BIOTERRA

BULLETIN OF SCIENTIFIC INFORMATION
NR. 33 JANUARY- JUNE 2017
(twice a year publication)

CERMI Publishing House
Recognized by
National Council for Scientific Research in Higher Education (NURC), cod 181
edituracermi@hotmail.com www.cermi.3x.ro 0040 723 136 640

Technical Editors:
GALAN Cătălin
catalin.galan@gmail.com

Professional Translation:
LĂZUREANU Cătălin

Office:
Nicolae Şuţu Street, no. 11 – 15
Central building, second floor, room 9,
sector 1, Bucharest, Romania
http://www.bioterra.ro/bulletin.php

Publication Recognized by NURC category "C" code NURC : 882
The journal is indexed in the following International Databases:
ReportLinker.com, SCOPUS, Google Scholar, INDEX COPERNICUS, CABI, EBSCO.
ISSN 1454 – 816X

Rector's Allocution

*We have the special pleasure to let you know that the Review of our University, „**Bulletin of Scientific Information**", having ten years of consecutive issue, it achieved the recognition of the **National Council for Scientific Research in Higher Education (NURC)**, being comprised in the category „**National Reviews – C Category**".*

*So, the Bioterra University review „**Bulletin Of Scientific Information**" works as a real platform for the information and exhibition of the most recent and valuable research in the agricultual field and connected sciences (food industry, agro-tourism, ecology, agricultural economics etc.).*

This way I express my gratitude the contributors to our review, authoritative academic and univeritary names of whose studies are found in the selection done by the scientific board of the review, co-workers with whom we have strong relations of partnership and mutual support in the development and course of some conjointed research projects.

I wish to the review many and consistent issues.

Prof. Floarea Nicolae, PhD
Rector of Bioterra University Bucharest

Editorial Board's Allocution

„Bulletin of Scientific Information" magazine was published at the initiative of several young researchers with the direct support of Bioterra University Board, having the first edition in 1998.

Years passed and this magazine has enriched continuously its scientific and didactic dowry, becoming slowly but surely a veritable platform for academic information.

In 2008 the magazine changed itself into a new more dynamic and attractive format, being published in special graphic conditions (full-color) and fully in English language. Also, since 2014 the magazine benefits of a modern website: www.bsi.bioterra.ro.

Every year the editorial team has increased the number of members; nowadays it brings together numerous personalities of the scientific and academic world from different foreign countries, thus being a guarantor of a high scientific level.

Thanks to all our readers and collaborators that through their suggestions, criticisms and feedback contribute to the improving of our magazine quality.

Prof. PETCULESCU Nicole Livia, PhD
Vice Rector of International Relations

Prof. GALAN Catalin, PhD
Vice Rector of the Educational Activity

Summary:

BULLETIN OF SCIENTIFIC INFORMATION

DYNAMICS OF THE POSTFILOXERIC ROMANIAN VITICULTURE

Prof. PhD. Cătălin GALAN,
Prof. PhD. Nicole-Livia PETCULESCU
Bioterra University of Bucharest, No. 81, Gârlei Street, District 1, 013722, Bucharest, Romania
catalin.galan@gmail.com; nicole.petculescu@gmail.com

Abstract: *In the mid-nineteenth century, as a result of increased trade between European and American continents and especially due to the import of American vines, a tiny insect appeared within the European vineyards, insect that will be responsible for a real environmental disaster. It's about Dactylosphaera vitifoliae (sin. Phylloxera vastatrix), belonging to the Homoptera Order. The great impact that it had the appearance of Phylloxera in Europe marked the history of Romanian and world viticulture. Thus, from then until nowadays, within the specialty literature, we can discuss about three phases (eras), distinct namely: prefiloxeric stage, filoxeric stage and postfiloxeric stage.*

Key words: *Dactylosphaera, Phylloxera, direct producing hybrids (H.P.D.)*

Introduction

Dactylosphaera vitifoliae, syn. Phylloxera vastatrix (Figure no. 01) pest invasion in Europe, was an event that took place in the nineteenth century and thousands of articles and hundreds of studies were written in this context. Unfortunately, its negative effects are found even today, after about 140 years. Here is described the powerful invasion: „By the middle of the last century the French

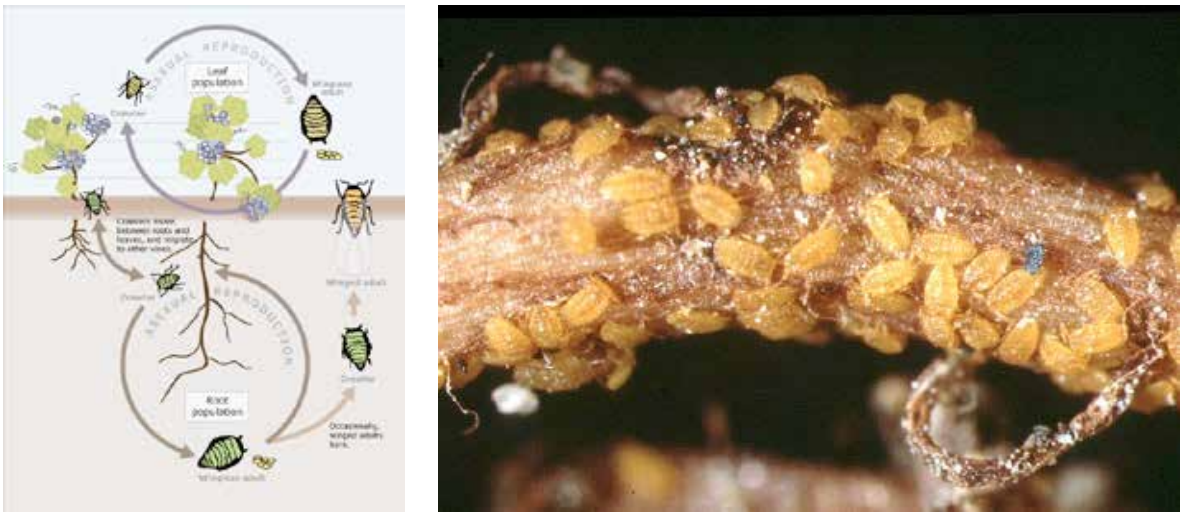


Fig. no. 01 - Phylloxera aphid live cicle
(Source: http://www.teara.govt.nz/; http://www.vinehealth.com.au/)

vineyards were attacked by a microscopic fungus disease called powdery mildew or Oidium. The yields of the vineyards decreased and reached a low quality wines. An important branch of economy of the country was in danger. As in North America were cultivated very resistant vines to mildew, they imported these type of vines. Nobody suspected that importing the vines they brought to the Old World the greatest enemy of European vines. In 1863 the growers of the famous Bordeaux vineyards had to get acquainted with it.

