different agricultural systems are practiced: sustainable, conventional, biological, organic, precision and extensive. [1]

Socio-economic changes in rural areas can not be developed under the old paradigm of agricultural systems in the Republic of Moldova. Rural economy, employment issues, natural resource management and also goals and circumstances of the agricultural production have changed considerably.

MATERIAL AND METHOD

Given the challenges that the national economy has to deal with, there are highlighted the following socio-humanistic research methods like: conceptual approach, analysis of the impact of public policies on the rural areas, including the agricultural sector, comparative analysis with the experience of Central and Eastern European countries, etc.

While writing the paper, quantitative research methods were used in order to evaluate the agricultural systems in the Republic of Moldova.

RESULTS AND DISCUSSIONS

In an era of rapid changes and increase of risk and uncertainty, agricultural policies and practices in developing states face a number of limitations that reveal their long term durability shortcomings and their ability to meet the range of objectives which they are expected to provide. Also, there are concerns about food safety, hygiene and nutrition. Agri-food systems are changing in several ways, as a result of the dynamic interactions of a series of socio-economic and environment forces, including global environmental changes, agricultural intensification, concentration of production, vertical and coordinative integration, industrialization, deregulation and economic liberalization and urbanization.

The agricultural sector in the Republic of Moldova has not yet been recovered from the decline in production and productivity, which occurred during the '90s. According to the 2010 data, the share of this sector in GDP does not exceed 12%; agriculture employs about 28% of the population, which reflects the situation characteristic for the countries with an insufficient regional development, when the major territory of the country is characterized by a predominance of unproductive and low-paid agricultural work. [3]

The overall productivity of the climate for the agricultural production is estimated by the bio-climatic potential indicator that synthesizes the indicators of heat and moisture availability. On the basis of the bio-climatic potential (BCP) indicator, regions-analogues were identified among the countries of the world [7]. Focusing on the performance of analogue regions of the developed countries, it is possible to determine the potential productivity of agriculture in Moldova by using the advanced technologies and improving the availability of logistical and technical resources.

Regions-analogues for our country among the developed countries of Europe are: Austria, Netherlands and Germany. Moldova, according to the European standards, has a sufficiently strong potential of natural resources for the agricultural development. Availability of agricultural land per capita is essentially higher than in Western developed countries, with an approximately equal bio-climatic potential (Table 1).

Table 1. Evaluation of the bio-climatic potential from the Republic of Moldova

Regions-analogues	Bio-climatic potential (points)	Bio-climatic potential of the regions-analogues in % to the BCP of Moldova
Republic of Moldova	144	100
Czech Republic	123	85
Ukraine	130	90
Romania	133	92
Netherlands	135	94
Germany	136	94

An important component of the country's natural resources is the soil. The Republic of Moldova ranks one of the first places in the world by the relative weight of the most fertile soil, black soil (chernoziom). However, the soil of Moldova are highly susceptible to the degradation processes, particularly erosions, due to an excessively high proportion of cultivated land in the total area of farmland and due to the over-intensive and unsustainable agricultural use for many decades. Nowadays, the intensity of erosion processes is one of the highest in Europe.

Table 2. Per capita production of selected agricultural products in CIS countries, kg

	Cereals		Potatoes		Meat (on slaughtered weight)		Milk	
	2000	2009	2000	2009	2000	2010	2000	2010
Azerbaijan	187	327	58	110	14	28	128	169
Armenia	70	116	90	183	15	21	140	185
Belarus	487	895	874	749	60	102	450	698
Kazakhstan	777	313	114	174	42	57	251	329[1]
Kyrgyzstan	319	361	213	261	40	35	225	250
Moldova	531	609	91	73	24	31	158	164
Russia	446	684	201	219	31	50	222	225
Tajikistan	88	153	49	89	5	9	50	88
Turkmenist	333	…	17	…	28	…	187	303
Uzbekistan	…	266[3]	29	55	20	31	147	220
Ukraine	497	999	403	428	34	45	257	245

[1] cow milk
[2] year 2004
[3] weight registered in 2008

The structure of agricultural production has undergone significant changes which are due

to the market conditions and the level of use of production factors. At the same time, Moldova's agricultural sector is characterized by a tendency of production stagnation, both in plant growing and livestock, while the vulnerability to natural and economic risks increase.

Currently, about two thirds of agricultural lands are cultivated within small and medium enterprises belonging to a small number of owners. They combine the agricultural lands of the individual owners on the basis of lease agreements of various types. These companies form the export potential of the agri-food sector. Approximately one third of the area is owned by individual small farmers that provide food products, mainly on the domestic market.

Most of the farmers work within the small and medium agricultural enterprises.

Crop production. The dominant position in the structure of agricultural production is the plant growing, which share in the total agricultural production is about two-thirds. The share of livestock production has declined in the 90s as a reaction to the appreciation of energy resources and liberalization of the market.

In Moldova, in recent years a poorly diversified structure of sown areas was formed. Cereals and industrial crops occupy about 90% of the acreage. The dominance of corn and sunflower in the structure of sown areas is present in almost all regions of the country, despite the fact that the soil and climatic conditions in many regions are unsuitable for cultivation of these crops. There is minimized the production of fodder crops on arable lands, which leads to the disruption of crop rotation patterns, deterioration of livestock forage, increasing the pressure on the lands to a level that leads to their degradation.

The total area of perennial crops and irrigated land in the recent years was significantly reduced. Positive trends were noted only in viticulture and winemaking. Diversification of sale markets for wines and spirits is done in a positive way. Nut plantations and the export of nuts are rapidly growing. At the same time, horticulture in general, remains a problematic

sector. The perspectives of its development are associated with the massive improvement of plantations and the change in their varietal composition.

Tabel 3 Structure of agricultural production, by categories of producers (% to the total volume of production) - 2010

	Agricultural enterprises	Farms	Households
Cereals and leguminous crops	37,4	35,8	26,8
Sugar beet - industrial	86,4	13,1	0,5
Sunflower	69,8	27,8	2,4
Potatoes	16,6	18,3	65,1
Vegetables	16,1	10,8	73,1

Livestock industry suffered the greatest losses during the economic crisis. The vast majority of livestock has been moved from large farms to the household and peasant farms, where the practiced extensive cultivation technology of livestock and poultry has led to a sharp decline in production. Recovery of livestock industry potential takes part with more slower rhythms than of the plant growing.

The essence of changes in recent years in the structure of production in corporate farms consists in their abandonment of the milk and meat production. Simultaneously, feed crops and some of the technical crops, including tobacco, partly and sugar beet, and also vegetables, potatoes, hetero-oil crops, medicinal plants have been excluded from these farms' rotations.

As a result, there suddenly decreased the production volumes of livestock products, vegetables, potatoes, tobacco, forage crops and other products with high added value.

In terms of quality, the core of structural disproportions is well known and widely discussed not only in scientific circles but also within the civil society as a whole. The main features of these problems are:
-The high share of subsistence farms;
-The low labor productivity and respectively, the high production costs;
-The low variety and poor quality of agricultural production;

-The predominant use of the obsolete farming technologies;
-Lack of market infrastructure, and marketing skills;
-Insufficient support from professional associations, local public administration bodies, and scientific institutions and those of consultancy from the rural area.

As a consequence of changes in the structure of cultivated areas, there is a permanent decrease both of work places, as well as the number of employed persons.
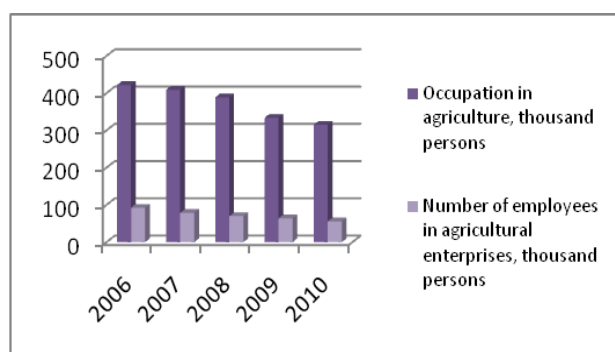

Figure1 Evolution of occupation and employment in agriculture

Currently, there are three agricultural systems within the Republic of Moldova: conventional, subsistence and ecologic.

The main features of the conventional agricultural system in Moldova:
-Concentration of agricultural land in the large farms;
-Deepening of specialization of agricultural enterprises;
-High level of dependence on imported resources;
-Mechanization and intensive use of chemicals in the production process;
-Increase of labour productivity and decrease of rural population

The subsistence agricultural system is characterized by:
-Production is mainly directed for the family consumption.
-Use of the simplified technologies, mainly based on the manual work.
-Small size of the agricultural plots.

The ecologic agricultural system is characterized by:

-Organized production at the certified agricultural farms;
-The ecologic certificate is made in accordance with the European Regulation of Ecological Production;
-Within the ecological agriculture the soil fertility is maintained and reestablished.

The share of ecologic agricultural system is still unsignificant and does not exceed 1% of the cultivated lands.

Taking into account the growing complexity and uncertainty that the agricultural systems at different scale have to confront nowadays, it is necessary to form the modern vision on agricultural development.

Discussions of the issues related to the modernization of agriculture have been made in Moldova for a long time. During the last decade there has been developed and approved a number of strategic documents that in general have had a little influence on the development of the agricultural sector.

However, in the society and government circles there is growing the awareness that the development of the agricultural sector is constrained by the presence of a number of issues of general economic nature. The main ones are as follows:
-Systems of agriculture practiced in the country do not provide the competitiveness of the agricultural sector;
-Insufficient developed system of food safety.

Due to the great diversity of rural areas and the presence of the historic and contextual factors in the realization of changes and developments in agriculture, there exists a diversity of future pathways for the agricultural systems that can prove to be useful in the future. Such pathways, linking social, technological and ecological elements, potentially cover the full range from 'high market modernist agriculture' through a range of other 'future agricultures'. Some possible futures may be highly constrained, given existing conditions, and others may be accepted as the 'right' path. But a broader assessment requires an opening up of such debate, unlocking biases and constraints, both intellectual and practical. [6]

The main principles which are laying in the transformation of agricultural systems in the Republic of Moldova are the following:

-The size of agricultural farms is determined by the challenges that stand in front of them;

-Diversification of agricultural businesses production;

-The development of non-agricultural activities in rural areas

-Decrease of dependence on the imported resources

-Ecological agriculture

-Focus on the added value in agriculture

-Investment in human capital development in rural areas

With principles of sustainability defined, the key question arises on the issues of policies elaboration and implementation. The problem is how to respond to the administrative, technical and managerial challenges related to the mobilization of necessary resources for agriculture modernization. As many studies show, Moldovan agriculture is not receptive to the innovation in many domains. It provokes many problems for the innovational system, research and extension services. Civil society considers that efficiency of the institutional framework is insufficient.

The Ministry of Agriculture on the basis of the model of other European countries has adopted the basic premise - to fully utilize the national scientific research resources in the agricultural sector. This challenge is possible to meet, because Moldova has the research resources that can address the needs of virtually every segment of this sector. The transition to a market economy, however, entails the need to reorganize the existing resources of research, so that they serve directly the development of agriculture and the current market requirements. [5]

For the Republic of Moldova food safety problem represents a strong need for the further development of the agricultural sector. Food safety and quality is the essential part of existence, welfare and quality of life. Consumers from the Republic of Moldova reasonably expect from the government that they will create the conditions for providing the population with food in accordance with international safety standards. Moldova's goal is to ensure the delivery of safe and quality food, as for its own population, and for the export. The prerequisites for the food safety provision exist and the Minister of Agriculture and Food Industry continues working in this direction. [2] The Republic of Moldova has made a significant effort for harmonization of technical regulations with the international standards for food, fact that would ensure the consumer's and human health protection, the conditions for loyal competition, commercial falsifications and technical barriers.

Moldova is ensured with the public health, veterinary, phytosanitary and quarantine laboratories at the national and district levels. Alongside with the public, private laboratories are located within the food industry companies. Central laboratories are the most are equipped, where are provided diagnostic and confirmatory tests, there exist a collection of samples tested, there are adapted and distributed methods for analysis and quality control for the smaller laboratories. Moldova has preserved old system of verification; witch includes the administrative bodies responsible for the control of individual stages in the food chain from producers to consumers. The intersection of authority and common responsibility of many ministries and agencies in the area of food security, leads to the holding of multiple inspections, conflict of interests and poor environment for agribusiness. The strategic goal of the Government is to reform the system of quality control of food. For achieving these goals it is necessary to accomplish the following strategic objectives:

-The improvement of legislation that will ensure a greater harmonization with the international legal norms and standards that reflect all aspects of food productions from the field to the table of the consumer, including the production of animal feed;

-Creation of the National Agency of Food Safety, which is charged with the responsibility of the implementation of several key objectives for managing all aspects of the food quality from the field to

the table of the consumer, including those of the rapid alert systems, dialogue and communication with consumers, as well as with the national agencies and scientific organizations;

-Control of food quality, which will provide a uniform procedure for the activities of the national system and inspection through the appropriate distribution of authority and responsibility among all government agencies involved in the food safety issue.

All marked problems should be solved on the basis of the need to improve the quality of management system of food, ensuring compliance with technical requirements, both for export and for domestic market.

CONCLUSIONS

The socio-economic changes from the rural areas can not be conceived under the old paradigm of development. There are different visions regarding the agricultural systems development, with the focus on technologies, agro-ecology and innovations.

Moldovan agriculture is characterized by a high share of subsistence farms, low labor productivity and respectively, the high production costs. Agricultural systems based on the economic growth through innovations represent the main pathway that provides transformation from the subsistance agriculture to a modern agri-food system.

Taking into account this context, it is obvious that it is necessary to support the sustainable development of the agricultural systems in the conditions of growing uncertainty at the global level.

It could be provided by a set of activities for resource conservation and appropriate technologies of land cultivation.

Maintaining the production capacity of agricultural land is a strategic national security concern. Implementation of environmentally friendly technologies in agriculture to increase soil fertility will help to ensure food security and increase agricultural production for export. It should be achieved through the integrated approach of the usage of different resources, such as natural, economic and human dimensions.

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EXACT NAVIGATION OF SMALL AGRICULTURAL MOBILE ROBOTS WITH THE UTILIZATION OF LASER RAY

Ondrej TAKÁČ [1], Lukáš TOMÁŠIK [1], Dušan HRUBÝ [1], Zuzana PALKOVÁ [1]

[1]Slovak University of Agriculture in Nitra, Trieda A. Hlinku 2, 949 76 Nitra, Slovakia,
Phone: +421 6415 489, +421 6415 301, Fax: +421 7417 003, E-mail: dektf@uniag.sk

Corresponding author :takac.ondrej@gmail.com

Abstract

Nowadays in agriculture there is a raising application of mobile robots and this increases the demand on better punctuation of their work. The autonomous mobile appliances have to be capable of independent working in both outside and inside environments. When working inside the agricultural buildings, we usually do not have enough GPS signal. That is the reason of our GPS free solution. We cannot accomplish punctual navigation with the use of only one navigational method. In mobile systems, we properly use navigation based on a relative navigation. However, there is a disadvantage of the occurrence of an error which grows during the working time. This error needs our correction and we can therefore use the method of total navigation, as it is in our case. Our theme is focused on the laser correction of the odometrical navigation errors which is a part of relative navigational methods. The greatest advantage of this system is the exact establishment of the position in coordination network, thereby also the increase of the exactness of mobile robot devices.

Keywords **:** *mobile robotics, navigation, total navigation, laser navigation*

INTRODUCTION

In our work we are dealing with the navigation of small autonomous agricultural robots and also with the increase of the exactness of relative navigation with a total method application. The usage of relative navigation in ideal circumstances, in our case it is odometrical navigation, is characterized by high exactness. In real circumstances, as the working time of mobile device is growing so the rate of accuracy is constantly falling. Therefore we need such correction which can eliminate the inaccurateness of the position establishment with the help of relative navigation. This solution has to state with relative navigation the actual position of the mobile device and to set one single error for the whole working place. For this purpose we can utilize modulated infrared light or a laser.

MATERIAL AND METHOD

Laser (*Light Amplification by Stimulated Emission of Radiation*) is a monochromatically coherent light source which is characterized by narrow focus and high energy. This narrow focus creates an effective assumption for the accurateness of the measures, as well as for exact navigation. The principle of the function lays in a detection of laser ray. The first step has to be the rotary laser light source installation onto the board of the mobile device. We tested the proper function of navigation method on the model of mobile robot we made for this purpose which is also equipped with relative odometrical navigation. If we will take into consideration e.g. an autonomous mower, then the working place will be some field with parameters: width x length. On the stable positions we put receivers with noted parameters, the best in the corners of the field. As we rotate the laser in constant speed the angles between the field corner and the mobile device will change, depending on the actual position of the device. These angles will be prescribed by the passing of the laser ray over the corner detectors. Let us mark the corners with numerals 1,2,3 and 4. Then we can describe the time period that makes the laser ray during the movement from the corner 1 to the corner 2 in a following way:

t_{1-2} and we set the angles according to the formula: $\alpha = t_{1-2}$, $\beta = t_{2-3}$. The same refers to the further γ and δ angles and for the sum of all angels we can set the formula, where $t(i)$ is a sum of all times:

$$\sum_{i=1}^{i=4} t(i) = 360°.$$
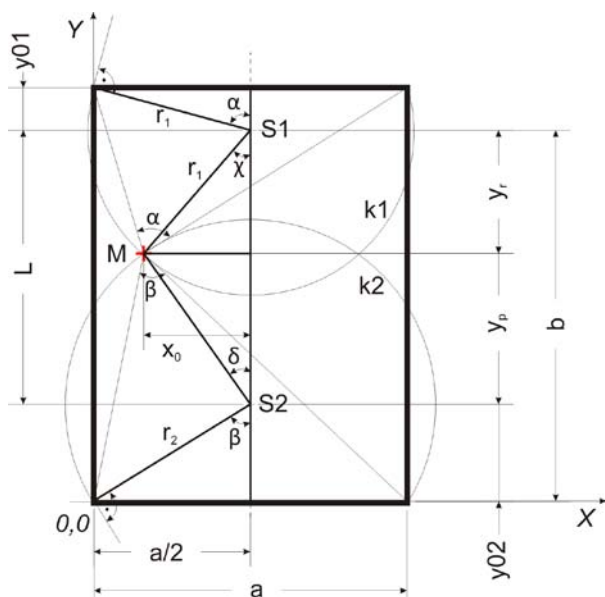
In the picture we introduce the case of rectangle:

Fig. 1. The principle of the actual position setting for the point M in the coordinate system.