Soon the most flourishing vineyards are destroyed. Of whom ? Mister! Research is done, but nothing. Only after about five years, it was found on the roots of the dried vines, a small insect that entomologists called it Rhizophis. The same insect is found on the roots of vines grown in a greenhouse in the surroundings of London. Soon, they found that the Rhizophis was in fact Phylloxera vastatrix, an insect discovered on vines since 1854 in North America by the French entomologist Planchon. The mystery was now clear.

So, through the American vines introduced from the New World, Phylloxera insect destroyed mainly European vine roots. The pest is spreading swiftly across the continent. The vineyards were falling one after another due to this tiny insect, such as the cities in a big storm. Nothing can stand in front of the attacker"[2].

Phylloxera disaster found the Romanian viticulture unprepared with a total cultivated area within the Romanian Kingdom of 137,176.00 ha. Although officially the emergence of phylloxera is recorded in 1884 when the vvineyards disappeared en masse, it seems that the pest was introduced accidentally into the country in 1877 through an import of infected vines from France by Professor Ananescu from Chiţoran (vineyard Dealu Mare).

In Transylvania region, the Phylloxera came in 1880 first in the vineyard of Arad and in 1883 in Şiria vineyards. Its further spread in the whole country has been done relatively quickly. To limit the effects of the disaster was formed in 1884 the "Phylloxera Commission", which was tasked to follow up the attack and to establish measures to combat the pest.

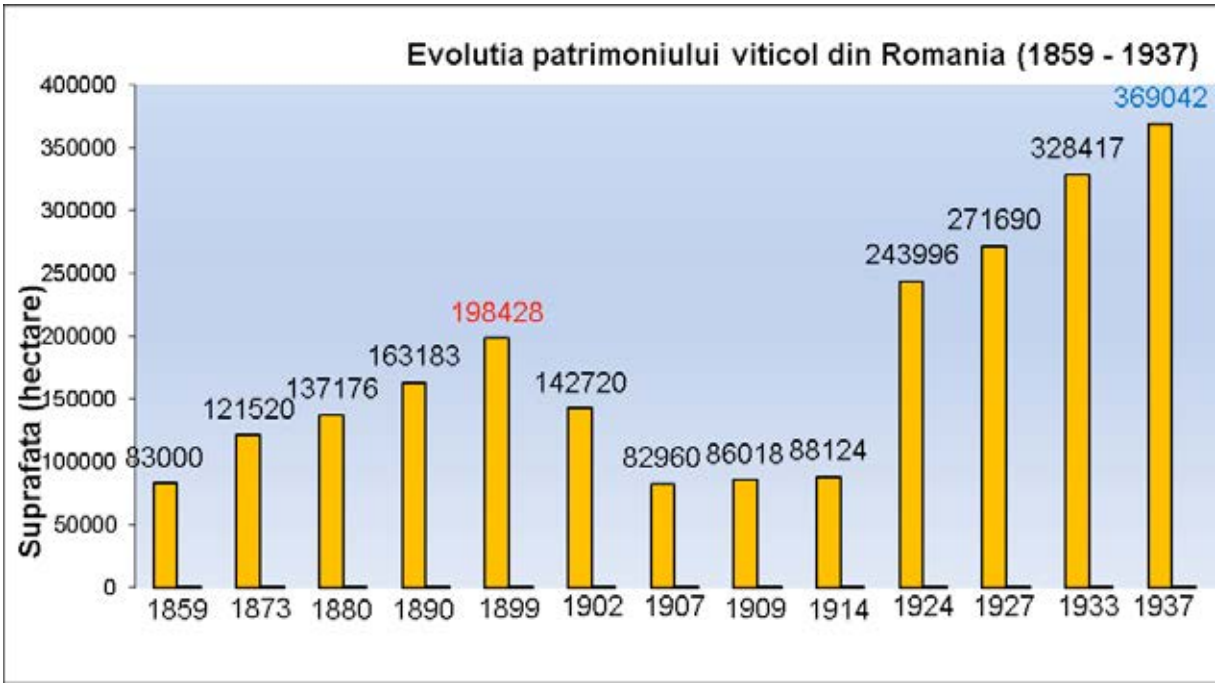
The results were not-succesfull and thus to restore the vineyards were used the direct producer hybrids (H.P.D.) and import grafted-vines from France, Algeria, Morocco and Austria. There were also imported American vines used as rootstocks V. riparia, V. berlandieri, V. rupestris, V. cordifolia.

After years of attempts to control the insects by direct chemical and physical methods, it was concluded that the only effective way to combat the insect is an indirect one, the grafting of the European vines on American vines or their hybrids resistant to phylloxera attack. The success of this method was based on American spontaneous species that, over time, they are constantly confronted by the attack of phylloxera, by natural selection [7].

Materials and methods

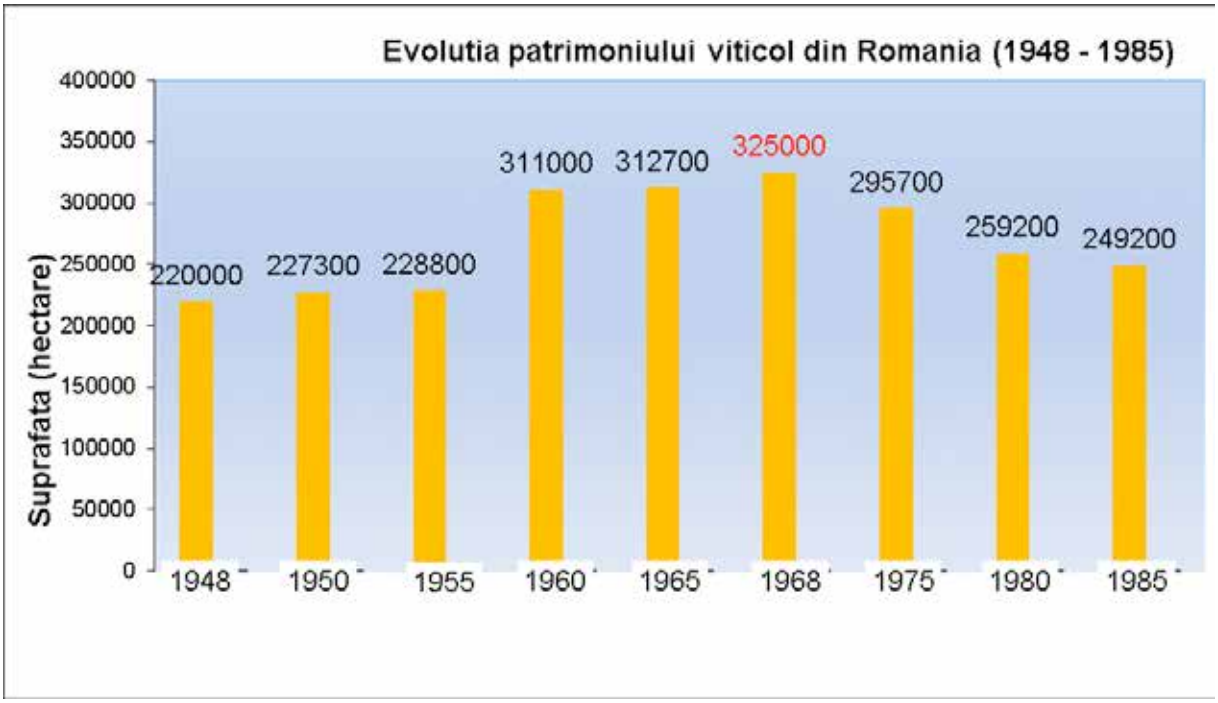
For an accurate analysis of the Romanian vines areas dynamics we have used data presented for the first time, data collected from "National Archives of Romania" and „Romanian National Institute of Statistics". Phylloxera disaster effect is found in the ratio of European vines areas cultivated on their own roots/direct producer hybrids/grafted European vines. These data are shown in the Graphic no. 01, 02, 03, 04 and in the Table. no 01 [1, 3, 4, 5, 6].

Graphic no. 01:
Evolution of the Romanian vines areas (1859-1937)



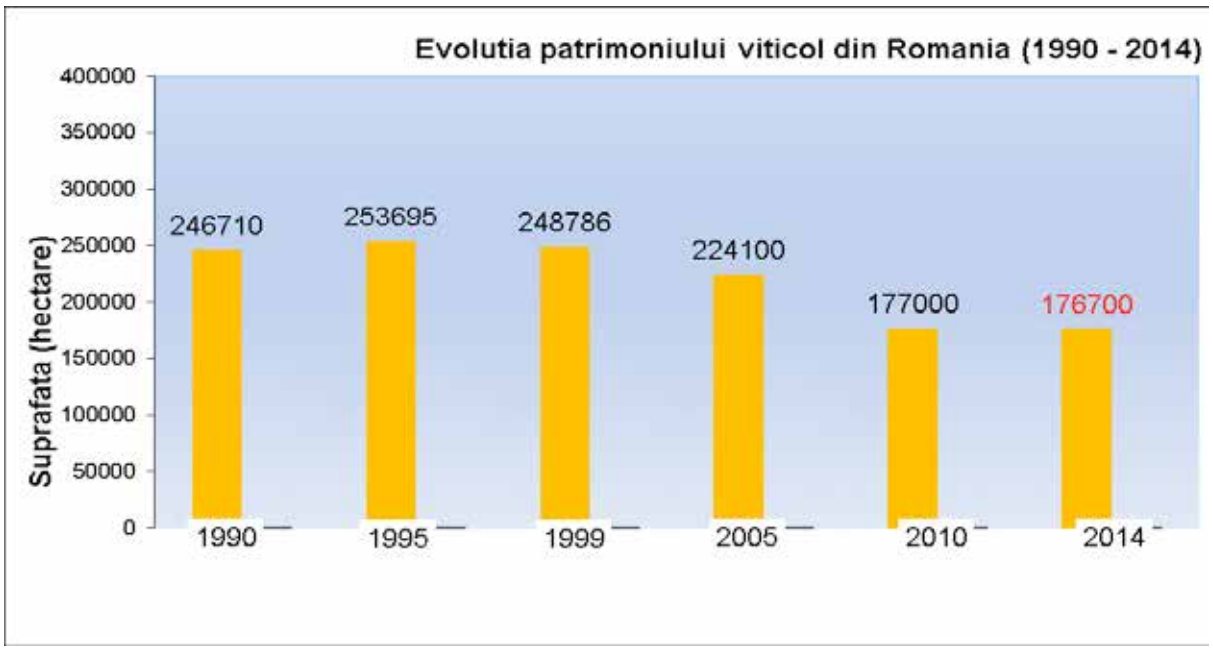
Source: National Archives of Romania

Graphic no. 02:
Evolution of the Romanian vines areas (1948-1985)