We set the actual position according to the formulas:

$$M : [\frac{a}{2} \pm x_0 \ , \ y_{02} + y_p]$$

Where:

$$x_0 = \sin \delta \cdot r_2$$

$$y_{02} = \cos \beta \cdot \frac{a}{2 \cdot \sin \beta}$$

$$y_p = \cos \delta \cdot r_2$$

After the modification, for coordinates x and y is valid the following:

$$X : \left[\frac{a}{2} \pm \sin \left(\arccos \left(-\frac{\left(\frac{a}{2 \cdot \sin \beta}\right)^2 - \left(\frac{a}{2 \cdot \sin \alpha}\right)^2 - \left(b - \left(\frac{a}{2 \cdot tg\alpha} + \frac{a}{tg\beta}\right)\right)^2}{2 \cdot \frac{a}{2 \cdot \sin \beta} \cdot \left(b - \left(\frac{a}{2 \cdot tg\alpha} + \frac{a}{tg\beta}\right)\right)} \right) \right) \right]$$

$$Y : \left[\frac{a}{2 \cdot tg\beta} + \cos \left(\arccos \left(-\frac{\left(\frac{a}{2 \cdot \sin \beta}\right)^2 - \left(\frac{a}{2 \cdot \sin \alpha}\right)^2 - \left(b - \left(\frac{a}{2 \cdot tg\alpha} + \frac{a}{tg\beta}\right)\right)^2}{2 \cdot \frac{a}{2 \cdot \sin \beta} \cdot \left(b - \left(\frac{a}{2 \cdot tg\alpha} + \frac{a}{tg\beta}\right)\right)} \right) \right) \cdot \frac{a}{2 \cdot \sin \beta} \right]$$

Repeatability is an important parameter in the evaluation. It enhances the punctuation of localization during working in real circumstances. Therefore we had to make a set of measurements from one specific point and to set the maximal error from the results we got.

RESULTS AND DISCUSSIONS

While measuring with infra red light we get non-evidentiary results. Things that influenced this were in large extent were reflections which caused also some position deformation. The result obtained by the software *Lm_HS Software* is displayed in the following picture:
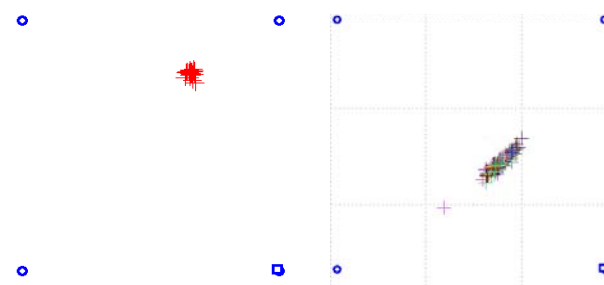

Fig. 2. The results of measuring with IR light in optimal conditions on left side, in non-optimal circumstances on right.

The outcome from the upper figure is that in optimal circumstances the error made $\pm$ 25 cm. In the second case of non-optimal circumstances the error was too big and for that reason we even did not estimate it.
When we wanted to substitute the IR light it was also the modification of the system was needed. For scanning the IR light we made a particular light detector with optical and electronic features. The result of 340 measurement of stating the position in coordinates x ad y is illustrated in Fig. 3.
In the picture we marked 2 monitored positions on the axis x and on y we showed the number of measuring repetitions. Then we can appoint 2 borders of punctuality: the gentle punctuality which is represented by

horizontal lines and the rough punctuality illustrated with vertical lines.
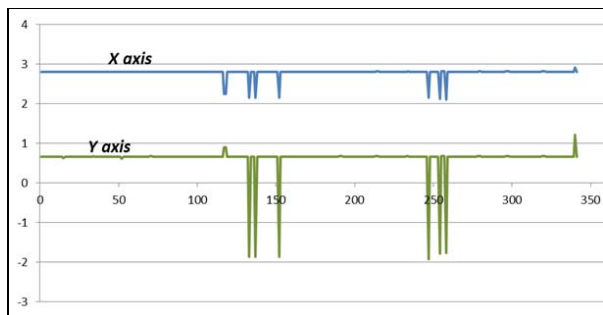

Fig. 3. The result of repeated measurements in particular position

Because the rough punctuality deviates the coordinates of mobile device markedly from both the actual and previous positions, we can filtrate it via software. Afterwards, in the repetition of 340 measurements we get for the axis x and y the following results:
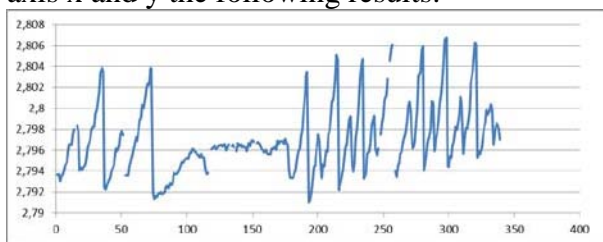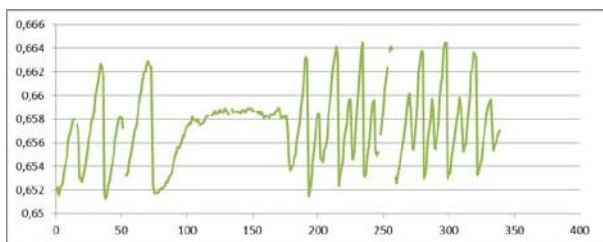

Fig. 4. The development of punctuality in x axis

Fig. 5. The development of punctuality in y axis

Then we can assert, that the punctuality of total laser navigation on the field 10x8m is approximately 2cm. Reading from the graphs we can set the position of mobile robot in the *xy* coordinates into 2,80 x 0,659 m.

CONCLUSIONS

In conclusion we have to maintain that this method had been applied statically. It means that for establishing the position the mobile device has to be fixed on one exact place. For our purpose it was satisfactory because the navigation method is taken as a correcting one and not as the main one. The punctuation of ±2cm could be refined with more punctual construction of the optical part and with the improvement of laser rotations speed. In our case, for the field of our size the optimal speed is 0,869 Hz. Also the exactness could be improved via laser output. We were attentive for the safety and therefore the output of the laser was < 2.5 mW.

This method could be applied also when mobile robot is moving, but for this case the algorithm must be mathematically adjusted.

ACKNOWLEDGEMENTS

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THE EFFECT OF PESTS ATACK ON THE QUALITY PARAMETERS OF ROMANIAN WHEAT CROPS

Radiana Maria TAMBA BEREHOIU [1], Stela POPESCU [1], Ciprian Nicolae POPA[2]

[1]University of Agricultural Sciences and Veterinary Medicine, Bucharest
59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 21 318 25 64/232,
Fax: + 40 21318 28 88, E-mail: radianatamba@yahoo.com; sazzpop@yahoo.com
[2]S.C. Farinsan S.A., Grădiştea vilage, Comana commune, Giurgiu district, Romania
Phone:+40 727 27 78 40, Fax: +40318156038, Email: cipnpopa@yahoo.com

Corresponding author : radianatamba@yahoo.com

Abstract

There have been analyzed 292 samples of Romanian wheat, from the 2007 to 2011crops, in order to assess the influence of the pests attack, upon the main quality parameters of wheat. In this respect, there have been analyzed the following physical and chemical indices: Hectolitric mass (kg / hl), Humidity (%), Protein content (%), Wet gluten content (%), Falling number (sec), Deformation index (mm), Gluten Index parameters, Content of seeds damaged by various pests (%), and the content of seeds damaged by Eurygaster (%). The results showed a significant influence of seeds damages, caused by various pests, on all the quality parameters of wheat, excepting the Falling number.

Keywords **:** *wheat quality, crop pests*

INTRODUCTION

The crop losses, caused by pests in wheat seeds, were estimated in the ninetieth to 13.9% of the world production. The losses represented about 40% of a total, that included also the plant diseases and weeds [1].
In Romania, the losses of wheat caused by pests, were estimated in the same period to about 9% of the total crop, representing 32% of the total damage caused by disease, weeds and pests [2].
The effects of pest attack on technological quality of wheat are relatively less studied in our country. For this reason, we believe that our approach to analyze the impact of the attack of pests on the main quality parameters of wheat, is of great interest to specialists in agriculture and food industry.

MATERIAL AND METHOD

We chose for analysis 292 wheat samples of the years 2007 to 2011, taken from the southern Romania, to assess the effect of the attack of pests, on the baking quality of wheat.

For each sample of wheat were determined the physical and chemical parameters listed in Table 1, according to the appropriate standards.

Table.1. Quality parameters determined for the 292 analyzed wheat samples and the methods of analysis we used.

Quality parameter	Method of analysis
Hectolitric mass (MH, kg/hl)	STAS 6123/2-73
Moisture (M, %)	SR ISO 712/1999
Protein content (P, %)	ICC 159-95 (NIR method, Perten Inframatic 8600)
Wet gluten (WG,%)	SR ISO 21415-2:2007
Gluten deformation index (GDI, mm)	SR ISO 21415-2:2007
Gluten Index (GI)	ICC 155-94
Falling number (FN, s)	SR ISO 3093:2005

The extent of the attack of pests was estimated due to certain parameters such as: the Content of seeds damaged by various pests (SDP,%) and the Content of seeds damaged by *Eurygaster sp*. (SDE,%), determined according to ISO 7970.
The results were interpreted statistically, using specific software, StatSoft, Inc. (2004). STATISTICA (data analysis software system), version 7. www.statsoft.com.

RESULTS AND DISCUSSIONS

The main estimates of variability for the analyzed wheat samples are presented in Table 2.

Table 2. The estimates of variability for the analyzed wheat samples (n = 292)

Quality parameters	M ± SD*	CV** (%)
MH (kg/hl)	76.166 ± 3.147	4.131
M (%)	12.591 ± 0.815	6.473
P (%)	14.108 ± 2.043	14.481
WG (%)	30.847 ± 6.857	22.229
GDI (mm)	10.050 ± 7.026	69.910
GI	45.317 ± 27.062	59.717
FN (s)	334.334 ± 73.996	22.132
SDP (%)	3.039 ± 3.382	111.287
SDE (%)	1.777 ± 2.266	127.518

* Mean ± standard deviation; **coefficient of variation

As seen from Table 1, the analyzed wheat samples were highly heterogeneous, regarding the content of seeds damaged by various pests or bedbugs (the coefficients of variation associated to the SDP and SDE parameters have exceeded 100%). This is due to the heterogeneity of the analyzed samples from five successive harvests taken from various areas of culture in the southern Romania. Nevertheless, the analyzed samples were relatively homogeneous in terms of the values of MH, M and P parameters.

The wheat quality parameters, dependent on its enzymatic activity, GDI, GI and FN, showed relatively high variation coefficients.

The WG parameter presented a higher coefficient of variation (22.229%) than the coefficient of variation of the protein content (P, 14.481%). This variability difference between the two parameters, which theoretically are strongly correlated, can be attributed to the method of determining the Wet gluten parameter (due to endogenous enzymatic activity developing during the analysis).

In terms of the average values of the quality parameters: Hectolitric Mass, Moisture, Protein content, Wet Gluten and Falling Number, the analyzed samples are considered to have optimal characteristics for processing in milling and baking industry. However, the values of the Gluten Deformation Index and Gluten Index parameters, show the poor quality of gluten.

The number of the seeds damaged by various pests exceeded on average by 50% the maximum values allowed by the official technical standards (SR ISO 7970).

Also, nearly 60% of all seeds damaged by various pests (expressed in percent by weight), were the wheat seeds damaged by bedbugs (*Eurygaster sp.*).

Table 3 shows the correlation coefficients between the. quality parameters of the analyzed wheat samples and their significance.

Table 3. Values of the correlation coefficients between the quality parameters of the analyzed wheat and their significance.

Pairs of parameters	r	Significance*
M – MH	-0.22	***
FN – MH	0.29	***
FN – M	-0.32	***
P – MH	-0.53	***
P – M	-0.06	ns
P – FN	0.00	ns
WG –MH	-0.45	***
WG – M	-0.05	ns
WG – FN	-0.06	ns
WG – P	0.89	***
GDI – MH	-0.40	***
GDI – M	-0.12	*
GDI -FN	0.10	ns
GDI – P	0.28	***
GDI – WG	0.13	*
SDP – MH	-0.38	***
SDP – M	-0.17	*
SDP -FN	-0.00	ns
SDP – P	0.36	***
SDP – WG	0.29	***
SDP – GDI	0.53	***
SDE – MH	-0.26	***
SDE – M	-0.17	*
SDE -FN	0.05	ns
SDE – P	0.23	***
SDE – WG	0.16	*
SDE – GDI	0.61	***
SDE – SDP	0.81	***
GI – MH	0.40	***
GI – M	-0.09	ns
GI -FN	0.17	*
GI – P	-0.21	**
GI – WG	-0.19	*
GI – GDI	-0.61	***
GI – SDP	-0.39	***
GI – SDE	-0.46	***

significant (p<0.0500), **distinct significant (p<0.0100), *** very significant (p<0.0010)

Our research regarding the effect of the seeds damages on the quality of Romanian wheat from harvest 2007 – 2011, revealed the existence of a significant correlation between

the percentage of grains damaged by pests (including *Eurygaster sp.*) and most wheat quality parameters). Basically, the only quality parameter of wheat, which is not significantly correlated with the content of seeds damaged by pests, is the Falling number (Table 3). This parameter, which reflects the grain amylasic activity is influenced by endogenous and environmental factors, that were not taken in this research study (genotype, temperature, humidity, etc.).

In table 3 we can notice that nearly 66% of the variation of SDP is due to variation of SDE (r = 0.81 ***), which confirms that for the studied wheat samples, the species of the *Eurygaster* genus, were the main species of pests which influenced the quality.

Figure 1 shows that as the percentage of seeds damaged by various pests or by species of the genus *Eurygaster* increases, the hectolitric mass decreases. This phenomenon is caused by the effect of seeds damages on the geometry of grains, on the one hand and by the effect of seeds damages on grain weight, on the other hand. Broken seeds, partially consumed, cause the growth of intergranular spaces and the change of the mechanical properties of the grain mass. Partially consumed grains have a smaller specific weight than the whole grains and therefore determine a lower volumetric density.

Although the attack of pests, including the genus *Eurygaster*, on the Hectolitric Mass of grains was very significant, only 14.4% of Hectolitric Mass variation can be explained on account of pests attack. Also, only 6.75% of the Hectolitric Mass variation can be explained due to the number of seeds damaged by *Eurygaster sp*.

Although many studies associate the effect of seeds damages with an increase in grain moisture, we obtained for the SDP - M pairs, respectively SDE - M pairs, a negative correlation (r = - 0.17 *). Therefore, seeds damaged by pests tend to have lower humidity. The increasing of grain moisture, reported by various studies, may be probably correlated with the metabolism of insects, so with their actual presence in the grain mass.
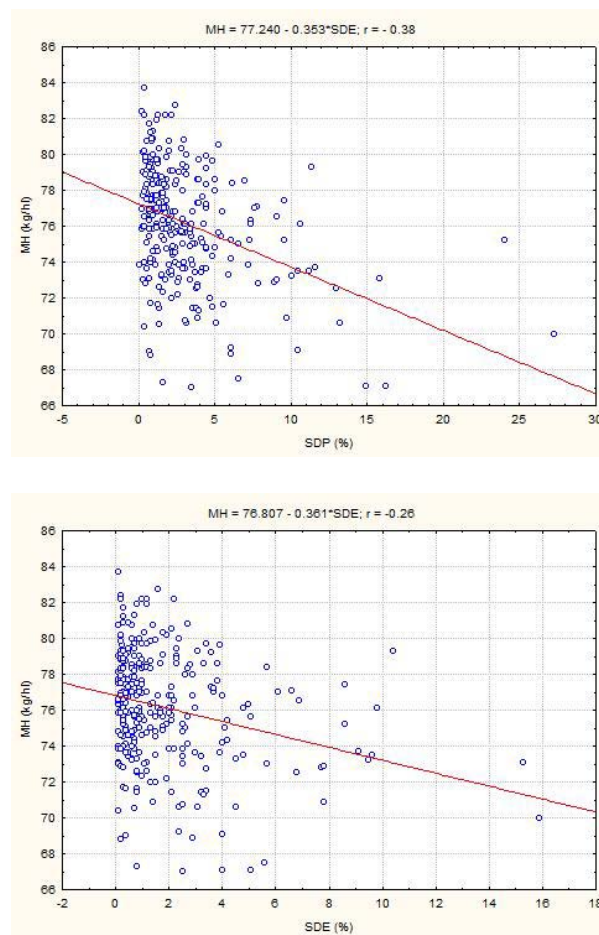

Fig.1. Regressions MH - SDP (top) and MH - SDE (bottom) in the analyzed wheat samples

SDP and SDE parameters do not necessarily take this into account. They measure the effect of the attack at some point, when the pests population may already be destroyed. Decreasing the moisture content can be attributed to several factors: on one hand, pests consume mostly the endosperm of the grain, whose humidity is higher than the humidity of the outer shells, and on the other hand, destroying the integrity of grain can lead to significant water losses, by increasing the transfer surfaces with the environment.

The significant consumption of polysaccharides contained in the endosperm may also be an explanation for increasing protein content, simultaneously with increasing the percentage of seeds damaged by pests (Figure 2). Some studies have shown that this phenomenon is true for whole wheat, but not for flours derived from grains with high percentage of seeds damaged by pests. If

flours, the protein content is the smaller, the higher the attack is. (*El-Dessouski* and *El-Kifl* **1976**, *Salunkhe et al* **1985**, and *Girish et al* **1975**, citaţi de *R. I. Sánchez-Mariñez*, **1997**) [3].
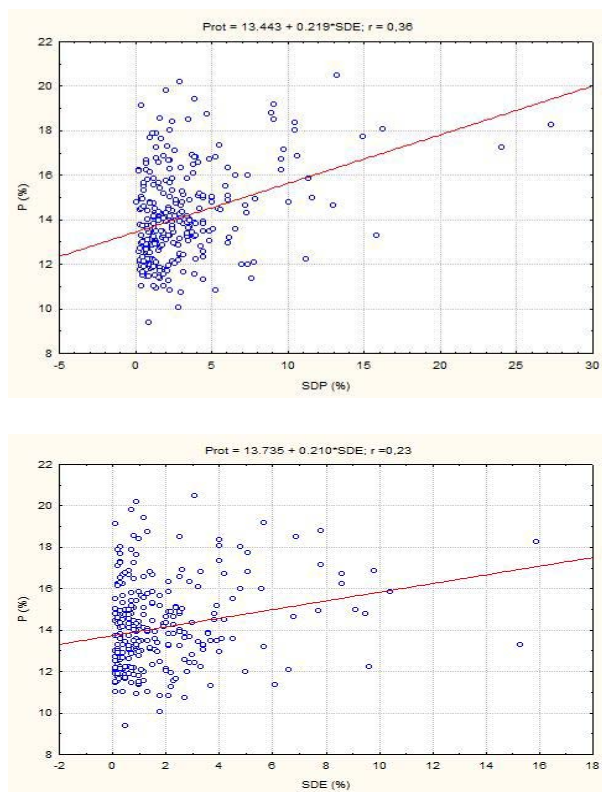

Fig.2. Regressions P - SDP (top) and P – SDE (bottom) in the analyzed wheat samples

A similar explanation can be taken into account when Wet Gluten parameter, which increases very significantly as pests grain content increases (r = 0.29 ***). If regression of Wet Gluten content and Content of grains attacked by *Eurygaster sp.*, the Wet Gluten content increase is significant (r = 0.16 *). The effects of the attack of pests are best expressed in the parameters describing the quality of gluten, ie Deformation Index and Gluten Index. Deformation Index, which expresses proteolytic activity of wheat, increases very significantly as the percentage of seeds damaged by pests increases (Figure 3).

About 28% of the Deformation Index parameter variation can be explained by the percentage of seeds damaged by various pests, and 37% of its variation can be explained by

the percentage of seeds damaged by bedbugs. This very strong dependence between the extent of seeds damaged by pests and the value of the Deformation Index parameter, is due to the exogenous proteolytic enzymes that insects transfer to the grain, in order to consume the its endosperm.
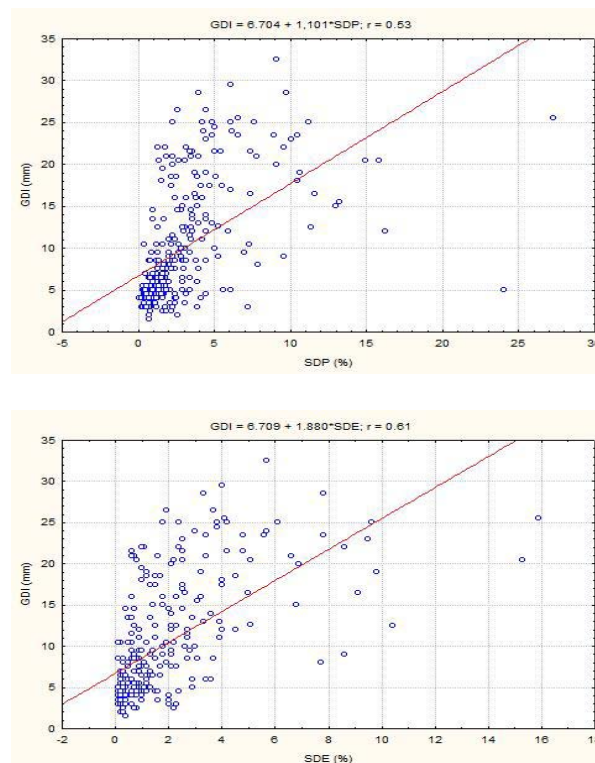

Fig.3. Regressions GDI - SDP (top) and GDI – SDE (bottom) in the analyzed wheat samples

Gluten Index decreases very significantly as the percentage of seeds damaged by pests increases. However, the attack of various pests only explains by 15.2% the variability of the Gluten Index parameter, while the percentage of seeds damaged by *Eurygaster sp.* only explains by 21.16% of its variation. The results suggest that most of the variability of the Gluten Index parameter is dependent on other factors including: genetic endowment (range, variety), applied plant growing and climatic conditions, through the vegetation period (Figure 4).

The percentage of seeds damaged by wheat bedbugs, presented however stronger correlation with gluten quality parameters (GDI and GI), than the total percentage of seeds damaged by various pests. This suggests

that the GDE is a better predictor for gluten quality than the percentage of seeds damaged by pests (GDP).

The gluten quality parameters GDI and GI can be estimated on account of multiple regression models. Thus, for GDI, the best predictors are: Hectolitric Mass, Moisture, Protein content, Gluten content, Falling Number, Content of seeds damaged by *Eurygaster sp.* and Gluten Index parameter, according to the model in Table 4.
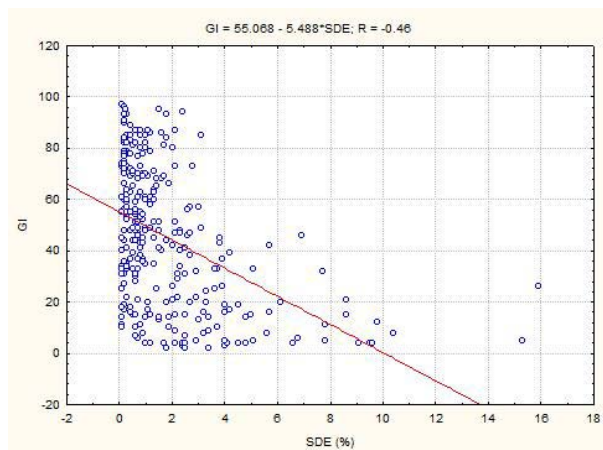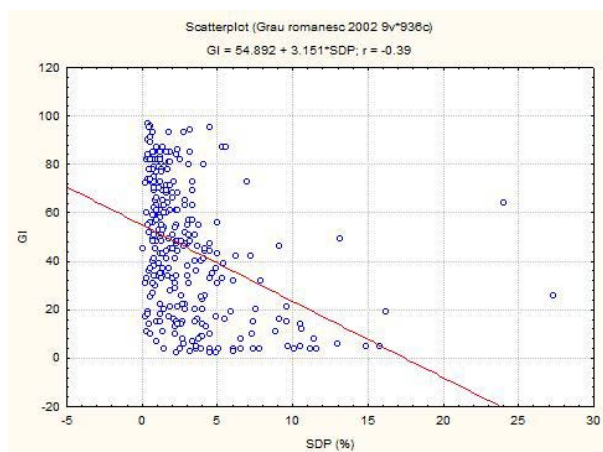

Fig.4. Regressions GI - SDP (top) and GI – SDE (bottom) in the analyzed wheat samples

Table 4. Multiple regression predictive model of the Deformation Index parameter value due to other quality parameters of wheat.

GDI	MH	M	FN	P	WG	GDE	GI
=	-0.22	-0.10	0.16	0.32	-0.37	0.32	-0.41
R = 0.77; r^2 = 0.60; F = 60.85; p < 0.00001							

The model in Table 4 explains 60% of the change in the Deformation Index parameter. As for the GI parameter, the best predictors

were the following quality parameters: Humidity, Falling Number, Protein content, Wet Gluten content, Deformation Index and percentage of seeds damaged by *Eurigaster sp.* (as seen in Table 5).

The model presented in Table 5 explains 46% of the Deformation Index change. Our results show that pests attack has a complex influence on the main quality parameters of wheat. Our study is an argument for implementing all necessary phyto and technical measures needed to combat pests, since their action is not limited only to quantitative crop losses.

Table 5. Multiple regression predictive model of Gluten Index value due to other quality parameters of wheat.

GI	M	FN	P	WG	GDI	GDE
=	-0.13	0.17	0.22	-0.29	-0.58	-0.15
R = 0.68; r^2 = 0.46; F = 41.26 ; p < 0.00001						

CONCLUSIONS

In the analyzed wheat samples, about 60% of the seeds damaged by pests (expressed in percent by weight), were the wheat seeds damaged by wheat bedbugs (*Eurygaster sp.*). Our results showed that the attack of pests is affecting all the wheat quality parameters, excepting the Falling Number parameter.

The attack of pests affects the quality of wheat gluten, assessed by the Gluten Index and Deformation Index parameters. The percentage of wheat seeds damages caused by bedbugs is a better predictor for GDI and GI parameter values, than the percentage of seeds damages caused by various pests. Also, the GDI parameter expresses better the extent of pests attack than the GI parameter.

There have been described multiple regression equations, which enable modeling the values of the GI and GDI parameters of wheat, due to the values of other quality parameters of wheat and to the percentages of seeds damages caused by cereals bedbugs (GDE).

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RESEARCHES CONCERNING THE EFFECT OF SOME IMPROVING FORMULAS IN MEDIUM QUALITY FLOURS

Radiana-Maria TAMBA-BEREHOIU [1], Ciprian-Nicolae POPA[2], Stela POPESCU [1]

[1]University of Agricultural Sciences and Veterinary Medicine, Faculty of Biotehnologies Bucharest, 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 21 318 25 64/232, Fax: + 40 21318 28 88, E-mail: radianatamba@yahoo.com; sazzpop@yahoo.com
[2]S.C. Farinsan S.A., Grădiştea vilage, Comana commune, Giurgiu district, Romania
Phone:+40 727 27 78 40, Fax: +40318156038, Email: cipnpopa@yahoo.com

Corresponding author : radianatamba@yahoo.com

Abstract

Two enzymatic preparates having mixed amylasic and hemicellulosic activity (Bel'ase PG 3098 and Alphamalt A 17098) and a preparate with L - cysteine were tested both separately, and in combination with citric acid, on a medium quality wheat flour. Our tests followed the change of the rheological properties of flour, using the alveografical method. Results showed that the enzymatic preparates had a significant decreasing effect on dough resistance and an increasing effect on dough extensibility. Also, we noticed that unlike L-cysteine, the effect of the enzymatic preparates on the energy absorbed by dough kneading (W) was insignificant. However, Alphamalt A 17 098 can be considered the most effective substitute for L-cysteine, in terms of decreasing the alveografic parameter P / L. The effect of citric acid addition on the flour quality has been the increase of dough resistance and decrease of dough extensibility. The citric acid cancelled the influence of the enzyme preparates on the rheological properties of dough, the effect being higher as the citric acid dose was higher.

Keywords **:** *amylase, hemicellulase , L – cysteine, citric acid, alveogram*

INTRODUCTION

Most formulas used to improve the technological properties of flours contain enzymatic preparates (amylase, hemicelullose, glucose oxidases, lipases, etc.), oxidation-reduction agents (ascorbic acid, L - cysteine) and acidifying agents (citric acid, salts of lactic acid etc.).

The alveografic method is considered to be both the most effective method of flour quality assessment and a method of assessing the effect of various impovement formulas on flour quality. Thus, research of *Bloksma* (1957), *Launay* (1979), and *Weipert* (1991), cited by *Dandy and Dobraszezyk* (2001), studies by *Dowell et al.* (1985), *Bettge et al.* (1989) *Addo et al.* (1990), *Dzikie and Laskowski* (2005) *Cabalero et al.* (2007), *C.N. Popa, Tamba-Berehoiu R. et al.* (2009) are significant examples for the ability of the alveografic parameters to correlate both with bread volume and to physical and chemical parameters of flour.

The minimum values of the alveografic parameters of a flour used for producing bread, mentioned in the literature, are different from an author to other, and depend on wheat variety, the area of the crop, the production technologies, etc.. *Lasztity and Salgo* (2002) refer to the Italian system of classifying the wheat quality, where W (deformation energy) suitable flour for usual bread has a value of min. 160×10^{-4} J and a ratio P/L of 0.6 (P represents the Resistance and L represents Dough Extensibility). In France, the baking qualities of flour are judged starting from the technological needs of the production process of French rod. Thus, a value W = 211 has been considered feasible for obtaining it. In Spain, *Lopez Bellido* (1981), quoted by *Belderok et al.* (2000) proposed a classification of flours according to the value of the alveografic parameter Deformation Energy (W). Flours having W parameter values between 200×10^{-4}J and 300

x $\overline{10^{-4}J}$ are considered flours with relatively good baking properties (average), while those with W <200 x 10^{-4}J are considered weak flours. A similar classification has also been used for grains produced in Argentina, whose flours are considered poor if W <200 x 10^{-4}J.

Banu et al. (1999) consider that the features of an alveogram, for a baking flour, must fall within the following ranges: P = 65-70 mm, L = 130-150 mm, G (Extensibility index) = 25-30, P/L = 0.55 - 0.65, and W> 200 cm^2 .

Citric acid is added to the flour in quantities that can reach up to 500 g / 100 kg, in order to modify the acidity of doughs. Changes in pH have significant effects on dough rheology, shown by significant changes of the alveografic parameters, namely: increasing of Resistance P, decreasing Extensibility L and increasing Deformation Energy W.

Addition of hemicellulases to the flour, in order to improve the rheological characteristics of dough and thus to improve the quality of end products, has become common in recent years. This fact is due to the special importance that hemicellulases (especially xilans) have on the technological behavior of dough. In cereals, most complex carbohydrates are pentoses of non-starchy polycarbohydrates, especially arabinoxylans.

The importance of soluble non-starchy polycarbohydrates comes from their ability to bind water in dough until 10 times their mass. Water in dough is related in the same measure by starch, protein and hemicellulose.

Studies showing the positive effect of hemicellulases on bread volume were made by *Haseborg* and *Himmelstein* (1988), *Maat* (*A. Awamori,* 1992), *Gruppen and others* (*A. Awamori*, 1993), *Rouau and others* (1994), *Krishnarau and Hoseney* (1994), *Martinez-Anaya and Jimenez* (1997) [26 -32]. *Monforte et al.* (1997), *Wang et al.* (2003), *Sorensen et al.* (2001).

Certain authors have shown synergistic effect of using hemicellulases with other enzymes, such as glucose oxidases and peroxydase (Hilhorst et al., 1999; *Primo – Martin et al* ., 2005), α- amylases (*Martinez-Anaya şi Jimenez,* 1997; *Gambaro et al*., 2006 ; *Chereji et al.,* 2009), amylases, xilanases, celulazele

and proteases (*Harada et al*., 2000), amylases, lipases, glucose oxidases and ascorbic acid (*Tamba - Berehoiu et a*l., 2004).

The main purpose of our research was the obtaining of significant information, in order to optimize the improving formulas of a flour with medium quality; the flour contains enzymatic preparates having amylasic, hemicellulosic and xylanasic activity, and acidifying agents. The effects of flour improvement have been emphasized by the alveografic method.

In accordance with the purpose set out above, we have outlined two main objectives, namely:

- evaluating the effects of enzymatic preparates on dough, in the presence of citric acid;

 - comparative assessment of the effects produced by enzymatic preparates and L-cysteine and study of the possibility of replacing L-cysteine with enzymatic preparates.

MATERIAL AND METHOD

A medium quality control flour, derived from the 2009 harvest of Romanian wheat, has been additivated according to the procedure described in Tables 1 and 2, with the following commercial preparates:

- **Alphamalt A 17 098 (AMLT)** - enzyme complex with hemicellulosic activity (900 u / g AX DNS pH 6.0) and amylasic activity (13 500 u / g DNS pH 5.0) produced by Muhlenchemie (Germany);

- **PG Bel'ase 3098 (BEL)** - mixture of alpha amylases and xylanases, on wheat flour support, produced by Beldem (Belgium);

- **EMCEtrik AK (AK)** - anhydrous citric acid for milling industry, produced by Muhlenchemie (Germany);

- pure **L-cysteine (CYS)** for food industry, from China.

The experimental plan consisted of a series of three experiments, two of which being represented by full bifactorial schemes, with three levels of variation for the factors (Table 1).

 Table 1 shows the experimental scheme applied to the first two experiments, which

tested the improving formulas Bel'ase PG 3098 - EMCEtrik AK and Alphamalt A 17 098 - AK EMCEtrik

Table 1. The experimental bifactorial scheme, used to test the commercial preparates Bel'ase PG 3098, Alphamalt A 17098 and EMCEtrik AK (citric acid)

Exp. code	BEL (g/ 100 Kg)	AK (g/ 100 kg)	Exp. code	AMLT (g/ 100 kg)	AK (g/ 100 kg)
1.2	7.5	0	2.2	7.5	0
1.3	15	0	2.3	15	0
1.4	30	0	2.4	30	0
1.5	0	50	2.5	0	50
1.6	0	100	2.6	0	100
1.7	0	150	2.7	0	150
1.8	7.5	50	2.8	7.5	50
1.9	7.5	100	2.9	7.5	100
1.10	7.5	150	2.10	7.5	150
1.11	15	50	2.11	15	50
1.12	15	100	2.12	15	100
1.13	15	150	2.13	15	150
1.14	30	50	2.14	30	50
1.15	30	100	2.15	30	100
1.16	30	150	2.16	30	150

The third experiment consisted of a partial bifactorial scheme with three levels of variation of the factors L - cysteine and EMCEtrik AK (Table 2).

Table 2. The experimental bifactorial scheme for testing the commercial preparates L – cysteine and EMCEtrik AK

Exp. code	CYS (g/100 kg)	AK (g/100 kg)
3.2	2	0
3.3	4	0
3.4	8	0
3.5	2	50
3.6	4	100
3.7	8	150

As for the control flour, we determined the following quality parameters in three repetitions, in accordance with the standards and methods specified below:
- Moisture content (%), Ash content (%) and Protein content (%) according to ICC Standard No, 202, using the technique NIR (near infrared reflectance) and using the device INFRAMATIC 8600 produced by Perten;
- Wet gluten content and Gluten Index (CCI No, 155);
- Falling number (ICC Standard No, 107 / 1);

- Alveografic parameters: P (Resistance, mm), L (Extensibility, mm), W (energy absorbed by dough, 10^{-4} joules) and P / L (specific ratio Resistance / Extensibility), in accordance with ISO 5530 / 4 .

For each improved variant there have been determined only the alveografic parameters.
The results were interpreted using methods specific for biostatistics analysis, using professional software: Cohort and StatSoft. Inc. (2007), STATISTICS (data analysis software system), version 8.0.

RESULTS AND DISCUSSIONS

The control flour used for tests presented the following quality parameters: **Moisture content** (%) = 14.63 ± 0.06, **Protein content** (%) = 11.77 ± 0.06, **Ash content** (%) = 0.63 ± 0.006, **Wet gluten content** (%) = 27.2 ± 0.53, **Gluten index** = 80.66 ± 2.08, **Falling Number** (sec) = 311.33 ± 13.05, alveograph **Maximum Pressure** (P, mm) = 84.333 ± 3.214, **Extensibility** (L, mm) = 63.667 ± 3.214, **Energy** (W, 10^{-4} J) = 185.333 ± 3.786, **Ratio P / L** = 1.330 ± 0.123. Therefore, the control flour corresponds to the 650 type flour, which is widely used on the Romanian market, for everyday consumption bread. The baking potential of the flour can be considered medium to low, the deformation energy (W) reaches the lower permitted limit and the ratio P/L > 1.

Table 3 presents the results obtained by the application of treatments, according to the schemes shown in Tables 1 and 2 (1.2 - 3.7.experiments).

In table 3 we can notice that the addition of the two enzymatic preparates to the control flour, namely citric acid and L - cysteine, or mixtures of them, induces changes of the alveografic parameters, compared with the specific values of the control flour.

The addition of preparates with mixed enzymatic activity, namely amylasic and xylanasic (PG Bel'ase Alphamalt 3098 and Alphamalt A 17098) determined a decrease of dough strength, compared with the control feature of the control flour; this decline is increasing as the added dose increases. The

same behavior occurs during treatment with L - cysteine, but the effects on dough rheology are stronger.

Table 3. Modification of the alveografic parameters as effect of treatments, for the three improvement formulas (experiments 1.2. - 3.7.)

Treat. 1	BEL*	AK*	P**	L**	W***	P/L
X ± s$_x$ (1.2. – 1.4.)	17.50 ± 11.46	0	75.00 ± 9.64	67.33 ± 6.66	178.00 ± 7.00	1.13 ± 0.24
X ± s$_x$ (1.5. – 1.7.)	0	100.00 ± 50.00	113.67 ± 21.50	43.00 ± 5.29	203.67 ± 26.08	2.71 ± 0.83
X ± s$_x$ (1.8. - 1.16.)	17.50 ± 9.92	100.00 ± 43.30	103.11 ± 19.39	53.22 ± 10.10	216.11 ± 20.29	2.07 ± 0.84
Treat. 2	AMLT*	AK	P	L	W	P/L
X ± s$_x$ (2.2. – 2.4.)	17.50 ± 11.46	0	68.00 ± 7.81	75.67 ± 0.58	176.67 ± 17.93	0.90 ± 0.10
X ± s$_x$ (2.8. – 2.16.)	17.50 ± 9.92	100.00 ± 43.30	95.00 ± 0.20	50.22 ± 11.46	190.56 ± 19.86	2.04 ± 0.80
Treat. 3	CYS*	AK	P	L	W	P/L
X ± s$_x$ (3.2. – 3.4.)	4.67 ± 3.05	0	56.00 ± 10.00	79.67 ± 6.11	121.33 ± 35.50	0.71 ± 0.17
X ± s$_x$ (3.5. – 3.7.)	4.667 ± 3.055	100.00 ± 50.00	65.67 ± 7.50	82.33 ± 4.73	170.33 ± 24.42	0.80 ± 0.14

Units of measurement: *g/100kg; **mm; *** 10^{-4}J

Meanwhile, the addition of citric acid has the opposite effect, of increasing the Resistance parameter, as the added dose increases (Figure 1).