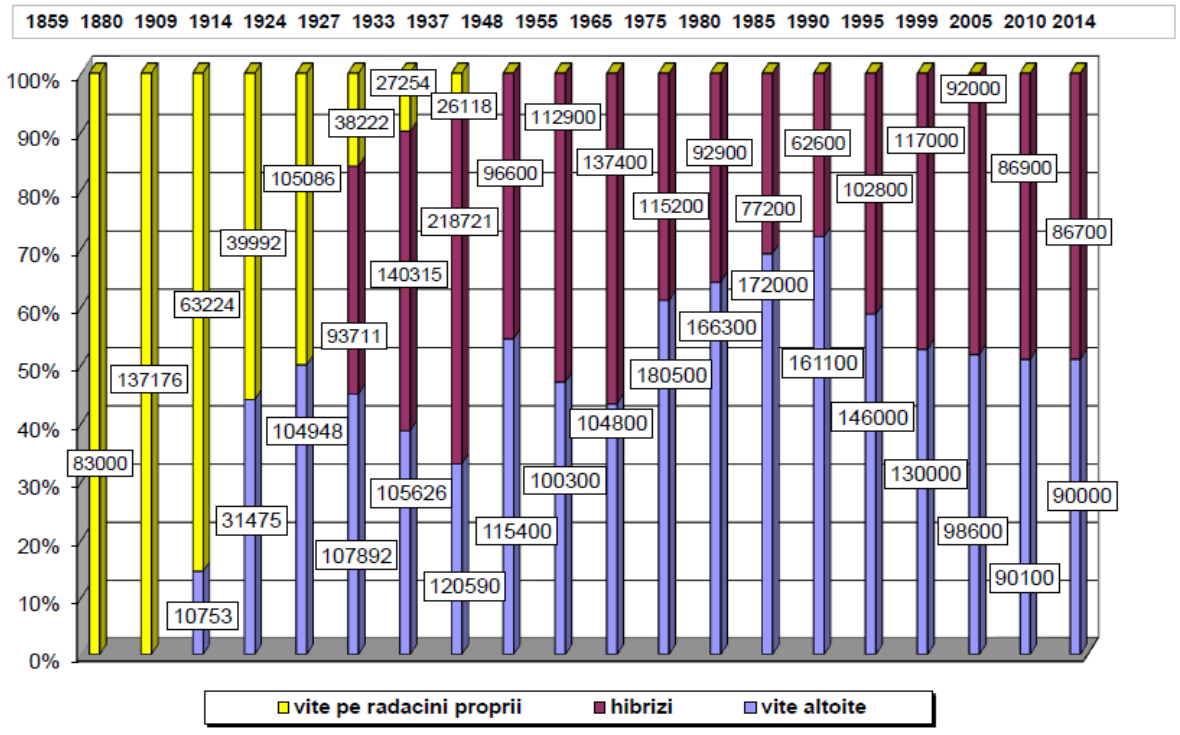
Source: National Archives of Romania

Graphic no. 03:
Evolution of the Romanian vines areas (1990-2014)



Source: Romanian National Institute of Statistics

Graphic no. 04:
Evolution of the Romanian vines areas cultivated with grafted hybrids (1859-2014)



Source: „National Archives of Romania“ and „ Romanian National Institute of Statistics“

Table no. 01:
Ratio of the European vines areas cultivated on their own roots / direct producer hybrids / grafted hybrids

No	Year	Total surface (ha)	European vines on their own roots		Direct producer hybrids (H.P.D.)		European grafted hybrids	
			ha	%	ha	%	ha	%
1	1859	83,000.0	83,000.0	100.00	-	-	-	-
2	1873	121,520.0	121,520.0	100.00	-	-	-	-
3	1880	137,176.0	137,176.0	100.00	-	-	-	-
4	1909	86,018.0	63,224.0	73.50	-	-	10,753.0	12.50
5	1914	88,124.0	39,992.0	45.38	-	-	31,475.0	35.72
6	1924	243,996.0	105,086.0	43.07	-	-	104,948.0	43.01
7	1927	271,690.0	38,222.0	14.07	93,711.0	34.49	107,892.0	39.71
8	1933	328,417.0	27,254.0	08.30	140,315.0	42.72	105,626.0	32.16
9	1937	369,042.0	26,118.0	07.08	218,721.0	59.27	120,590.0	32.68
10	1948	220,000.0	-	-	96,600.0	43.91	115,400.0	52.45
11	1955	228,800.0	-	-	112,900.0	49.34	100,300.0	43.84
12	1965	312,700.0	-	-	137,400.0	43.94	104,800.0	33.51
13	1975	295,700.0	-	-	115,200.0	38.96	180,500.0	61.04
14	1980	259,200.0	-	-	92,900.0	35.84	166,300.0	64.16
15	1985	249,200.0	-	-	77,200.0	30.98	172,000.0	69.02
16	1990	246,710.0	-	-	62,600.0	25.37	161,100.0	65.30
17	1995	253,695.0	-	-	102,800.0	40.52	146,000.0	57.55
18	1999	248,786.0	-	-	117,000.0	47.03	130,000.0	52.25
19	2005	224,100.0	-	-	92,000.0	41.05	98,600.0	44.00
20	2010	177,000.0	-	-	86,900.0	49.10	90,100.0	50.90
21	2014	176,700.0	-	-	86,700.0	49.07	90,000.0	50.93

Source: By authors' calculation and interpretation

Results and discussions

If the vines area cultivated during the period 1873-1898 yards is constant increased till 1899 to 198,428.00 ha after 1900 the cultivated vines area continuously decreased, reaching in 1902 at 142,720.00 ha and in 1907 at 82,960.00 ha, as a result of the plantations decimation and of insufficient number of replanting vines.

Only after 1908 it is registered a slight recovery in the wine sector, the vines areas slightly increased and reached in 1909 the value of 86,018.00 ha (of which 63,224.00 ha with Romanian vines, 10,753.00 ha with American vines and 12,041.00 ha with fruitless plantations) and in 1914 reached the value of 88,124.00 ha (of which 39,992.00 ha with Romanian vines, 31,475.00 ha with American vines and 16,657.00 ha with fruitless plantations.