Although treatment with PG Bel'ase 3098 led to an average decline of the value of Resistance P by about 11% compared to the control, this difference was not statistically significant (t = 1.590). Treatments which induced a significant decrease in Resistance P, compared to the the control, were those with Alphamalt A 17098 (t = 3.349*) and L - cysteine (t = 7.108**). Also, treatment with L - cysteine resulted in obtaining significantly lower values of the Resistance P, than the enzymatic treatment with PG Bel'ase 3098 (t = 2.883*). There has been no significant difference between the enzymatic preparate Alphamalt A 17098 and L - cysteine, concerning the effects of decreasing the alveografic parameter P (t = 2.095). This may suggest that Alphamalt A 17098 can be used to replace L - cysteine, in order to reduce dough Resistance.
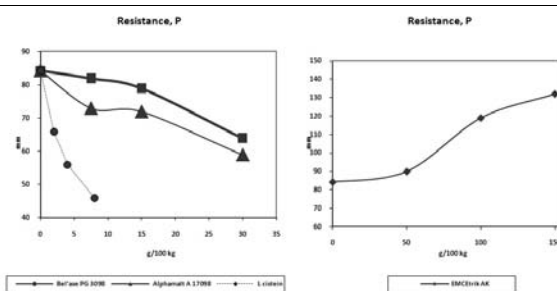

Fig. 1. The influence of treatment with PG Bel'ase 3098, Alphamalt A 17098, L cysteine (left) and EMCEtric AK (right) on Resistance (P)

Increasing dough resistance after treatment with EMCEtrik AK (citric acid) has not been significant (t = 2.336). This was due to large effects of individual treatments with different doses of preparates on Resistance value, the average value of the parameter being characterized by a relatively high coefficient of variation (18.92%).

The addition of PG 3098 Bel'ase did not influence significantly the Extensibility (L) of improved flour, compared with control flour Extensibility (t = 0.858). Contrary, treatment with Alphamalt A 17098 and L - cysteine caused a distinct significant increase, respectively significant increase of the Extensibility compared with control (t = 6.365**, t = 4.014*). However there has been no significant difference regarding the value of alveografic Extensibility. Additionally, there have not been significant differences between the effects of each treatment with enzymatic preparates and the treatment with L-cysteine (Figure 2).

The treatment with (EMCEtrik AK), based on citric acid, caused a distinct significant decrease of the Extensibility, compared with control flour (t = 5.782**).
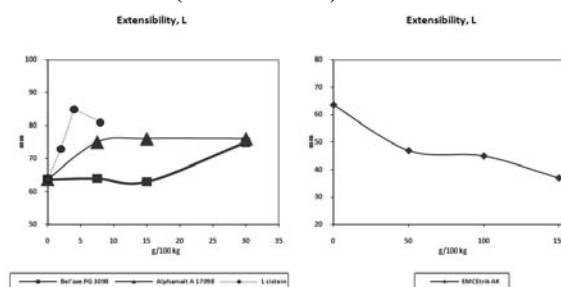

Fig. 2. The influence of treatments with Bel'ase PG 3098, Alphamalt A 17098, L-cysteine (left) and EMCEtric AK (right) on Extensibility (L)

Treatment with enzymatic preparates did not influence significantly the value of the alveografic parameter W (deformation energy), although it decreased slightly. In the case of L - cysteine, the decreasing of the alveografic parameter W has been very strong, as doses of   preparates increased.
 The preparate with citric acid caused a slight (insignificant) increase of the parameter W (Figure 3).
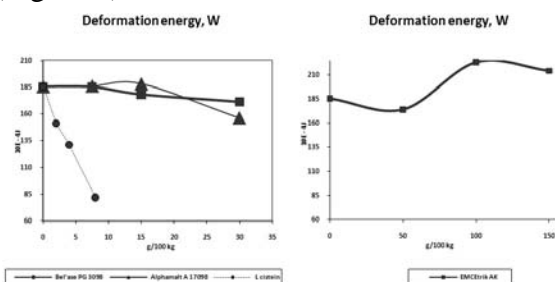

Fig. 3. The influence of treatments with Bel'ase PG 3098, Alphamalt A 17098, L-cysteine (left) and EMCEtric AK (right) on alveografic parameter W

The enzymatic preparates and L-cysteine caused a decreasing of the average values of the P / L ratio of the flour. The decrease was insignificant for the Bel'ase PG 3098 preparate (from 1.33 to 1.12) and distinct significant for Alphamalt A 17098 (from 1.33 to 0.90, t = 4.619**) and L - cysteine (from 1.33 to 0.71, t = 5.119**). Citric acid caused a strong, but insignificant increase of the average value of the P / L ratio, from 1.33 to about 2.71 (Figure 4).
Between enzymatic preparates, as well as between enzymatic preparates and L - cysteine, there were not significant differences regarding the effect on the average value of the P / L ratio. Consequently, the two enzymatic preparates can be used in certain improving formulas for replacing L - cysteine, with greater efficiency than Alphamalt A 17098. Tested   enzymatic preparates, compared with L – cysteine, have the main advantage that do not influence significantly the alveografic parameter W (Deformation energy).
The addition of citric acid (EMCEtrik AK), at the same time with the enzymatic preparates, affected their influence on flour Resistance, cancelling the decreasing effect of this parameter. Combinations Bel'ase PG 3098 -

AK EMCEtrik led to a significant increase in dough Resistance (from 75.000 mm to 103.111 mm, t = 2.360*) compared with the variants using only Bel'ase PG 3098.
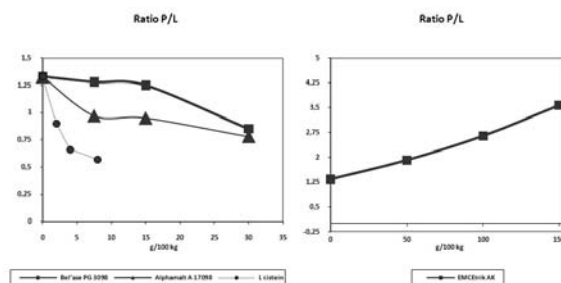

Fig. 4. The influence of treatment with PG Bel'ase 3098, Alphamalt A 17098, L cysteine (left) and EMCEtric AK (right) on alveografic parameter P/L

A similar behavior has been notified for the combination Alphamalt A 17098 - AK EMCEtrik, but in this case the increase of dough Resistance has been statistically insignificant (from 68.000 mm la 95.000 mm, t = 2.209 ns) (Figure 5).
The effects of the combinations citric acid - enzymatic preparates may also be correlated with a decrease of dough pH, influencing the steric configuration of the enzymes and of other protein molecules in dough. As a result, dough tenacity increases. There were no significant differences between the effects of the combinations Bel'ase PG 3098 - EMCEtrik AK and Alphamalt A 17098 - AK EMCEtrik (103.111 mm vs.. 95.000 mm, t = 0.869 ns).
Unlike the combinations Bel'ase 3098 - EMCEtrik AK and Alphamalt A 17098 - AK EMCEtrik, L-cysteine has partly kept the effect of significantly reducing Resistance in combination with citric acid, compared with the control (from 84 333 mm to 65.667 mm, t = 2.672*).
The values of the Resistance parameter, for the flour treated with L - cysteine - EMCEtrik Ak combinations, were significantly lower than the Resistance parameter for the flour treated with combinations of Bel'ase PG 3098 - EMCEtrik AK (65.667 mm compared with 103 111, t = 3.180**) or Alphamalt A 17098 - AK EMCEtrik (65.667 mm compared with 95.000 mm, t = 3.394*).

The effects of the combinations between enzymatic preparates, L cysteine (right) and citric acid on on Resistance parameter (P) are described by the following mathematical models:

P (mm) = 80.926 – (0.476*Bel'ase PG 3098) + (0.325* EMCEtrik AK); [r = 0.934; r^2 = 0.873; F = 51.607***]

P (mm) = 84.123 – (1.075*Alphamalt A 17098) + (0.304* EMCEtrik AK); [r = 0.954; r^2 = 0.910; F = 75.660***]

P (mm) = 84.445 – (6.908*L-cysteine) + (0.232* EMCEtrik AK); [r = 0.929; r^2 = 0.562; F = 28.209***]

The combination of L-cysteine - citric acid has been the most effective in increasing dough Extensibility and was even better than the individual enzymatic preparates. The addition of citric acid in the two enzymatic preparates diminished significantly (PG Bel'ase 3098, from 67.333 mm to 53.222 mm, t = 2.232*) and very significantly (Alphamalt A 17098, from 75.667 mm to 50.222, t = 6.633***) their action on Extensibility, in relation to the variants in which the enzymatic preparates were used without the addition of citric acid.

On the other hand, there have been no significant differences between L - cysteine and L-cysteine – Citric acid mixture, and also no significant differences between the mixtures Bel'ase PG 3098 – EMCEtrik AK and Alphamalt A 17098 - EMCEtrik AK, regarding the effect on Extensibility.

There were no significant differences concerning the Extensibility, between the control flour and the flour improved with citric acid-enzyme preparates combinations, nor between the effects of Bel'ase PG 3098 - EMCEtrik AK and Alphamalt A 17098 - AK EMCEtrik combinations, on Extensibility.

The best models (Figure 6) for testing Extensibility (L) in the control flour were based on the combinations: Alphamalt A 17098 - AK EMCEtrik (F = 56.014***), followed by Bel'ase PG 3098 - EMCEtrik AK (F = 26.567 ***) and L - cysteine - EMCEtrik AK (F = 10.113 **):

L (mm) = 62.910 + (0.310*Bel'ase PG 3098) - (0.164* EMCEtrik AK); [r = 0.883; r^2 = 0.780]

L (mm) = 65.418 + (0.391*Alphamalt A 17098) - (0.217* EMCEtrik AK); [r = 0.939 ; r^2 = 0.882]

L (mm) = 61.790 + (4.501*L – cysteine) – (0.102* EMCEtrik AK); [r = 0.841; r^2 = 0.707]

As regarding Deformation energy (W), the most effective tested combination was that between Bel'ase PG 3098 and citric acid. This has led to significantly higher values of the parameter W, compared both with the control (216.111 x 10^{-4}J compared with 185.333 x 10^{-4}J, t = 2.532*) and with the variant in which the enzymatic preparate has been used alone ($216,111$ x 10^{-4}J, compared with 178.000 x 10^{-4}J, t = 3.104*). This combination has allowed the obtaining of distinct significantly higher values of parameter Mechanical work, against the variant L-cysteine - citric acid ($170\ 333$ x 10^{-4}J, t = 3.241**) and significantly higher than the version Alphamalt A 17098 - Acid Citric ($190,555$ x 10^{-4}J, t = 2.700*).

The modeling of the additives we used (Figure 5 - 7) shows that in the case of the model based on the combination of Bel'ase PG 3098 - EMCEtrik AK, the quantities of enzymatic preparates do not significantly influence the value of the parameter W.

In the model based on the combination Alphamalt A 17098 - AK EMCEtrik, the increasing quantities of enzymatic preparates determines a significant proportional decrease of the value of W. The influence of the added citric acid quantities to the parameter W is nearly double for the combinations with Bel'ase PG 3098, compared with Alphamalt A 17098 (the first combination determines an increase of W by 31% of the added citric acid dose, and the latter combination determines an increase of W only by 16%).

In combinations between L - cysteine and citric acid we can talk about different influences on W. The W is increased with 30.3% of the added citric acid dose and decreased over 11 times of the added L-cysteine dose. The quantity of citric acid used

in combination is important in determining the value of W, for low doses of L - cysteine, while for higher doses of L - cysteine, the amount of citric acid to rely is less important:

W $(10^{-4}J)$=181.787 + (0.007*Bel'ase PG 3098) + (0.310* EMCEtrik AK); [r = 0.796; r^2 = 0.633; F = 12.949***]

W $(10^{-4}J)$=190.901 - (1.039*Alphamalt A 17098) + (0.162* EMCEtrik AK); [r = 0.736; r^2 = 0.542; F = 8.874**]

W $(10^{-4}J)$=179.817 – (11.151*L-cysteine) + (0.327* EMCEtrik AK); [r = 0.954; r^2 = 0.911; F = 46.136***]
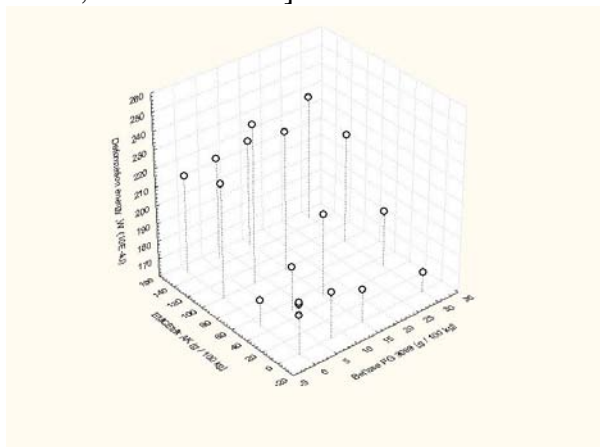
Figure 5. The influence of combinations between Bel'ase PG 3098 with citric acid (EMCEtrik AK) on the alveografic Deformation energy (W)
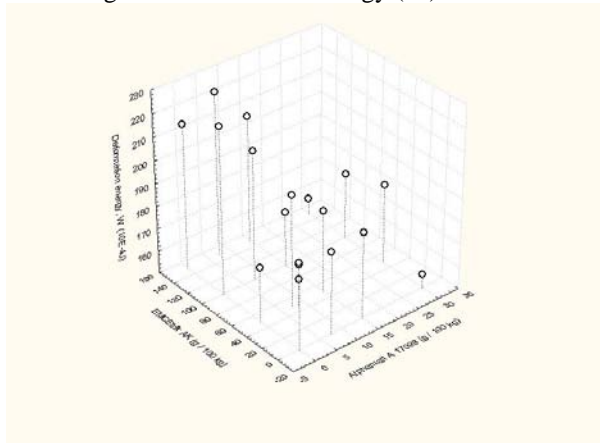
Figure 6. The influence of combinations between Alphamalt A 17098 with citric acid (EMCEtrik AK) on the alveografic Deformation energy (W)

Generally, the P/L ratio has increased with the increasing of the citric acid quantities in combination with enzymatic preparates, and decreased with the increasing of the enzymatic preparates quantities. Compared to the control flour, the combination between L - cysteine and citric acid determined a distinct

significantly decreasing of the P/L ratio (from 1.330-0.803, t = 4.879**), while the combinations of the two enzymatic preparates with citric acid led to a significant increase of the ratio P / L (from 2.074 for Bel'ase PG 3098- EMCEtrik AK, t = 2573*, respectively to 2.039 for Alphamalt A 17098 - AK EMCEtrik, t = 2.562*).
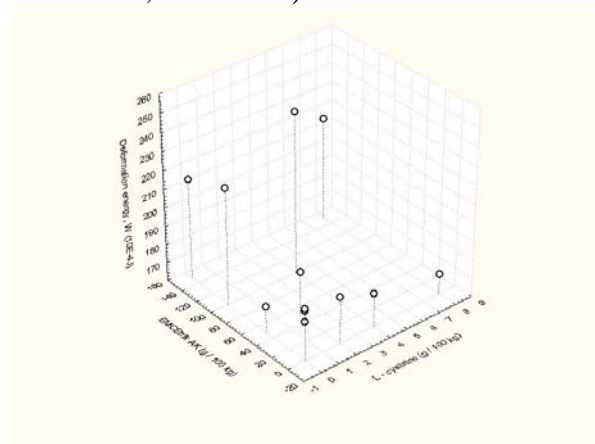

Figure 7. The influence of combinations between L cysteine with citric acid (EMCEtrik AK) on the alveografic Deformation energy (W)

There were no significant differences between the effects of combinations Alphamalt A 17098 - citric acid and Bel'ase PG 3098 - citric acid on the ratio P / L.

Figures 8-10 shows that the three models used for all three combinations are similar and can be used in very good conditions for estimating the values of the P / L ratio. The citric acid increased the value of P / L ratio, with a percentage of 1.3% of the citric acid dose used in combinations with the two enzymatic preparates, and with 0.9% of the citric acid dose used in the combination with L - cysteine.

The addition of enzymatic preparates had the effect of lowering the P / L ratio. This effect was stronger when Alphamalt 17098 was added. Thus, for the same dose of citric acid used in combinations, the decreasing of the P / L ratio was equal to 3.2% of the Alphamalt A 17098 dose and only to 1.9% of the Bel'ase PG 3098 dose. Also, for the same amount of citric acid in the combinations with L - cysteine, the reduced value P / L was 21.5% of the dose of L - cysteine:

1,267 - (0,019*Bel'ase PG 3098) + (0,013* EMCEtrik AK); [r = 0.895; r^2 = 0.801; F = 30.199***]

1,319 - (0,032*Alphamalt A 17098) + (0,013* EMCEtrik AK); [r = 0.956; r^2 = 0.914; F = 79,917***]

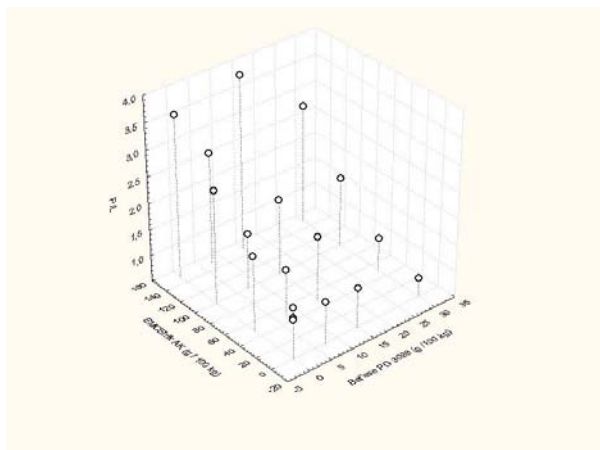1.447 – (0.215*L-cysteine) + (0.009*EMCEtrik AK); [r = 0.858; r^2 = 0.737; F = 12.633**]

Fig. 8. The influence of combinations between Bel'ase PG 3098 with citric acid (EMCEtrik AK) on P/L ratio
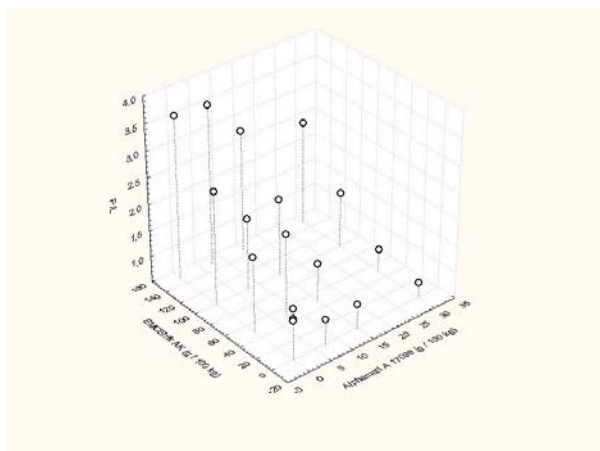

Figure 9. The influence of combinations between Alphamalt A 17 098 with citric acid (EMCEtrik AK) on P/L ratio
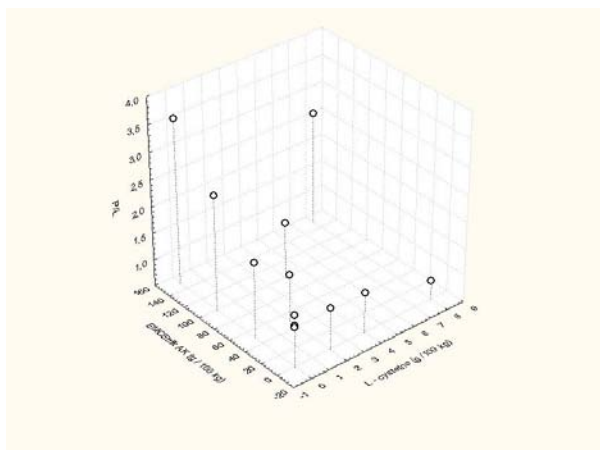

Figure 10. The influence of combinations between L cysteine with citric acid (EMCEtrik AK) on P/L ratio

The models presented above show that the most effective combination to increase the alveografic parameter W was the combination between the biggest quantity of Bel'ase PG 3098 (30 g/100 kg) and the smallest quantity of citric acid (50 g/100 kg citric acid). For this improvement formula we can anticipate a slight increase of the parameter W, with a constant P / L ratio. A similar combination, consisting of 30 g/100 kg Alphamalt A 17098 and 50 g/100 kg citric acid, allows significant improvement of the P / L ratio, but determines decreasing of the value of the alveografic parameter W. This suggests that the two enzymatic preparates could be used together in combination with citric acid, in order to achieve the desired effects of improving the alveografic parameters.

CONCLUSIONS

Our researches shows that the tested enzymatic preparates can be used in improving formulas of flours with low baking qualities, as substitutes of L - cysteine. They have the advantage that they do not modify significantly the value of the alveografic parameter W, but improve significantly the value of the alveografic parameter P / L. Although the two tested enzymatic preparates had similar effects in dough, the enzymatic preparate Alphamalt A 17098 was more effective in lowering the values of Resistance, increasing Extensibility and thus improving the P / L ratio.

Citric acid and L - cysteine had drastic opposite effects on dough rheology. Citric acid increased the Resistance and decreased the alveografic Extensibility, so that higher doses of 100 g/100 kg flour lead to the loss of baking properties. L-cysteine decreased Resistance and increased Extensibility, so that for doses higher than 4 g/100 kg, the baking qualities of the flour decrease to minimum.

Using citric acid in combination with the enzymatic preparates limited their effects on Resistance and Extensibility, so that the value of the P / L ratio becomes unfit for using the

flours in baking. The most effective combination for increasing the W parameter is the combination between Beláse PG3098 and citric acid, but in this case the value P / L has been very high (2.074).

L-cysteine and citric acid mixtures were more effective in lowering Resistance, compared with similar combinations of enzymatic preparates and citric acid and did not significantly influence the value of Extensibility. Thus, the value of the P / L ratio decreased distinct significantly compared with the control, unlike the combinations of the two enzymatic preparates with citric acid, which significantly increased the P / L ratio, compared with controls.

Our research showed that usage of acidifying agents (citric acid) in the improvement formulas, together with enzymatic preparates with amylasic and hemicellulosic activity, reduces the effects of the latter on dough rheological parameters. Combinations of enzymatic preparates- citric acid, can be used to increase the parameter W, while the combinations L-cysteine-citric acid are more suitable for increasing the Extensibility.

The improving formulas of flour, starting from combinations: enzymatic preparates-citric acid or L-cysteine-citric acid, can be optimized based on the mathematical models presented and explained. These models argue that the best results can be obtained by concomitant use of both enzymatic preparates in combination with citric acid.

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DEVELOPING KNOWLEDGE ON USING AND PRODUCING STRUCTURED WATER

Georgeta TEMOCICO

University of Agricultural Sciences and Veterinary Medicine, Bucharest 59 Marasti, sector 1, 011464, Bucharest, Romania, Phone: +40 21 318 25 64/232, Fax: + 40 21318 28 88, E-mail: gtemocico@yahoo.com

Abstract

One of the most important goals of the good agricultural practices is to ensure protection of water, vital essential element of any form of life, whose quality and quantity ensure quality and quantity of agricultural production, but at the same time is very vulnerable to agricultural activities of any kind. The water can be structured, which means restoring its power of resistance and self-purification by transforming molecular clusters into a smaller group which may enter the cells and help oxygen become more available. Using structured water in agronomic ecosystem, for the first time in Romania on plants, harvests and environment, can increasing self-cleaning effect and micro-biological stability. Structured water can determine decreasing the incidences of specific diseases in protected or not protected agricultural crops. Important changes on agricultural products quality and quantity will be expected as results additional as physiological processes caused by slippery structured water, which glides faster, covers surfaces more completely and allows ingredients to dissolve more completely.

*Keywords***:** *agricultural practices, water proprieties,*

INTRODUCTION

On planet Earth, water is the single most important substance. If you do not have water you do not have life. It is the driving force behind all the various environments and ecosystems that make up our world. It is the factor in regulating all weather systems. It keeps the temperature of the earth stable. It has the ability to clean, absorb, and transport any other substance. In fact it is present everywhere and because of this we tend to forget about it's importance and take it for granted.

Water is a crystal. A crystal is programmable just like an electronic mini-chip and has the ability to retain memory. Thus, water also has the ability to retain memory [1].

The human body contains 70-75% water; science now says it could be much higher. At 10% loss dehydration sets in, at 20% loss death is usual. It regulates our whole metabolism, millions of complex bio-chemical processes occurring every day. It is not always the amount of water or even the purity that governs your health; it is the quality of the water. Thousands of years ago water had certain characteristics in respect to oxygen content, surface tension and solubility.

How close to this ideal water do you think your current drinking water is, if it is tap water, bottled water or treated by ozone, chlorine, fluoride, reverse osmosis, distilling.

What characteristics makes one water healthy another unhealthy? After chemicals contaminants, the next most important are physical properties. Changes in the way water flows and changes have profound effects on detoxification. The way water flows is governed by surface tension. When a drop of liquid is placed on a membrane, the drop either spreads into a thin uniform layer or remains in a discrete drop. The degree of interaction between the drop and the surface is known as "wetting" [1].

"People say that we are what we eat. I say that we are what we drink. Water is the most important thing you put in your body, but not all water is equal. Everywhere on earth, water has different physical characteristics, no matter where you travel, and many waters have what they call anomalous properties", said Henri Coanda to Patrick Flanagan the man who took over from Romanian scientist the "water of life" in 1963. In that year, the American was only 17 years, but work at the Pentagon. There, they have been met. "Henri Coanda told me: I have a project! I have

worked for it my whole life. I do not think I will be able to complete. I wish to entrust it to you, for further research," remembered Flanagan, now a renowned scientist.

The water can be structured, which means restoring its power of resistance and self-purification by transforming molecular clusters into a smaller group which may enter the cells and help oxygen become more available. Many top scientists worldwide, among them: Henri Coanda, David Schweitzer, Masaru Emoto, Johann Grander, Viktor Schauberger, Nikola Tesla, Alexander Gurwitsch, Vladimir Kondratov, Patrick Flanagan, Yurii Rakhmanin, had remarkable discoveries concerning the living or structured water and his applications.

Nanotechnologies have opened this millennium with incredible possibilities for life extension and increase in quality of life. The fantastic work of Dr. Patrick Flanagan is brought alive by his peers who describe him as one of the most incredible scientists since Nikola Tesla's groundbreaking work with energy [2].

RESULTS AND DISCUSSIONS

Since the '90, concerns about the negative impact of farming on the environment, natural resources and even human health had increased. There are somewhat mistaken idea that industry and urban waste water discharges are the main factors affecting human health and pollution of nature. The data from monitoring water quality, air and soil indicate a substantial number of hazardous chemicals and toxic products from agriculture and which are found in foods. Agriculture became an important source of environmental pollution and permanent and especially water. In terms of agricultural development, agricultural production and rural development by default, there is a legitimate question: can this growth be sustained without prejudice to the environment and human health? This difficult issue has been addressed with the concept of sustainable agriculture, whose promotion is a complex, laborious and expensive.

In this respect it is necessary to achieve several objectives: increase agricultural production to ensure consideration of conservation and protection of renewable natural resources; ensuring people's essential needs in the context of rural development; protect human health and the environment; new quality assurance processes to increase production; to conserve and enhance the stock of resources; ensure technological restructuring and maintaining control of possible risks; regulatory measures to ensure legal application of scientific research and development of information services.

Based on the latest scientific knowledge and production technologies, can be developing and implementing integrated plans and programs, many valid ecological agricultural practices and measures of evaluation and monitoring, in a view to contribute of the achievement of the objectives listed above.

As an Earth being, water has life and death. Any incorrect, ignorant handling, it becomes diseased, and inducing this condition to all other organisms, vegetable, animal and people, causing some physical decay and death, and in the case of human beings, their moral, mental and spiritual deterioration as well. From this it can be seen just how vital it is, that water should be handled and stored in such a way as to avert such pernicious repercussions.

The crucial factor that affects the health and energy of water is temperature.

According to Schauberger, the behaviour of water as a liquid differs from all other fluids. "The latter become consistently and steadily denser with cooling, water reaches its densest state at a temperature of +4° Celsius (+39.2° Fahrenheit), below which it grows less dense. In contrast, water's behaviour is anomalous, because it reaches its greatest density at a temperature of +4°C (+39.2°F)." It is the "anomaly point", or the point of water's anomalous expansion, which is decisive in this regard and has a major influence on its quality. Below this temperature it once more expands. This highest state of density is synonymous with its highest energy content, a factor to be taken carefully into account, since

energy can also be equated with life or life-force. Therefore if water's health, energy and life-force are to be maintained at the highest possible level, then certain precautions must be taken, which will be addressed later [3].

Another of its life-giving properties is its low specific heat - lowest at +37.5°C (+99.5°F). The "specific heat" refers to the capacity and rapidity of a body to absorb or release heat. With a relatively small input of heat, fluids with a high specific heat warm up less rapidly than those with a lower specific heat. How strange then, and how remarkable, that the lowest specific heat of this "inorganic" substance - water - lies but 0.5°C (0.9°F) above the normal +37°C (+98.6°F) blood temperature of the most highly evolved of Nature's creatures - human beings. This property of water to resist rapid thermal change enables us, with blood composed of 80% water, to survive under large variations of temperature. Pure accident, or it is clever, symbiotic design?! Since we are used to thinking about temperature in gross terms (car engines operate at temperatures of 1,000°C (1,832°F) or so and many industrial processes employ extremely high temperatures) and despite the fact that we begin to feel unwell if our temperature rises by as little as 0.5°C (0.9°F), we fail to see that non-mechanical, organic life and health are based on very subtle differences in temperature. When our body temperature is +37°C (98.6°F) we do not have a "temperature" as such [3].

One of the biggest enemies of water is excess heat or over-exposure to the sun's rays. It is a well-known fact that oxygen is present in all processes of organic growth and decay. Whether its energies are harnessed for either one or the other is to a very great extent, if not wholly, dependent on the temperature of the water as itself or in the form of blood or sap. As long as the water-temperature is below +9°C (+48.2°F), its oxygen content remains passive. Under such conditions the oxygen assists in the building up of beneficial, high-grade micro-organisms and other organic life. However, if the water temperature rises above this level, then the oxygen becomes increasingly active and aggressive. This aggressiveness increases as the temperature rises, promoting the propagation of pathogenic bacteria, which, when drunk with the water, infest the organism of the drinker [4].

Ordinary water has a high surface tension which means it has a difficult time wetting the cells within the body. In the body, cell membranes are phospholipids (fats) have low surface tensions of about 45 dynes/cm[5]. Normal tap water has a surface tension of 73 dynes/cm which means that the water is able to move cells through the body, but is not capable of penetrating the cell. This water passes through the body but cannot penetrate cells without lower surface tension. [6]The wetter water is "slippery." Slippery water glides faster, covers surfaces more completely and allows ingredients to dissolve more completely. In the body, water with lower surface tension fully hydrates. Without low surface tension toxins cannot be removed from cells and the cells die due to accumulation of their own waste products [7]. These waste products are compounded by the many hazardous chemicals, such as perchlorate and pesticides typically found in the body due to tap water and food contamination. The cells must be in contact with water that has a low surface tension, in order to leave the toxins and to enter the nutrients the cells. Thus, a low surface tension environment is optimal for cellular health. Lower surface tension equals faster toxin removal and a healthier body[7].

Using Grander technology water that has undergone magnetized treatment returns to its natural energy level, preserves essential minerals thus making it more digestible, magnetized water improves digestion as this treatment lowers surface tension and makes the water more conducive for nutrients. Water treated by bio-magnetism conveys oxygen to every organ of the body and creates an oxygen-rich environment and destroys anaerobic organisms (cancer is an anaerobic). It creates minute water clusters that enhance cell ability to cope with stress, neutralizes the pH in the water and brings it to the normal pH level of the body [8].

Using structured water in an agronomic ecosystem – crop management in protected and

non-protected crops, for the first time in Romania, we can have as results increased self-cleaning effect and micro-biological stability. Structured water can determine decreasing the incidences of specific diseases in protected or not protected horticultural crops. Important changes at fruits quality and quantity will be expected as results additional as physiological processes caused by slippery structured water which glides faster, covers surfaces more completely and allows ingredients to dissolve more completely.

Reduce energy consumption while increasing performance and competitiveness of fruit technologies in the production of fruits, obtaining higher quality products, clean, ensuring safety and consumer welfare, protecting the environment and promoting sustainable development-oriented on agricultural areas are the most current targets at the national and international level.

There are many questions which may have answers after the project implementation: How can influence structured water the agro ecosystem, the life plant in natural or artificial conditions, relations between parts of biological systems, the level quantitative and qualitative of the horticultural crops, their storage capacity? Exists in Romania a natural source of structured or living water or an environment unique given by water source?

CONCLUSIONS

Collecting data from each type of water involved in natural environment (underground water groud water, rain water) on Romanian area, concerning physical, chemical and microbyological indicators, we can descover the natural water proprieties which are very close to the structured water proprieties.

Using structured water in crop management technologies for agronomical species and cultivars, based on *observations, determinations and data collecting concerning biological and agronomical indicators* (biological sequences of each cultivars from each species; behaviour of plants to frost, drought and other stress factors; behaviour of plants to diseases and pests in lack of pesticides; productivity level and inputs-

outputs ratio; evaluation of horticultural fresh products quality pre and postharvest concernig: general aspects, taste), it will be possible to create ***new important sequences in conventional crop technologies***.

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HIGHLIGHTS IN MATCHING LABOUR WITH LABOUR MARKET NEEDS IN THE REGION OF SOUTH-WEST OLTENIA

Victor TITA

University of Agricultural Sciences and Veterinary Medicine, Bucharest, Romania
Faculty of Management, Economic Engineering in Agriculture and Rural Development, Slatina Branch, 150, Strehareti Street, Zip Code: 0500, Slatina City, Olt County, România, Phone: 0767911444 E-mail: victortita@yahoo.com

Corresponding author: victortita@yahoo.com

Abstract

This paper emphasizes the importance of several items in linking labour with labour market needs in the region of South-West Oltenia. By reference to the proposed research objectives, research instrument was a sociological survey, representing two sets of questions for two distinct target groups: unemployed and representatives of companies in the region. These instruments allowed an assessment of labour market in South-West Oltenia region, the present study highlighting some aspects of skills that alleged employee should had, from two perspectives: the representatives of companies in the region and the perspective offered by unemployed from the same region. The conclusions are outlined also in two ways. From the perspective of employers, who, in the common sense, said that much of the unemployed had satisfactory professional competences and perspective of unemployed showing that the main reasons for accepting a job were economic: accordingly wage and salary increases.

Key words: unemployed, employers, labour market, region of South-West Oltenia

INTRODUCTION

South-West Oltenia represented 10.5% of the total population of Romania, about 2.258 million inhabitants in 2009. In South-West Oltenia reduction registered from one year to another is greater, accounting for around 0.5% -0.7%, between 2002 and 2009 the population decreased by 3.9% - about 90,000 people less. Male population is in steep decline. In the South-West Oltenia unemployment rate is rising in 2009, 76,000 people being unemployed. Unemployment in the region is around the national average and is equivalent to 6.8%. In the region the male population suffered more closely than the female, with an increase of 5.9%[4].

In 2009, the South-West Oltenia vacancy rate in economic sectors is 0.7%. Agriculture, narrow industry and constructions have lower rates (0.2 to 0.3%). Conversely, public and social services, have relatively high percentages: activities department with residential care specific reached 4.7%, and social activities to 1.7%. The highest percentage of vacancies presents the medium-education professions.

South-West Oltenia has a share of GDP of the country of nearly 8%. Agriculture is the most important contribution to GDP by about 18%. South-West Oltenia area developed over time industry, too, main areas being: non-ferrous metallurgy, electrical and mechanical engineering industry, chemical industry and light industry, building materials and food industry. In this economic context, services accounted for almost 39% of the region's GDP [2,3,4,5,6,7,8,9, 10].

Table 1.Real GDP growth over the previous year

Real GDP growth over the previous year						
	2005	2006	2007	2008	2009	2010
ROMÂNIA	**4,2**	**7,9**	**6,1**	**6,5**	**6,1**	**5,8**
South-West Oltenia Region	**-2,2**	**9,0**	**6,0**	**6,5**	**5,9**	**5,8**
Dolj	-1,9	9,0	6,2	6,5	6,0	5,8
Gorj	0,2	9,2	5,3	5,9	5,3	5,3
Mehedinţi	-8,5	7,1	6,9	6,8	6,3	6,1
Olt	-5,2	9,6	5,4	6,7	6,1	6,0
Vâlcea	1,3	9,1	6,4	6,7	6,0	5,9

In terms of other development regions of Romania, South-West Oltenia has close indicators to the others indicators.

Prospective for the next three years estimates starting the positive growth of industrial production. This coordinate will depend upon regional socio-economic circumstances and the ability of firms to absorb some of the labour force and find financial resources.

MATERIAL AND METHOD

Sociological research conducted by two separate questionnaires aimed primarily to obtain information about complex psychosocial phenomena generated by national labour market dynamics and in relation to specific elements belonging to South-West Oltenia region. The research instrument used was questionnaire sociological. Two questionnaires were formed, distinct, for the two target groups: unemployed and company representatives. Omnibus type surveys are conducted.

The questionnaire for the unemployed is structured into the following chapters:

➢ demographic variables and micro (12 questions).

➢ Information and advice (7 questions).

➢ Attitudes and behaviours (1 question).

➢ Unemployed and specific activities (19 questions)

➢ Skills Assessment unemployed (46 variations on a scale from 1 to 4).

➢ Other variables (6 questions).

➢ Questionnaire for companies structure has the following coordinates:

➢ General information identifying the company (9 questions).

➢ Business Environment (3 questions).

➢ Companies and human resource issues (17 questions).

➢ Continuous training (6 questions).

➢ Assessment of skills potential employees (46 variations on a scale from 1 to 4).

The two completed questionnaires allowed an evaluation of skills of unemployed in their own perspective and potential employer, and obtain comprehensive information about specific individual variables and their networking with micro elements (manifested by attitudes, perceptions, behaviours, etc.)