It should be noted that at that time the "Romanian vines" meant indigenous grafted plantations which included direct producer hybrids (HPD); the "American vines" meant grafted plantations and the plantations for

American rootstocks and the "fruitless plantations" meant young vine plantations and vine nurseries [1].

To ensure the necessary vines seedlings it is established in 1885 at Baraţca-Păuliş (Transylvania region) the first vines nursery for the production of grafted vine, phylloxera-resistant by green and ground-grafting. The next nurseries were established in the Romanian Kingdom in Strehaia - Mehedinti County (1889) and in Ţintea - Prahova County (1889), followed by the period of 1889-1892 with further 12 vines nurseries in the main vineyards of the country.

Due to the high needs for the vines seedlings and as a consequence of massive imports were indiscriminately introduced into the Romanian vineyards many foreign varieties, plus a considerable amount of direct producer hybrids, much lower than the local varieties quality.

During the interwar period the development of the vines plantations and especially of those cultivated with direct producer hybrids (H.P.D.) vines was as follows:

• **1924** - of about 243,996.00 ha, **43.07%** (105,086.00 ha) were cultivated with local non-grafted vines including direct producer hybrids (HPD);

• **1927** - of about 271,690.00 ha, **34.49%** (93,711.00 ha) were cultivated with direct producer hybrids (HPD) vines. It should be noted that only in 1927 within the official statistics it appeared distinctly individualized the areas cultivated with HPD;

• **1933** - of about 328,417.00 ha, **42.72%** (140,315.00 ha) were cultivated with H.P.D.;

• **1937** - the area cultivated with vineyards in Romania reaches 369,042.00 ha of which **59.27%** (218,721.00 ha) with, which shows that the percentage of H.P.D was maintained despite the anti H.P.D law adopted at that time.

According to the data collected from the National Archives of Romania [1], the distribution of the total area of about 273,195.00 hectares on different geographical regions was as follows:

- The "Old Romanian Kingdom" region, had a total area of 142,495.00 ha (52.16%) with 70,800.00 ha H.P.D., 55,800.00 ha grafted vineyards and 16,000.00 ha non-grafted vineyards;
- The „Bassarabia" region, had a total area of 90,200.00 ha (33.02%) with 63,100.00 ha H.P.D., of 18,000.00 ha grafted vineyards and 9,000.00 ha non-grafted vineyards;
- The „Transilvania" region, had a total area of 40,500.00 ha (14.82%) with 6,400.00 ha H.P.D, of 31,800.00 ha grafted vineyards and 2,300.00 ha non-grafted vineyards.

It is noted that besides Transylvania region where the grafted vineyards net exceeded the H.P.D. vineyards and those with indigenous grafted vines, within the remaining Romanian counties were prevalent the HPD vineyards, with a total area of 140,315.00 ha (42.70%), followed by the grafted vineyards cultivated on an area of 105,626.00 ha (32.20%).

Although hidden from the public opinion by a regime that wanted to show only their achievements, the vineyards evolution and especially of those cultivated with H.P.D. during the communist period, was as follows:

• **1948** - from a total area of 212,000.00 ha cultivated vineyards, **45.57%** (96,600.00 ha) was cultivated with H.P.D.vineyards;

• **1950** - from a total area of 223,000.00 ha, **47.40%** (105,700.00 ha) was cultivated with H.P.D. vineyards;

• **1955** - from a total area of 213,200.00 ha, **52.95%** (112,900.00 ha) was cultivated with H.P.D. vineyards;

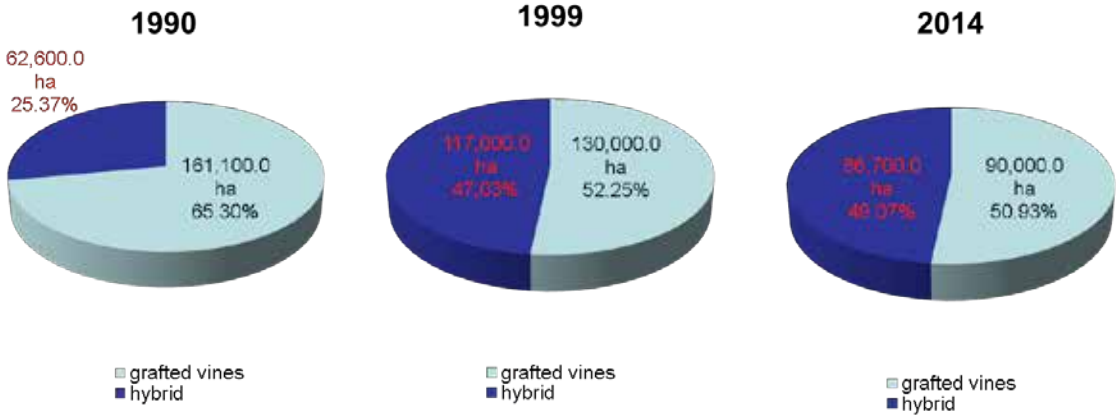
• **1965** - from a total area of 242,200.00 ha, **56.73%** (137,400.00 ha) was cultivated with H.P.D. vineyards;

• **1975** - from a total area of 295,700.00 ha, **38.96%** (115,200.00 ha) was cultivated with H.P.D. vineyards;
• **1980** - from a total area of 259,200.00 ha, **35.84%** (92,900.00 ha) was cultivated with H.P.D. vineyards;
• **1985** - from a total area of 249,200.00 ha, **30.98%** (77,200.00 ha) was cultivated with H.P.D. vineyards [3, 4].

Conclusions

The consequences of the Dactylosphaera vitifoliae (syn. Phylloxera vastatrix) in Romania are extremely difficult to be capitalizing. What we know with certainty it is that the real effects of this ecological disaster is felt even today, after about 140 years. Thus, many Romanian traditional varieties of Vitis vinifera were lost forever from the national and European vineyards patrimonium.
Although are "dry", the figures highlight a back in time of the Romanian viticulture. We note an „explosion" of H.P.D. vineyards, large areas being cultivated with un improved hybrids within the interbelic vineyards range with low productivity and poor quality.
In conclusion, we can say that the "involution" of this sector, was as follows:
• 1990 - from a total area of 223,600.00 ha, 25.37% (62,600.00 ha) were cultivated with H.P.D vineyrads (Graphic no. 05);
• 1995 - from a total area of 248,800.00 ha, 41.32% (102,800.00 ha) were cultivated with H.P.D vineyrads;
• 1999 - from a total area of 247,000.00 ha, 47.03% (117,000.00 ha) were cultivated with H.P.D vineyrads (Graphic no. 05);
• 2005 - from a total area of 190,600.00 ha, 48.27% (92,000.00 ha) were cultivated with H.P.D vineyrads;
• 2010 - from a total area of 177,000.00 ha, 49.09% (86,900.00 ha) were cultivated with H.P.D vineyrads;
• 2014 - from a total area of 176,700.00 ha, 49.07% (86,700.00 ha) were cultivated with H.P.D vineyrads (Graphic no. 05) - [3, 5, 6].

Graphic no. 05:
Involution of the Romanian viticulture sector (1990 – 2014)



Source: Romanian National Institute of Statistics

References

[1] National Archives of Romania – „The farms and livestock, within the period 1837 – 1939“, Fund arhive no. 484, access allowed no. 580/2004, Bucharest;
[2] Bălțărețu A. (1971) – „Millennia of History“, Ed. Albatros, Bucharest, pg. 247-248;
[3] Galan C. (2005) – „ Study of economical and juridical aspects regarding the privatization of state companies owned vinery companies”, Doctoral thesis, University of Agronomic Sciences and Veterinary Medicine of Bucharest;
[4] Romanian National Institute of Statistics (1992) – „Romanian agriculture (1938-1990)“, Editura Tehnică Agricolă, Bucharest;
[5] Romanian National Institute of Statistics (2009) – „Romanian Statistical Yearbook“, Editura Revista Română de Statistică, Bucharest;
[6] Romanian National Institute of Statistics (2015) – „Romanian Statistical Yearbook “, Editura Revista Română de Statistică, Bucharest;
[7] Oprea A., Galan C. (2012) - „Tehnologia procesării strugurilor, oenologie şi derivate”, Editura Mustang, Bucharest.

AGRITOURISM AND RURAL ECONOMY DEVELOPMENT

PhD. Daniela Ileana DANILA, Lecturer PhD. Sia SARARU
Bioterra University of Bucharest, No. 81, Gârlei Street, District 1, 013722, Bucharest, Romania
godja_daniela_ileana@yahoo.com; sia_ion@yahoo.com

Abstract: *At the moment, the agritourism represent for our country and for some european countries an attractive field for potential investitors and for the costumers. The supply in this field in romanian rural areas is still in deficit. With all this, in Romania already exist two specific forms of agritouristic units omologated and clasified, namely: farmhouses and rural guesthouses.In this context, is imposing to elaborate and to apply some global strategies of romanian agritourism development which to allowance about all the social, technical, economic and ecologic implications of this development. Priority in the process of sustainable development on our country is the component that includes planning, establishment and operation of tourism as part of the sustainable development strategy of the area, region or country.*

Key words: *agrotourism, rural economy, strategy.*

Introduction

Increasing the potential of the tourism product from the established values to those corresponding to the international standards requires the initiation and promotion of actions that include, on the one hand, the development of the education processes and the formation of a mentality adequate to the current type of development and, on the other hand, the enhancement of the agrotourism development in reception areas. This emphasis needs to deepen in time and space the relationship between the economy and the environment, which involves balancing the negative and the positive effects of the tourism activities.

Tourism capitalizes on the natural and anthropogenic potential of a country with a multiplier effect, introducing into the economic circuit novelties such as landscape, hospitality, geography, cultural, historical, gastronomic, artistic information etc.

Rural tourism includes a wide range of accommodation, activities, events, celebrations, sports and entertainment, all taking place in a typical rural setting. It is a concept that encompasses the touristic activity organized and managed by the local rural population and which is based on a close connection with the natural and human environment. Agrotourism is therefore inherently linked to agricultural activities which can be a complementary solution to directly support its development with good social and economic results.

Materials and methods

The following indicators were used to characterize tourism and agrotourism in Maramureş County of the NW of Romania (Fig. no. 01):

- the number and the weight of the agro-touristic pensions in Maramureş County in the NW region of Romania;

- the top of the localities according to the number of boarding houses in Maramureş County.

The data were taken from the National Institute of Statistics and processed according to the objectives of the paper.

Fig. no. 01 - Maramureş County of the NW of Romania
(Source: https://goo.gl/y117Ir)

Results and discussions

The impact of tourism development has the effect of regional development that is oriented according to studies on the following issues:
- increasing the size of the household;
- technical endowment of households constitutes a condition of raising the efficiency of resources utilization;
- professionalisation and education, which constitute a lever to improve the living standards of citizens through efficient utilization of resources.

Simultaneously both official statistical records and official documents of the functionality of rural tourist guesthouses present terms such as: the characteristics of pension, expenses and income, inputs etc. Research by the World Tourism Organization in order to establish and identify the impact

of tourism development on national and regional economies have enabled grouping them into two categories of indicators (table no. 01).

Analyzing the number of rural tourism units from Maramures County in the 2012-2016 period (table no. 02), on settlements, show the following:

- in Maramures county are 40 localities where pensions were established in 2012-2016;

by averaging at county level it ranged between 1.77 guesthouses / village in 2014 and 2.6 guesthouses / village in 2016;

- we note that there are places (eg. Sighetu Marmaţiei) where there was only one pension and therefore that pension not resisted, but also places where their number has increased sharply, from 7 to 10 in the town of Poienile Izei;
- we can establish a ranking of settlements with agrotourist boarding houses; so first place is occupied by Ocna Şugatag, followed by Poienile Izei, Botiza and Vadul Izei are on 3rd place and 4th place, and on the 5th is situated Bârsana village (table no. 03).