In the South-West Oltenia were interviewed representatives of 139 companies in our area of responsibility. Also, in the same region South-West Oltenia a number of 263 unemployed people have replied to the questioners. Of these, 87 were women (33.1%) and 176 were men (66.9%).

Table 2. Age structure of the sample

Age groups	Number of people	Per cent
18-25	158	60,1
26-35	51	19,4
36-40	22	8,4
41-50	24	9,1
Over 51 years	8	3,0

Young people (people under 35 years) represent almost 80% of subjects with unemployed status that have been investigated. Also, 76.0% of participants were from urban areas, the difference of 24.0% belonging to rural areas [1].

RESULTS AND DISCUSSIONS

Developing research tools allowed an assessment of labour market size in South-West Oltenia by starting with two perspectives: the perspective offered by representatives of companies in the region and the perspective offered by subjects belonging to the target, having the status of unemployed.

Evaluation of transversal competences
Point of view of the unemployed

Below are the results obtained in our research on transversal key skills or competences of unemployed in South-West Oltenia. The analysis of descriptive data can be observed that submits the lowest average communication skills in a foreign language, followed by business skills.

The skills developed in the minds of the trial, are the mother tongue followed by social and civic. What is important to note that none of the media skills assessed does not exceed 3 (well developed) scale with four steps used in the study. Moreover, even the largest environments are located around 2 which means a low scale of development. Overall,

we can say that the perception of the sample of participants on their own skills is not very positive, placing their own level of development at a low level.

Table 3.Descriptive statistics transversal competences Point of view of the unemployed

Descriptive statistics transversal competences					
Evaluated competences	N	Minimum	Maximum	Average	AS
Communication in mother tongue	140	1,00	4,00	2,33	1,00
Communication in foreign languages	140	1,00	4,00	1,62	0,76
Basic numeracy and technical competences	139	1,00	3,45	2,04	0,72
ICT Competences	140	1,00	4,00	2,00	0,99
Self-development competences	140	1,00	4,00	2,02	0,89
Searching a job competences	140	1,00	4,00	2,06	0,80
Social and civic competences	140	1,00	4,00	2,16	0,82
Entrepreneurial sense and initiative	140	1,00	4,00	1,66	0,61

More detailed analyses (analyses aimed the investigation of flattening and skew index and also data distributions on the eight dimensions) conducted showed that over half of those surveyed have communication skills in foreign language at a very low level of development. A similar situation is observed for ICT skills where also there are many people with low levels of this skill, but also the frequency of people with an average level of development of this competence is high. Also personal self-development skills and finding a job manifest a tendency toward negative inclination distribution, towards the bottom of the scale, congruent and with lower average of these skills, indicating that there are in our sample more people with low levels of development of these skills.

Overall, we can say that, based on self-assessments made by research participants in South-West Oltenia, the development of the eight key competences assessed cross is slow, the problem is communication skills in a foreign language and entrepreneurship.

These results indicate that these skills are not independent, but tend to evolve in the same direction, which means that a low level of a competence will tend to be associated with a low cross and the other competences. This is even more important as the skills level of our sample tends to be a reduced one.

Point of view of the companies

The analysis of descriptive data can be seen that, overall, the companies evaluated the competences of persons seeking jobs as being below theoretical average scale. This may indeed indicate a low level of development of these skills from the perspective of corporate representatives.

Investigating the table below, we see that the least developed in terms of employers, are entrepreneurial skills (M = 1.67) and the communication in foreign languages (M = 1.79), two central transversal competences in the European perspective on the development of a knowledge society. The differences between these environments and the other are not very large in the environment under theoretical average scale being and competences to search for a job (M = 1.95) and the personal self-development (M = 1, 85) which could indicate difficulties in shifting people on employment and maintain employment.

Also, mother tongue communication skills along with social and civic skills are evaluated most positively by representatives of employers. These data coincide with those from the evaluations unemployed stands who situate the same two competences at the highest level of development.

Overall, we see also that none of the media do not approach the value 3 of the scale, a value which indicates that a competence is considered to be developed, most ranging between stage 1 - very weak, and 2 - weak developed.

Table 4.Descriptive statistics transversal competences Point of view of the companies

Descriptive statistics transversal competences					
Evaluated competences	N	Minim	Maxim	Medie	AS
Communication in mother tongue	80	1,00	4,00	2,17	0,65
Communication in foreign languages	82	1,00	3,33	1,79	0,60
Basic numeracy and technical competences	82	1,00	3,18	1,97	0,53
ICT Competences	82	1,00	4,00	1,88	0,69
Self-development competences	82	1,00	4,00	1,85	0,66
Searching a job competences	82	1,00	4,00	1,95	0,71
Social and civic competences	81	1,00	3,90	2,03	0,59
Entrepreneurial sense and initiative	82	1,00	3,11	1,67	0,62

Based on assessments made by representatives of companies participating in research in South-West Oltenia, the development of the eight transversal key competences assessed is weak, the most problematic being entrepreneurial skills, communication in foreign languages, and to search for a job. These data draw a warning because the foreign language communication skills and entrepreneurial competences are considered strategic in the knowledge economy and are particularly relevant for efforts of unemployed to identify new strategies of employment [1].

CONCLUSIONS

We present several conclusions written in the research report from the following perspectives:

A. From the perspective of employers:

• For the next three years companies have not imposed the need for clear policy towards its own labour, preferring a kind of status quo (keeping the number of employees).

• From the perspective of employers the most important qualities of their employees are: experience, education, professional knowledge and held specialized skills.

B. From the perspective of unemployed:

• In terms of unemployed, the most relevant information in the counseling process should refer to the training and retraining opportunities existing in the area.

• The main reasons for which they accept a job are economic: appropriate wages salary increases.

• There is a relatively wide dispersion of responses for questions that focused on the causes and reasons for rising unemployment, after completing a vocational training process, they could not integrate vocational and occupational. This prevents a large part of the unemployed to integrate occupational on medium and long term. We could discuss about some "passivity" of the unemployed.

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INVESTMENTS, SUBSIDIES AND IMPLEMENTATION OF SCIENTIFIC AND TECHNOLOGICAL PROGRESS – A LEVER TO ENHACE PHYTOTECHNICAL BRANCH EFFICIENCY

Elena TIMOFTI [1], Diana MEMEŢ[1]

[1]The State Agricultural University of Moldova, Chişinău, 42 Mirceşti st., MD- 2049, Chisinau, Republic of Moldova, Phone +373 22 31 22 58, fax: +373 22 31 76, e-mail: e.timofti@uasm.md, diana.cotruta@mail.ru

Corresponding author : e.timofti@uasm.md

Abstract

For the economy of agricultural enterprises a great importance has investment activity, which directly influences the production potential. Investments for agricultural development have a pronounced innovative nature, material conditions are created to promote the technical progress and scientific research results in agriculture, which would provide the improvement of production means, technologies, forms of production organization and renewal with various types of products (Brassica). Capital investments play a critical role in ensuring economic development and restructuring of agriculture. One of the directions and priority sectors of agriculture which will be subject to subsidy policy is modernization of agricultural sector.
For it will be subsidized investment activities related to creation of agricultural production processing units, provision of technical and agricultural equipment, creation of infrastructure for collecting agricultural products, supply of agricultural inputs, perennial plantations, production of seeds, planting and reproductive material, development of service sector in agriculture, and also construction and restoration of irrigation and drainage systems.

Keywords: investments, subsidies, efficiency, phytotechnics, technical progress.

INTRODUCTION

The investments in agriculture represent the material support of social and economical development of rural space. Through them is ensured the fixed capital enhance, the increase of economic and technical efficiency of existent ones, the creation of new labor places and the raise of the labor productivity. So, the investments represent a decisive element of economical increase of agriculture, including phytotechnical branch, of promoting intensive factor and efficiency ones.

MATERIAL AND METHOD

For present study they were used the data of Statistic Year-Book from the Republic of Moldova and of specialized forms of agricultural enterprises. As a methodological basis they were utilized the following statistical methods: monographic, observation and grouping method, the method of tables, relative and average sizes.

RESULTS AND DISCUSSIONS

Every investor economic agent independently of the investment nature pursues the following objects:
-the modernization of the technical basis in the conditions of agrarian sector reorganization;
-the promotion of technical progress by applying the more rapidly in producing of agricultural production of the results of technological and scientific researches;
-the reduction of the production costs and afferent expenses to the sale and organizing of the production process. The reduction of the production costs is possible in the conditions of raising of the qualitative level of the products and assortment diversification;
-the rational utilization of the investments through the resources potential from which disposes each enterprise, the raise of the capitalization degree of these ones and enhance of economic efficiency of the intensification;

-the qualitative increase of entire activity of marketing, including external commerce and international economic co-operation

Table 1. The dynamics and investments weighting in the fixed capital in the agrarian sector of Republic of Moldova in average of 2001-2010 years

Indicator	Year				
	2001	2007	2008	2009	2010
Investments in fixed capital, total, mil. leis	2315	15336	18225	11123,6	13098,7
Including agriculture, hunting, forestry, mil. .leis	114	743	1031	934,2	995,3
Weighting %	4,9	4,8	5,6	8,4	7,6

Source: Statistic Book-Year of Republic of Moldova, 2009, page 369, 2010 page 370

The dynamics of investments in the fixed capital (table 1) indicates a slight increase. In 2009 in comparison with 2011 the investments value in the fixed capital was of 7,9 times bigger and constituted 934,2 mill. Leis. But the existent weighting of 4,8% and even of 7,6% can not solve the urgent problems of agrarian sector development. The providing of agrarian sector with sufficient energetic and technical means is the principal factor of the production increase and output. According to M.A.I.A data in 2009 the agrarian sector of the Republic of Moldova was provided with technical resources in the following way (units): tractors – 43 thousands, combines – 4,7 thousands, ploughs – 15 thousands, seed drills – 13,6 thousands, which in comparison with the level of 2005 year were respectively bigger by 5%, 24%, 4,8%, 8% and 11%. About 70% from 524 investigated enterprises have an energetic potential at 1 ha arable land and lasting plantations lower than the average of 2,3 hp. It is mentioned that in the last enterprises group the level of 18,4 hp. in the actual conditions we consider it best although the efficiency of agricultural sector in the 5th group is bigger only by 33%. It denotes the fact that in enterprises with high potential of energetic resources in spite of obtaining higher results the energetic potential is not effectively utilized for absence of adequate completing of old units in time. The reinforcement of technical-material basis of the phytotechnical sector finds itself a direct reflection in the indicator of providing agricultural enterprises with tractors. The enterprises divided in groups under the level of providing with tractors with a large pitch of 0,34 units up to 15 at 100 ha denote that only at 29 b% from 483 enterprises the providing level with tractors is from 5,3 up to 15,0 a level to be considered high and best, but the efficiency of the agricultural land in comparison with the average per enterprises increased only by 2,2 times, the labor productivity with 50,5% but the obtained profit per 1 ha by about 4 times. This situation is analogical with the obtained results from the utilization of energetic resources, that is neither tractors potential is not efficient used that denotes the fact that the branches of raising of economic efficiency indicators of intensification are more reduced than of providing with energetic resources and tractors. These researches permit us to ascertain that the primordial condition and principal factor of increasing of intensification efficiency is a best insurance with modern technical resources, with high efficiency outputs and their efficient utilization taking into account the practice of European countries. Nowadays in the agricultural enterprises the depreciation coefficient of fixed means is of 50% and tractors at a level of about 60-70%. This situation requires enormous expenses for current and capital reparation that influences directly to the increase of products costs. We consider that the principal lever for increasing the intensification efficiency of phytotechnical branch remains the technique renewing on a new basis of the scientific technical progress achievement, able to rise the technical level of production. For completing of the fleet with new techniques are utilized different forms of subsidies (direct, indirect) and sources proceeded from credits leasing, etc. as well as the own sources (profit, owner contribution). In this context the implementation of the Food Production Increasing Project 2KR and the delivery under an advantageous scheme of agricultural technique in leasing without TVA, has a particular importance and is considered a support on state part for agricultural producers. The project moldo-

nipon 2KR represents a technical grant whose purpose is the qualitative realization of ploughing with reduction of fuel consumption and the efficientization of harvesting processes. By means of 2 KR project in the period of 2001-2009 years they were secured by agricultural producers more than 280 of combines about 2800 tractors, about 600 units, over 370 irrigation equipments. An impressive activity had the project Investments and Rural Services (SRISP) financed by the Great Britain government through the Department for International Development (DFID) and implemented in co-operation with the World Bank and Britain consultation company Landell Mills LTD that foresees the rural business development, providing with accessible financial resources as well as the training of the farmers. This project was elaborated by the World Bank specialists and those ones from DFID, with direct participation of the government of Republic of Moldova, that is the project beneficiary and special line of World Bank Accreditation, the repayment of the loan by our country being prolonged for a period of 40 years, but the rate of interest constitutes only 1,75 % annually. One of the major preoccupations of SRSIP was the farmers sustaining by their orientation toward the utilization of advanced agricultural technologies by the promotion of profitable agricultural crops. The final goal of this project of technical assistance was the realization of increasing of the life level of rural population by durable and complex development of rural regions. The investigations of 622 agricultural enterprises divided into 5 groups, demonstrate that 29% from these ones benefit of subsidies and subventions (gr. I) in a volume of only 101 leis per 1 ha of agricultural sector, at 47% from enterprises (gr. I-II) amount subsidies at the level of 235-390 leis in average at 1 ha agricultural land, but at 24% of enterprises (gr. IV-V) the subsidies reach 520-1650 leis. Only the level of 1650 lei/ha subsidies and subventions ensure the level of output of the agricultural sector and the efficiency of vegetable production about 2 times higher

than average data. At 1 lei of production consumptions from group V is to receive 0,18 leis subsidies and compensations that constitute a level of 2,5 investigated enterprises. The means of the Fund for Sustaining of Agrarian Sector in 2008-2009 years were directed in the most priority activities. The most weighing of 47,5 – 49,6% was attributed to economic agents and agricultural producers. For example, the agricultural units that effectuate capital investments in a volume that surpass an equivalent sum with 250 thousand USA dollars are spare from the tax on income in a volume of 50%, etc. the taxes system must contribute to provide incentives of agricultural producers in implementation of technical and scientific progressive measures. We consider reasonable that the level of the bank percentage to be differentiated depending on the production type. The facilities must be attributed firstly to those economic subjects that export their production abroad. This policy promoted in UE countries gives the possibility to autochthon producers to ensure currency receipts in such a way improving its economic situation. As part of Development Investigating program of Academy of Sciences is specified the strategic direction 06 "Efficientization and providing of energetic complex and energetic security inclusive by promoting renewable resources" for which in 2009 were allotted 9008,3 thousand leis. An important and rapid contribution in solving of this problem could be the promotion of energetical crops that would ensure the production of at least 50% from the necessary of diesel oil and petrol. But the production of the bioethanol from cereals, sugar beet, potatoes and other agricultural crops can not be a durable solution in Moldova because of low level of the productivity of these crops. A durable and efficient solution for producing bioethanol is presented by artichoke, that ensures from 5-6 up to 10-12 tons of bioethanol from 1 ha, so of 2-3 times more than maize. In opinion of many specialists the artichoke is appreciated as being an energetical crop of the future. It was prepared a program of improvement and

implementation of this crop in Moldova as a bioenergethical source. For producing the biodiesel the realest source is autumn rape (brassica) in value of over 500 mill. leis, as raw material so appreciatively 10 thousand lei/ha, with average efficiency of over 50-80%. In the leader enterprises the production surpassed 3-3,5 t/ha and the output – 100-150%. None of a crop ensure such an output. Although the natural conditions are not the most favorable the market is unsaturated and the dynamics of the prices at brassica as raw material is favorable.

CONCLUSIONS

Under the aspect of the implementation of technological transfer and innovation projects in order to develop intensively phytotechnical branch we consider timely to suggest:

-The selection of leader enterprises with perspective (about 8-10% from the total number profitable) that observe the crop rotation, the system of working and fertilization of the soil that implements the protection integrated system of the plants directed to providing as minimum of unscanty balance sheet of organic substance in the soil and the reduction of the environment pollution having high efficient activities (not less than 50-55% in average), calculated on the basis of multicriterial middle coefficient of the production economic efficiency suggested by the autochthon scientists (3, page 214) that initially would be at the basis of technological implementations and technical progress.

-The selection and promotion the most efficient crops, plant varieties, creation of hybrids, the production of seeding, improvement of cultivation and production technologies with application of irrigation technologies and systems with high and stable outputs bringing the highest profit per unit of agricultural land, with high efficiency and demand on the external and internal food market.

-The implementation of energetical crops based on world new technologies generating high maximum results as artichok, autumn rape (brassica) as the realest sources regenerating of bioenergy (bioethanol, biodiesel and biomass) presenting for Republic of Moldova a great economic and ecological interest.

-The projects implementation with modern technologies for the process organization of processing, keeping, packing, transporting, selling with high profitable results.

-The consolidation and efficient utilization of own financial sources of selected enterprises of physical persons involved in the project, as well as the necessity of directing of considerable financial sources from the state part and attraction of foreign capital.

-The indicators recommendation that would characterize the intensivity level and intensification efficiency in phytotechnics including the application of technologies and means with innovator character, such as: the intensivity level of production in phytotechnical branch taking into account the application of innovational technologies and means; the economic efficiency of phytotechnical area intensification, taking into account of technologies and means applying with innovational character. According with actual tendencies of agricultural production development based on innovational production technologies, these indicators will permit a more exact appreciation of intensivity level of vegetable production and economic efficiency of intensification. But in practice the evaluation of these ones is rather difficult because of indentifying of technologies and means value with innovational character in the total sum of production fixed means and of production current consumptions as well as of the obtained results. In spite of the impediment these indicators must be determined on the basis of analytical accounting as the innovations at this moment represent one of the decisive factors of economic efficiency of phytotechnical production intensification.

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GENETIC GAIN OBTAINED BY INTRODUCTION OF PIONEER CORN HYBRIDS IN ROMANIA OVER FOUR DECADES

Gabriela VALSAN, Ion CIOCAZANU, Valentin MANDACHE, Viorel DINCA

Pioneer Hi-Bred Seeds Agro SRL, DN2, km 19.7, Comuna Ganeasa, Sat Sindrilita, cod 077104, Judetul Ilfov, Romania, Tel: 021.303.53.42, Mobile: 0745 121 744, E-mail: gabriela.valsan@pioneer.com; ion.ciocazanu@pioneer.com; valentin.mandache@pioneer.com; viorel.dinca@pioneer.com.

Corresponding author: gabriela.valsan@pioneer.com

Abstract

Corn PIONEER hybrids representing breeding introduction and cultivation in Romania in several eras (decades) were reproduced and tested during 2008 and 2009. Experiments design was a split-split-plot: four densities were split in two water stress (full irrigated and limited surviving irrigation) while hybrids representing different decades were splits into densities. Full input technology was applied to the trials field and supporting traits were collected and used to estimate the genetic gain. Genetic gain for grain yield expressed as the slope of the linear regression between yield and agronomic traits and years of hybrid registration in Romania was on the overall experimental factors 0,55 q/year at the hybrid maturity group FAO400-500 and 0,80 q/year at the maturity group FAO500-600. Stress level affected significantly the level of genetic gain for yield only in later hybrids (FAO500-600) but in both maturity groups in case of plant densities. Plant and ear height generally were not significantly modified or were slightly reduces while ASI (anthesis silking interval) highly correlated to drought tolerance, was reduced.