Table no. 01:
Indicators for evaluating agro-tourism

Result Indicators	**Impact Indicators**
➢ the number of households equipped for agro-tourism	➢ increasing the value of the construction through amenities
➢ the number of tourists/year	➢ the complementary amount of revenues
➢ the number of new jobs created or maintained	

Source: By authors' interpretation

Table no. 2:
The number of agrotourist boarding houses

The reference years	**Total for northwestern Region**		**Maramureș county**	
	Number	**%**	**Number**	**%**
2012	252	100%	78	30.95%
2013	231	100%	78	33.77%
2014	226	100%	71	31.42%
2015	246	100%	79	32.11%
2016	284	100%	104	36.62%

Source: By authors' calculation and interpretation

During 2012-2016, in Maramures County, the number of tourist accommodation structures ranged from 168 in 2014 to 221 in 2016. The number of tourist boarding houses and agrotourism units, which constitute the majority (78.73%), practically exploded. In the case of pensions, the minimum recorded was 53 in 2012 and the maximum of 72 was recorded in 2015. Regarding the number of agrotourist boarding houses, the minimum number recorded was 71 in 2014, and the maximum of 104 in 2016. There is an increase of 19 units in tourist guesthouses in 2016 compared to 2012 (minimum compared to maximum) and 33 units in the case of rural tourism units. From the total of tourists structures recorded in Maramures County in the 2012-2016 period, the share of rural tourism units in the total varied between 40.51% in 2015 and 47.06% in 2016. In tourist guesthouses, the variation was between 30.99% in 2012 and 36.92% in 2015 (table no. 04).

Table no. 3:
The top five localities in Maramures County

		Maramureș County				
		2012	**2013**	**2014**	**2015**	**2016**
1	***Ocna Sugatag***	12	14	12	11	13
2	***Poienile Izei***	7	7	7	7	10
3	***Botiza***	8	8	8	6	8
4	***Vadu Izei***	8	7	6	8	8
5	***Barsana***	4	4	3	8	7

Source: By authors' calculation and interpretation

Table no. 4:
The share of main accommodation structures in Maramures County

Maramureș County						
Year	**Guesthouses**		**Agrotouristic guesthouses**		**TOTAL**	
	Number	**%**	**Number**	**%**	**Number**	**%**
2012	53	30.99%	78	45.61%	171	100%
2013	64	35.56%	78	43.33%	180	100%
2014	58	34.52%	71	42.26%	168	100%
2015	72	36.92%	79	40.51%	195	100%
2016	70	31.67%	104	47.06%	221	100%

Source: By authors' calculation and interpretation

Conclusions

Rural tourism is an employment alternative for the rural labor force, a way of diversifying the rural economy and a source of alternative income for rural inhabitants. An important component of Romanian rural tourism is agrotourism usually practiced by the owners of farms agricultural or rural households as a secondary activity complementary to agriculture. As a result, it can be appreciated that supporting rural tourism in general and agro-tourism in particular as well as recreational activities related there to helps not only to diversify rural activities but also to create opportunities for integration of young people and women on the labor market. The precarious income situation of rural residents fully justifies the need to develop a diversified rural economy, building on the current development potential of the non-agricultural sector as a sustainable source of decent living for the rural population, as well as development of the rural economy.

References

1. Gheorghilaş, A. (2014) - „Geography of Tourism", Universityof Bucharest, CREDIS Publishing House;
2. Honţuş, A., C., (2013) - „Tourist and agrotourist Geografy of Romania", Second edition revised, Ceres Publishing House;
3. Pota, M., M. (2010) – „Research on agro tourism potential of the lowland area of Arad county", Summary of Ph.D.Thesis, USAMV Timisoara;
4. Petrescu, M., Sîrbu, N., Petrescu, A. G., Petrescu, M. (2012) – „A Risk Management Approach to Cyberspace", Transylvanian Review of Administrative Sciences, Cluj-Napoca;
5. Stanciulescu, G., Lupu N., Ţigu, G., Ţitan, E., Stancioiu, F. (2002) – „Lexicon of tourism terms", Oscar Print Publishing House, Bucharest;
***Agricultural Journal, September 2008, The agritourism, an opportunity in the current crisis in the agricultural sector.

Foto no. 1 - Bârsana Monastery, Maramureş County
(Source: personal archive)

RESEARCH ON THE IMPORTANCE OF PESTS IN THE PRODUCTION OF DAMAGE AND DAMAGE IN FIELD AND STORAGE CONDITIONS WITH SPECIAL REGARD TO MYCOTOXINS

Student PhD. Roxana MUNTEANU
Bioterra University of Bucharest, No. 81,Gârlei Street, District 1,013722
roxana_and84@yahoo.com

Abstract: *Pathogenic microflora and field and intermediate saprophytes are very rich and consist of bacteria and fungi that colonize the seeds before harvesting. These can affect the appearance, quality and germination of the seeds, but only some produce losses during storage. The stored cereals are attacked by quite a number of pests (insects, mites, rodents), which generally have a widespread spread around the globe, being mainly driven by international trade. Another general feature of pests of stored cereals is their high environmental plasticity, which allows them to adapt to very diverse food regimes and is therefore unspecific for a particular type of product.*

Key words: *mycotoxins, wheat, maize, field, grain storage.*

Introduction

Pathogenic and saprophyte, field and intermediate microflora is very rich and is made up of bacteria and fungi that colonize the seeds before harvesting. These can affect the appearance, quality and germination of the seeds, but only some produce losses during storage. Many of them are not macroscopically absent, but are only highlighted by a careful microscope examination or by special methods (wet rooms, Ulster et al.). Due to the very large quantities that are harvested, transported and stored, due to their longer storage as well as the extension of the mechanization of the listed operations, the grain cereals sometimes raise serious and varied problems after harvesting and upgrading in all producing countries.

The stored cereals are attacked by quite a number of pests (insects, mites, rodents), which generally have a widespread spread around the globe, being mainly driven by international trade. Another general feature of pests of stored cereals is their high environmental plasticity, which allows them to adapt to very diverse food regimes and is therefore unspecific for a particular type of product.