Key words: corn, genetic gain, hybrids, *Zea mays* L.

INTRODUCTION

Pioneer has a long successful history in Romania. First significant Pioneer hybrid introduction and cultivation in Romania dates back in 70's. Research activity began also in that period when Pioneer hybrid were submitted to first official registration testing in 1975. Since then to present a continuous flow of improved Pioneer hybrids have been tested, registered, introduced and grown by numerous Romanian farmers, Pioneer becoming meanwhile the first market player in Romania. This was possible due to the genetic superiority of the newly introduced Pioneer hybrids. Genetic gain imbed in the Pioneer hybrids, tested, introduced and cultivated in the last 40 year has not been revealed yet. Local breeding company published relevant data about the size of the genetic gain achieved by their breeding programs. Thus, Sarca reported in 1982 a genetic gain for grain yield of 0.232 t/ha/year in irrigation conditions and 0.141 t/ha/year in dry land condition obtained by Fundulea Institute corn breeding program, focussed on the same maturities groups as those considered in this study [12]; almost similar data were published by Cosmin et all. in 1986 (0.218 t/ha/year in irrigated conditions and 0.205 t/ha/year in rainfed conditions) [3], while later in 1998, Ciocazanu et all. communicated genetic gain values from Fundulea breeding program of 0.108 t/ha/ year under irrigation and 0.058 t/ha/year in non-irrigated conditions [2].

Numerous genetic gain studies were also published in USA and all over the world; significant genetic gains in dry land yield, have been released during the last half century [1,4,6,9,10,11,13]. Genetic progress in yield under dry land conditions was linear, and was responsible for at least half of total yield gain obtained in farm production. Agronomic practices improvement is the source for the other half [7]. The studies are also consistent in showing that yield gain is associated with increases in tolerance to prevailing biotic and abiotic stresses [5,6,8,14].

The present study is aimed to estimate for the first time the genetic gain obtained by the continuous introduction and cultivation of

Pioneer hybrids in Romania in the last four decades.

MATERIAL AND METHOD

A number of 18 top commercial hybrids, representing four decades of continuous introduction and cultivation of improved Pioneer hybrids in Romania (Table1), were tested during 2008 and 2009 in three locations from South Romania: Afumati-Ilfov, Cazasu-Braila and Valul lui Traian-Constanta. Two factorial design trials, according to hybrid maturity groups (mid-late, FAO400-500 and late, FAO500-600), in three replications were used in each location; four plant populations were split into two levels of water stress (non-stressed irrigated and moderate stressed irrigated) and hybrids were split into plant populations.

Table1. Pioneer hybrids, representing four breeding decades, grouped into two maturities groups and their registration year in Romania.

CRM (Pioneer corn relative maturity) / FAO	Hybrid	Year of registration	Breeding decades
100 /400-500	3780A (Axia)	1975	1970-1980
	3747 (Fulvia)	1982	1980-1990
	3737 (Panonnia)	1989	1980-1990
	3615 (Pura)	1991	1990-2000
	3751 (Marista)	1992	1990-2000
	XC277 (Stira)	1992	1990-2000
	37M34 (Ribera)	2001	2000-2005
	36R10	2001	2000-2005
	37F73	2008	2005-2009
	37Y12	2009	2005-2009
103 /500-600	3709 (Sylvia)	1979	1970-1980
	3377 (Luana)	1987	1980-1990
	3475 (Volga)	1989	1980-1990
	3573 (Florencia)	1992	1990-2000
	3523 (Georgina)	1997	1990-2000
	35P12	2002	2000-2005
	35F38	2009	2005-2009
	35T06	2009	2005-2009

Experimental plot consisted of 4 rows (two central rows harvestable) long of 6 m; distance between rows was 70 cm in 2008 and 75 cm in 2009; plant populations used were 59, 75, 89 and 104 thousand plants/ha in non-stressed irrigated conditions and 44, 59, 75 and 89 thousand plants/ha in moderate stressed irrigated conditions. High input technology was applied to trials in all locations and years. Trials were mechanically over planted and manually thined to the desired plant populations at 6 leaves stage. Differentiated managed irrigation regimes were applied, using small splinkler equipment, to ensure the achivement of the two water stress levels. Yield, antesis-silking interval, plant and ear height and number of leaves over ear were collected during vegetation and at harvest. Genetic gain was estimated as the slope (q/ha/year) of the linear regression between yield and agronomic traits and year of the registration of the hybrids.

RESULTS AND DISCUSSIONS

Genetic gain of the yield of top commercial mid-late and late Pioneer hybrids introduced and cultivated in the last four decades in Romania.

Table2. F values and Probability obtained by ANOVA .

Source	Mid-late maturity group 400-500		Late maturity group 500-600	
	F value	Probability	F value	Probability
Year (Y)	1847,5729	0,0000	2975,991	0,0000
Location (L)	312,5443	0,0000	863,5814	0,0000
YL	871,6922	0,0000	1249,9176	0,0000
R(LY)	119,8431	0,0000	88,8584	0,0000
Factor A- Water stres level	4684,1184	0,0000	5314,8207	0,0000
YA	2719,0425	0,0000	2270,8607	0,0000
LA	257,1251	0,0000	552,8138	0,0000
YLA	385,7847	0,0000	314,1803	0,0000
Factor B- Plant population	352,8268	0,0000	200,459	0,0000
YB	9,6987	0,0000	19,5651	0,0000
LB	28,7571	0,0000	21,5274	0,0000
YLB	2,5083	0,0205	5,338	0,0000
AB	12,52	0,0000	7,562	0,0001
YAB	65,7624	0,0000	3,6307	0,0127
LAB	5,5931	0,0000	4,5468	0,0002
YLAB	10,5232	0,0000	6,0951	0,0000
Factor C - Hybrid	240,2579	0,0000	504,0353	0,0000
YC	15,2985	0,0000	14,3516	0,0000
LC	15,2802	0,0000	38,9517	0,0000
YLC	4,2034	0,0000	5,6122	0,0000
AC	4,3145	0,0000	2,5095	0,0149
YAC	2,5559	0,0066	15,3829	0,0000
LAC	4,3096	0,0000	5,7347	0,0000
YLAC	5,4185	0,0000	6,6083	0,0000
BC	7,5615	0,0000	14,5939	0,0000
YBC	2,0658	0,0012	7,5087	0,0000
LBC	3,4856	0,0000	5,3169	0,0000
YLBC	3,4824	0,0000	5,9416	0,0000
ABC	2,3132	0,0002	2,3716	0,0005
YABC	2,5798	0,0000	3,5909	0,0000
LABC	3,0703	0,0000	2,8028	0,0000
YLABC	2,2014	0,0000	3,7598	0,0000

ANOVA data presented in Table2 indicate that environmental factors such as years, locations and particularly water stres levels, as well as all

possible interactions among them induced the largest variation of the grain yield in both experiments.

Plant populations and hybrids are also responsible for large variations in yield. All possible interactions among these two factors as well among these two factors and the environmental factors (years, locations and water stress levels) produces much lower F values, although significant. Yield genetic gain (espressed as the slope between yield and year of the registration), obtained by Pioneer hybrids FAO400-500 tested, introduced and cultivated in the last four decades in Romania, averaged over locations, years, water stress levels and plant populations was 0.55 q/ha/year (Fig.1). Data presented in Table3 show that similar yield genetic gains were obtained by years and water stress levels in the case of this maturity group, but plant populations produced significant different yield genetic gains.
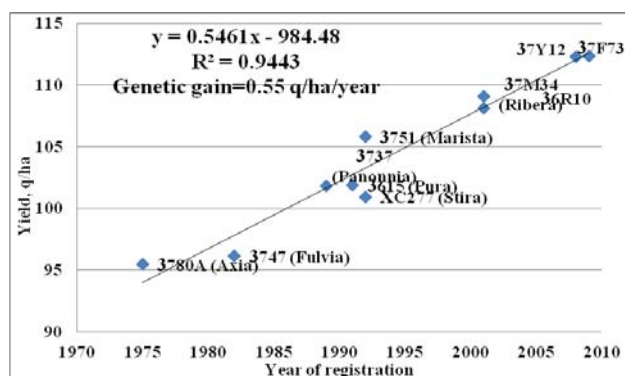
Fig.1 Genetic gain, expressed as the slope of the linear regression between YIELD and year of the registration for mid-late (FAO400-500) Pioneer hybrids introduced and grown in Romania in the last four decades, averaged over water stress levels and plant populations.

Higher plant populations resulted in larger yield genetic gain. Thus, yield genetic gain almost double from the lowest plant population (0.39 q/ha/year) to the highest plant population (0.67 q/ha/year). These data suggest that important improvement of the adaptability to higher populations was achieved by the introduction of the new hybrids. Better tolerance to drought and other abiotic or biotic stresses would be expected since higher plant population, in many ways, could be considered a form of stress because it induces greater intra plant competition for resources. In case of the later

maturity group (FAO500-600) of Pioneer hybrids, general yield genetic gain (averaged over locations, years, water stress levels and plant populations) was 0.80 q/ha/year (Fig.2)
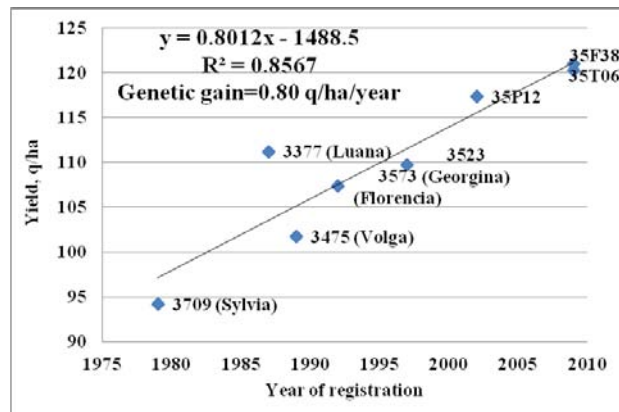

Fig.2 Genetic gain, expressed as the slope of the linear regression between YIELD and year of the registration for late (FAO500-600) Pioneer hybrids introduced and grown in Romania in the last four decades.

Table3. Effect of the year and experimental factors on genetic gain, expressed as the slope of the linear regression between GRAIN YIELD and year of registration of the hybrids for mid-late (FAO400-500) Pioneer hybrids introduced and grown in Romania in the last four decades.

Factor	Graduations	Genetic gain for grain yield (q/year), expressed as the slope of the linear regression between GRAIN YIELD and Year of registration of the hybrids.
General average over years, locations, stres levels and palnt populations	-----	0.55
YEAR (averaged over 3 locs, 2 stress levels and 4 plant populations)	2008	0.58
	2009	0.51
STRESS LEVELS (averaged over 2 years,3 locs and 4 plant populations	Non-stressed	0.54
	Moderate stressed	0.55
PLANT POPULATIONS (averaged over two years, 3 locs and 2 stressed levels)	D1	0.39
	D2	0.53
	D3	0.59
	D4	0.67

Effect of the years and experimental factors on yield genetic gain is more evident in the case of later hybrids, which are generally more affected by drought and heat in the conditions from Southern Romania (Table4).

Yield genetic gain produced by the moderate water stress level was 0.10 q/ha/year lower than non-stressed and consequently, since there were important differences in drought intensity between the two testing years, 0.19 q/ha/year lower in 2008 (significantly drier) than in 2009.

Similarly to earlier maturity group, the highest plant populations resulted in higher yield genetic gains in this later maturity group of Pioneer hybrids (Table4), from 0.69 q/ha/year at lower plant populations to almost 1 q/ha/year at increase plant population.

Table 4. Effect of the year and experimental factors on genetic gain, expressed as the slope of the linear regression between GRAIN YIELD and year of registration of the hybrids for late (FAO500-600) Pioneer hybrids introduced and grown in Romania in the last four decades.

Factor	Graduations	Genetic gain for grain yield (q/year), expressed as the slope of the linear regression between GRAIN YIELD and Year of registration of the hybrids.
General average over years, locations, stres levels and palnt populations	-----	0.8
YEAR (averaged over 3 locs, 2 stress levels and 4 plant populations)	2008	0.71
	2009	0.9
STRESS LEVELS (averaged over 2 years,3 locs and 4 plant populations	Non-stressed	0.85
	Moderate stressed	0.75
PLANT POPULATIONS (averaged over two years, 3 locs and 2 stressed levels)	D1	0.69
	D2	0.69
	D3	0.83
	D4	0.99

Changes in agronomic traits of top commercial mid-late and late Pioneer hybrids introduced and cultivated in the last four decades in Romania.

As already mentioned in the previous chapter there is evidence of an important improvement of the tolerance to **increased plant populations** of the new introduced Pioneer hybrids.
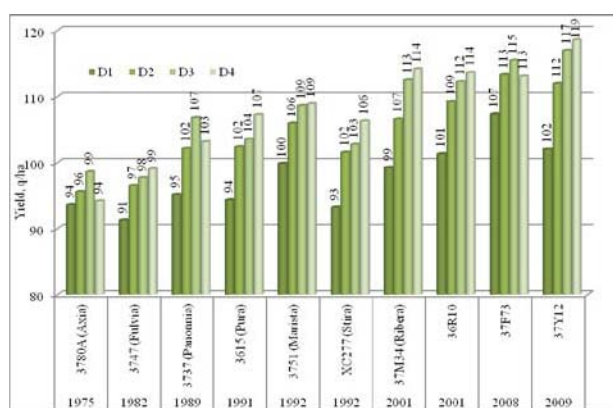
Fig.3 Effect of high plant populations on grain yield of the mid-late Pioneer hybrids (averaged over locations

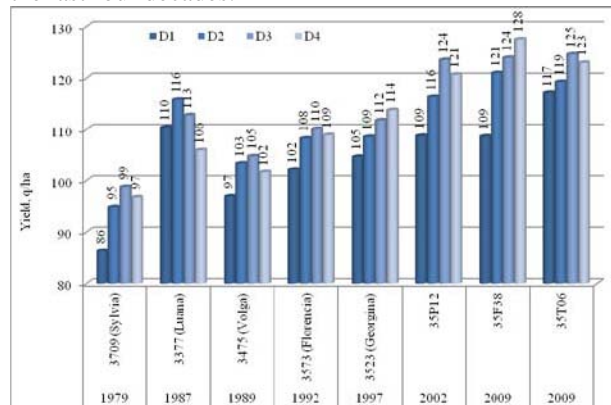and water stress levels), introduced and cultivated over the last four decades.

Fig.4 Effect of increased plant populations on grain yield of the late Pioneer hybrids (averaged over locations and water stress levels), introduced and cultivated over the last four decades.

From Fig.3 and Fig.4, direct comparison of the yield obtained at different plant populations show that the last generation of hybrids produced significantly greater grain yield when tested in increased plant populations.
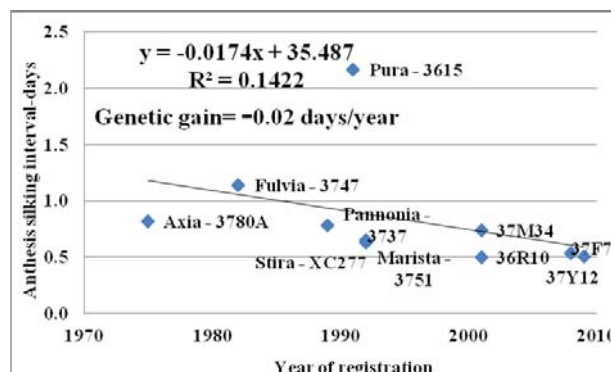

Fig.5 Genetic gain, expressed as the slope of the linear regression between Anthesis silking interval and year of the registration for mid-late (FAO400-500) Pioneer hybrids introduced and grown in Romania in the last four decades.
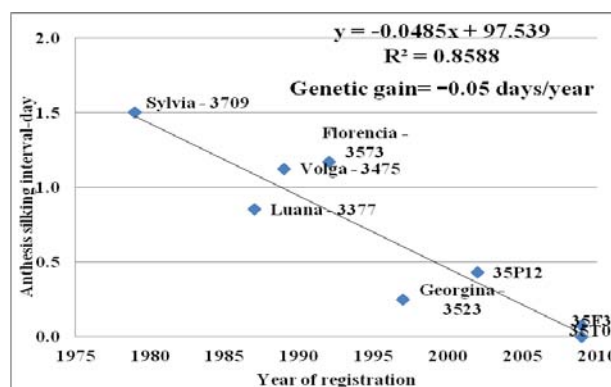

Fig.6 Genetic gain, expressed as the slope of the linear regression between Anthesis silking interval and year of

the registration for late (FAO500-600) Pioneer hybrids introduced and grown in Romania in the last four decades

Shorter **anthesis-silking interval (ASI)** is highly correlated to better tolerance to increased plant population and drought. In the case of semi-late hybrids (Fig.5), ASI almost did not change (0.02 days/year) as compare to late hybrids where more than triple value for genetic gain was registered (-0.05 days/year) (Fig.6). Since no direct selection for this trait was probably performed in introducing the new Pioneer hybrids, these changes in ASI seem to be a correlated response to the improvement of the tolerance to increased plant populations and drought tolerance, particularly in the case of later Pioneer hybrids, were genetic yield gain obtained in moderate stressed conditions was greater than in non-stressed.

Plant height (Fig.7 and Fig.8) and **ear height** (Fig.9 and Fig.10) had slightly tendency to diminish, but generally both traits remained within the same parameters during the whole period considered in this study.
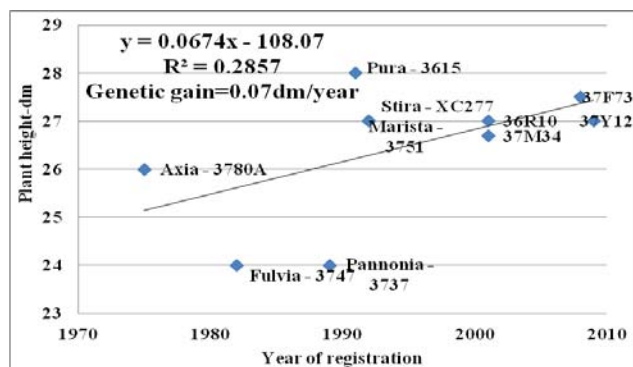

Fig.7 Genetic gain, expressed as the slope of the linear regression between Plant height and year of the registration for mid-late (FAO400-500) Pioneer hybrids introduced and grown in Romania in the last four decades.
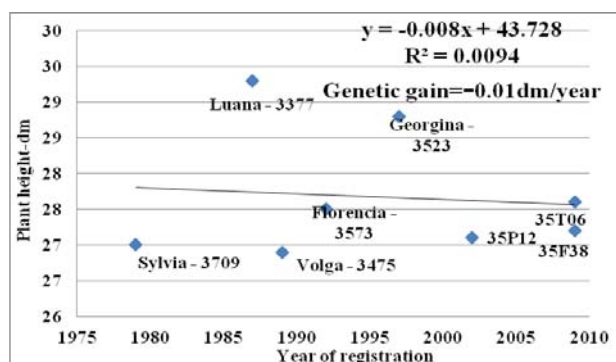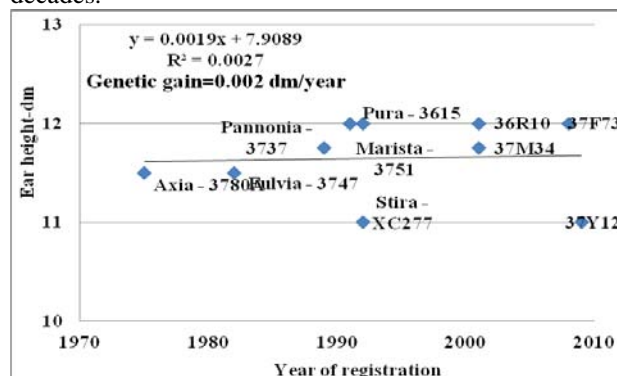

Fig.8 Genetic gain, expressed as the slope of the linear regression between Plant height and year of the registration for late (FAO500-600) Pioneer hybrids introduced and grown in Romania in the last four decades.

Fig.9 Genetic gain, expressed as the slope of the linear regression between Ear height and year of the registration for mid-late (FAO400-500) Pioneer hybrids introduced and grown in Romania in the last four decades.
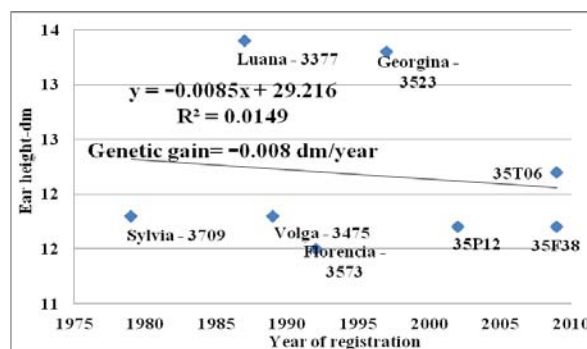

Fig.10 Genetic gain, expressed as the slope of the linear regression between Ear height and year of the registration for late (FAO500-600) Pioneer hybrids introduced and grown in Romania in the last four decades.

Number leaves over ear (only the leaves over the ear supply photosynthesized assimilates after pollination) did not change significantly during the last four decades, although there was a slight tendency to increase, particularly in late hybrids (Fig.11 and 12).
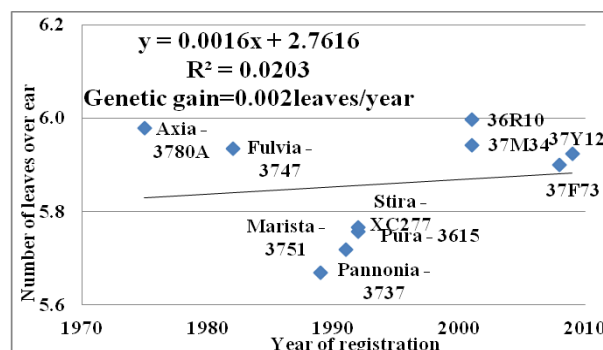

Fig.11 Genetic gain, expressed as the slope of the linear regression between Number of leaves over ear and year

of the registration for mid-late (FAO400-500) Pioneer hybrids introduced and grown in Romania in the last four decades.
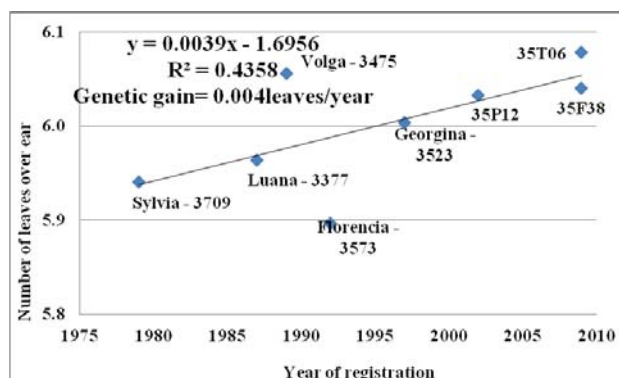

Fig.12 Genetic gain, expressed as the slope of the linear regression between Number of leaves over ear and year of the registration for late (FAO500-600) Pioneer hybrids introduced and grown in Romania in the last four decades.

CONCLUSIONS

A general consistent yield genetic gain was obtained by breeding, testing and introduction of new Pioneer hybrids over the last four decades in Romania.

Yield genetic gain was significantly superior when evaluated in increased plant populations, suggesting that new introduced hybrids over the time had a better tolerance to high plant population.

Increase tolerance to plant populations of the new hybrids was correlated with better tolerance to drought, yield genetic gain in moderate stressed conditions being similar to that obtained in non-stressed for mid-late Pioneer hybrids and even superior for later hybrids.

Anthesis silking interval showed a slight tendency of decreasing as a result of the improvement of tolerance to increased plant populations and drought

Other agronomic traits considered in this study showed non-significant changes if none.

A new corn breeding program for the maturity groups considered in this study was opened in Romania having as aim the releasing of superior adapted hybrid for Eastern Europe, with favorable agronomic traits and good drought and heat tolerance.

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SUSTAINABLE ECONOMICS IN THE FRAMEWORK OF EUROPE 2020: INVESTMENTS IN BIODIVERSITY

George ZHELIAZKOV [1], Darina ZAIMOVA [2]

[1]Trakia University, Faculty of Economics, Management Department, Bulgaria
Student Campus, Stara Zagora, Bulgaria, Phone: +359 888 20 26 63,
E-mail: george-zh@mbox.digsys.bg
[2] Trakia University, Faculty of Economics, Management Department, Bulgaria
Student Campus, Stara Zagora, Bulgaria, Phone: +359 899 80 70 08,
E-mail: dzaimova@gmail.com

Corresponding author: dzaimova@gmail.com

Abstract

In 2008 the European Commission presented a new plan for development of "sustainable industrial policy", which includes biodiversity in the meaning of new markets and opportunities to satisfy demand with particular behavioral characteristics. The economic justification of the business activities in the framework of biodiversity goes beyond the traditional analysis of market prices and expediters. Traditional approaches are easier to be applied in the manufacturing sector, considering the input and output quantitative indicators and price information. Considering the characteristics of the biodiversity and the role of the local governments, it is difficult to define and apply appropriate indicators that represent the level of the market prices, the quality of the services provided and the impact achieved. The present paper aims to develop a new approach in achieving two crucial goals: balance between the economic growth and environmental priorities; and development of a system for financial stimuli for those companies, which follow the criteria for sustainable development. Against this background the general relationship between the agriculture and the biodiversity or the concept of agro-biodiversity; and the multifunctionality in agriculture will be analyzed. The paper identifies the new business opportunities offered by the biodiversity and ecosystem services. It corroborates the necessity of a range of public policy measures at national, regional and local level which will enable a viable business initiatives, cooperation, tax incentives and strict performance standards.

Keywords: biodiversity, agriculture, added value, government policy

INTRODUCTION

Dynamics in the ecological and environmental policy in the last few decades acknowledged biological diversity as the natural capital, which significance and effect indisputably calls for appropriate strategies and intervention measures. In comparison with the financial, informational, cultural, religious, political and even social capital, the misbalance of the biodiversity would be critical with effect of a global threat. Forecasting precisely the consequences stemming from the current rate of biodiversity loss is a matter of substantial uncertainty (Balmford et al., 2003). According to FAO 60 per cent of the world ecosystems degrade or are used unsustainably, 75 per cent of the sea and ocean resources are over exploited and

significantly decrease, and since 1990 75 per cent of genetic diversity in the agriculture has been lost. These negative trends indicate that society is facing the risk of losing both current and future benefits from biodiversity (Vitousek, 1994).

Two are the key factors, which have changed the development directions and research interest in the field of biodiversity. At first place, the so called "reductionism" gave way to the opportunity to perform scientific studies and create knowledge on the base of integrating the complexity of the cases examined. Secondly, social marginalization and social exclusion have emerged as continues and quite problematic processes. The raising debate about the social aspect of biodiversity loss focuses on the emerging economic consequences and the negative

impact over particular society groups. Management of biodiversity also sustained considerable changes. In fact, the unilateral perception for preserving environment has evolved in a mechanism for management and preserving ecosystems, and creating a balance between these systems and the services provided as well. Since these ecosystems could not be independently separated in accordance to their geographical meaning, agriculture and cultivated regions reasonably fall into the group of studied objects while managing biodiversity. This problem has insufficient dissemination among the scientific studies and barely supported by practical scientific results.

THE CONCEPT FOR BIODIVERSITY AND METHODOLOGIES USED

In 1992 the Global meeting of the Earth in Rio and the proclamation of the Convention of Biological Diversity opened a new horizon for biodiversity and issues related. With this strategic document three levels of organization of the living organisms are defined: *ecological diversity* (diversity of ecosystems); *diversity of biological species* and *genetic diversity*. In the field of natural science, biodiversity is represented by three main elements of life diversity, studied by specialists in the field of ecology, taxonomy and genetics. The motivating values for biodiversity preserving undergone significant transformation due to the change of the value of the service (direct and indirect) provided by the ecosystems. Four starting points were added to the already adopted concept of biodiversity: *ecology* and policies for preserving environment; *agronomy*, which aims at limiting losses in the genetic biodiversity and improvement of plant characteristics; *commercialization* which enables the patent process of intellectual property rights (plant patents, animals, element of DNA) and *social and cultural aspect*, which presents in the discussions since 1980.
The interventional measures and actions regulated by the strategy Europe 2010 did not overcome the negative consequences stemming from the land cultivation, over-use of biodiversity and its components, global pollution and climate changes. The rate of the world population growth exerted indirect effect, as well as the lack of knowledge and limited information regarding biodiversity and the fact that its economic value was not taken into account in the process of policy-making. This corroborates the necessity for a new interpretation of biodiversity, considering the emerging new markets and demand with modified characteristics and consumer preferences. Hence the interest towards biodiversity received global dimensions due to factors such as: critical levels of pollution, increased usage intensity of key non-renewable resources (oil, coal), society consciousness towards life standard, and the increased social polarization and poverty problems.
Significance of the biodiversity and the balance between the nature and human activity was set in a particular framework in the Strategy of biodiversity 2020 of the European Union. As priorities overcoming and preventing further losses in biodiversity and degradation of the ecosystems and related services have been defined; and the measures for their gradual restoring as well.

Table 1.Methodological approaches for studying biodiversity

	Source	Main findings	Limitations
Management of renewable resources	Gordon, 1954	Bioeconomic model in fishery	Optimization models allow for partial representing of the complexity of biodiversity. The concept of biodiversity refers to the concept for biological resources.
	Clark, 1973	Dynamic bioeconomic model for studying extinct species	
	Perrings, Walker, 1995	Studying the results from constant biotic changes	
	Swanson, Barbier, 1992	Biological actives in the social portfolio	
	Metrick, Weitzman, 1994	Cost efficiency analysis of optimal preserving of biodiversity	
Assessment of biodiversity	Perrings et all. (1995)	Total economic value of biodiversity	Methods represent partial assessment of biological resources and not an integrated

OECD (2004)	Development of methodology for monetary assessment of biodiversity	approach towards biodiversity elements. Do not offer assessment of its social character and collective action.

Source: Rodrigues-Labajos, B. et al. (2008)

Traditional neo-classical theory has a number of economic studies analyzing biodiversity (Table 1). Monetary valuation was introduced with a twofold goal – to underline the benefits obtained from biodiversity and to quantify the risk from biodiversity loss.

New approaches to integrating biodiversity into existing business activity in different economic sectors are perceived as a way where by the net positive biodiversity impact, as well as the net positive financial returns can be estimated. Consequently principles of sustainable and socially responsible business behaviour and activity were formally defined in the UN Global Contract (UNGC) at the World Economic Forum in 1999. In practice, this contract sat forth 10 principles in four thematic areas: human rights, labour standards, environment and anticorruption. One of the most explicit definitions of corporate social responsibility has been proposed by the European Commission as *"a concept whereby companies integrate social and environmental concerns in their business operations and their interaction with their stakeholders on a voluntary basis. Being socially responsible means not only to fulfil legitimate expectations, but to go beyond compliance and investing more in human capital, environment and relations with stakeholders."*[15]

Efforts to approach biodiversity under an integrated multidisciplinary research prompted the need for a coordinated methodology across research issues (Figure 1).

The interpretation of biodiversity in the context of business activity focuses on two main goals: a) balance between economic

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growth and biological equilibrium; b) applying a system of financial stimuli for those economic subjects, whose business activity or private consumption satisfies the two main criteria for sustainable development: ecology and social equity.
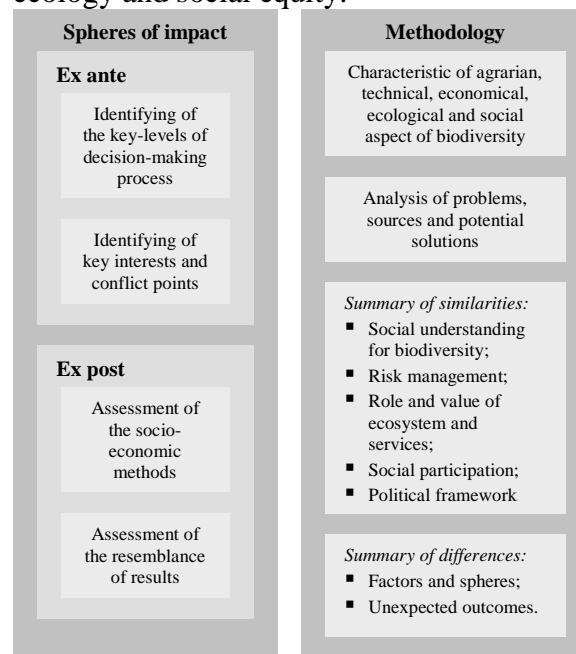
Source: Adapted from Rodrigues-Labajos, B. et al. (2008)
Fig. 1 Biodiversity as multidisciplinary problem

RESULTS AND DISCUSSIONS

Agriculture and biodiversity

The meeting in Rio imposed a new interpretation and understanding for the role of the agriculture in the process of sustainable development and biodiversity. Two new issues received publicity – the relationship between agriculture and biodiversity or the concept of agro-biodiversity; and multifunctionality of the agricultural sector. The main supposition is that the integration of biodiversity in the decision-making process in the companies would decrease the risk and production costs, stabilize the incomes and improve the quality of production offered. Potential opportunities stem from the change in consumers' behaviour – the demand for organic production with certain origin has increased in the recent years. The agricultural sector not only could benefit from biodiversity, but also modify, maintain and preserve it. Hence, biodiversity shapes priorities and policies in the sector, which in

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[15] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A renewed EU strategy 2011-14 for Corporate Social Responsibility, Brussels, 25.10.2011 COM(2011) 681 final

their broader content shape management and control of ecosystems.

The logic of organizing production process in the agriculture defines that any change in the technical characteristics (production methods, new rotation schemes, non-production elements at farm level) directly results from changes in the environment. Three are the possible ways for modifying production systems, which are in direct relationship with the biodiversity in the region and relate to: the process of de-intensification of production, diversification of production types, and development of non-productive systems. Studying this modifying process is a logically consequence from the dynamics of the factors, which will be used more intensively. In the classical economic formulation as intensive is identified a production which involves increasing quantity of production factors on unit arable land. The more intensive is the agriculture, the more production quantity per hectare is expected. At the same time while studying the opportunities for diversifying production types, arguments with pure economic character are involved. This in practice could restrict production of plant and animal species that have higher production margins. Similar production tendency is backed up by additional investments at organizational level, which pre-supposes increased specialization and higher level of dependence on suppliers and resources.

Biodiversity and the markets

The growing interest to conserve and preserve environment, combined with consumers' demand for healthier food and wellness has changed the market place.

There is a necessity to separate markets for the products of wider genetic diversity in two categories - regulated and volunteer markets. The main factors which would simplify this process are summarized in the Table 2.

Table 2 Development factors for biodiversity markets and products

Financial	Legal	Market
Risk level of actives	Property rights	Classifying of actives
Clearly defined accountancy	Assessment of investments in the sphere of genetic diversity	Process for approval of projects
Investment activity		
Competitiveness		
Entrepreneurship	Assessment	Low level of
premium	standards and methods	transaction costs
Integrated approach among ecosystem, business development, and financial expertise	Fiscal preferences Legal framework for energy and climate борси	Systems for monitoring and control Creating data base and information system Role of mediators

Ecosystems service markets are defined as "the bringing together of a buyer and seller so they can trade ecosystem service credits" (Ecosystem Service Project, 2008). Furthermore with the adoption of the concept for sustainable development, the fundamental base of the traditional economics was also a challenged. According to the traditional economic theory maximizing profit and satisfying consumers is compatible with maximizing society welfare; and that market failure could be corrected through government policy and intervention mechanisms. Another supposition is that short-term maximizing of profit and satisfying individual consumers' preferences would lead to exhausting natural and social resources on which is based humans' welfare and survival of biological types.

Economic aspects and value of biodiversity

The higher level of specialization and technological innovation relates to the substitution of mechanic labour and optimization of production process. In the recent years this trend was simultaneously supported by the results from the industrial revolution and the dynamics of the economic factors. At the same time this trend reflected on the production methods and requirements – quality of resources, consumer behavior and preferences, demands for ecological products.

Economic justification of business activities related to biodiversity goes beyond the traditional framework of market price factors and accountancy. In fact, biodiversity is perceived as a community resource which is available and assessable for all economic agents excluding the risk that one or a group of them could embezzle monopoly right for its usage. Nevertheless the potential of business to conserve and preserve biodiversity and restore ecosystems depends on how biodiversity assets are managed. Major biodiversity assets, such as: mountains, forests, rivers and lakes are either directly

owned or controlled by government. This way the process follows the logic that since there is no market for biodiversity, there is no fixed price for its consumption and this resource is not taken into account in the companies' accountancy. Consumption of biodiversity remains regulated by the public institutions, which are supposed to balance the interests of the economic agents. In this situation, the total economic value of biodiversity could be estimated by the levels of subsidies earmarked for ecological production, taxes for pollution, and preferential regimes for organic products. Business related to biodiversity in general is qualified as a commercial enterprise which generates profit through performing activities related to preserving biodiversity, sustainable usage of natural resources and proportional distribution of generated benefits (Bishop et al., 2008). In the last years the number of the companies which profit directly or indirectly from biodiversity and ecosystems has increased significantly, as well as the interest towards management, marketing and risk management in this specific sphere (Graph 1).
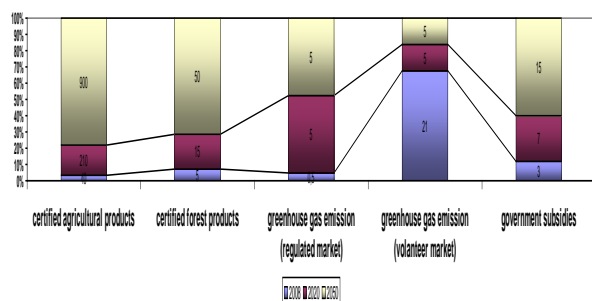
Graph 1 Market share of biodiversity and ecosystems

CONCLUSIONS

Recent work on the economics of biodiversity has emphasised that the conservation of the living resources involves economic decisions which are indistinguishable from decisions about the use and allocation of any other resources (Perrings et al., 1995)

The main questions that urge for adequate solution remain connected to the mechanisms for regulation the relationships between the government and industrial sectors, the balance between the goals for sustainable development at national and regional level, generalizing the role of the industry within the framework of the national strategy and last but not least creating a clear mechanism for monitoring and control at national and corporate level.

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