Materials and methods

A particularly important place in the quantitative aspect of the damage caused to the cereals, as well as due to the unfavorable consequences caused by the heating of the grains, are its ladybugs, represented by 2 species with very wide spread in the world, namely: Ladybug grain (Sitophilus granarius) and Ladybug maize (Sitophlus zeamais).

a) **Ladybug grain** (Figure 1) is common in temperate regions of the globe, but is present in all areas due to grain trade. It is often found in grain stores and grain products in our country. Ladybug of wheat attack both the adult and larval stages. Adult feeding takes place throughout life, the damage caused by them being greater than those of larvae. Damage seeds and cereal processing products. Do not lay eggs in products in ground products such as flour and wheat, but can feed on them. They are attacked by adults and packaged cereal products (eg shrimp, grain, rice etc.).

Figure 1 - Ladybug grain, Sitophlus zeamais (Source: R. Munteanu)

Larvae cause damage by destroying a part of the grain endosperm while feeding, as well as filling the seed with excrement. Following the development of the larva, there is a loss of over 50% of the grain weight which is increased by the adult feeding of the adult, before leaving the seed. Ladybug of wheat resists inoculation for long periods depending on the temperature and reaching up to 3 weeks.

b) **Ladybug maize (Sitophilul zeamais, S. seamaize)** is very similar to that of rice, the difference is made only by the genital reinforcement analysis. It is spread in a wide range of countries across continents; has been reported only occasionally in some corn shipments from America. Other pests can attack healthy grains, being considered primary pests, while others attack only products harmful beforehand from other species considered secondary pests.

c) **Red bug of flour (Tribolium castaneum, sin T. Ferrugineum)** is a pest found on the globe, in grain stores and in mills, especially in warm regions. It infests a wide variety of foods of plant and animal origin, including wheat, barley, oats, rye, beans, peas, cotton, peanuts, vegetables, fruits, medicinal plants, spices (Figure 2) etc.

Figure 1 - Ladybug grain, Sitophlus zeamais (Source: R. Munteanu)

Following mass multiplication the insect, the flour takes a gray color and molds in a short time. Infected products have a characteristic taste and an unpleasant, stinking smell.
The adult is red or brown-red, and the larva has a white or yellowish body of 6-7 mm in length. The optimum temperature for the development of this insect is 30°C; under these conditions, incubation lasts 3-5 days, and at 25°C, 5-7 days. The length of larval development is variable, ranging from 22 to over 100 days. The number of larval stages varies between 5-11, depending

on the environmental conditions (food, temperature, humidity).
The larvae live in dark places, often being found in cracks in buildings, but usually develops in the surface layer of the food packaging or on pieces that are found incidentally on their surface. At maturity, the larvae retreat to sheltered places. The duration of the aft stage varies in temperature, between 4-12 days.

d) **The Thief of Thickness (Tribolium confusum sin Stene confusum)** is as widespread on the globe as the previous species; in Romania is found in some grain stores, mills, grain processing enterprises, very varied food stores.
The adult has a brown body - reddish or chestnut. Unlike the previous species, the antennas are progressively labeled, without forming a distinct carpet (Figure 3).
The maximum longevity of adults of both genders exceeded 3 years. The average prolificacy of a female is 450 eggs, and the maximum number of eggs deposited was close to 1000.

Figure 3 - The Thief of Thickness, Tribolium confusum (Source: R. Munteanu)

e) **Suriname beetle a pest Oryzaephilus surinamensis** is a general spreading in tropical and temperate. In our country it is common in warehouses as well as in all types of agri-food warehouses. It attacks besides grains and oilseeds, dried fruits and vegetables, medicinal plants, tobacco and others (Figure 4).
The length of the pre-boosted period is between 8 and 207 days. Adult longevity ranges from a few days to 39 months. In temperate climates, the insect has 4-5 generations per year.

f) **Wheat beetle (Rhyzopertha domicica, Figure 5)** is common in different areas of Africa, Asia, Australia, some states of America; it is often reported in all major European ports in cereals imported from other continents. We have only been reported in imported cereals. The body length is 2.3-3.0 mm. In tropical countries, the duration of the insect's evolutionary cycle is 27 days in summer and 38 days in winter.

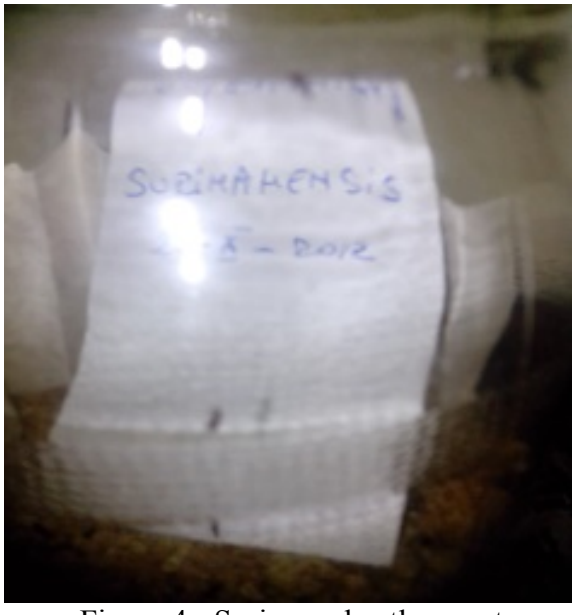


Figure 4 - Suriname beetle a pest Oryzaephilus surinamensis (Source: R. Munteanu)

Figure 5 - Wheat beetle, Rhyzopertha domicica (Source: R. Munteanu)

The optimal development temperature is 28°C. This insect is sensitive to low temperatures, multiplying it at 21°C, and adults at + 3°C. At high temperatures, they are resistant, but the 3 minute exposures at 50°C are fatal.

g) **Xanthomonas transluces var. cerealis** is the most damaging bacteria, whose wheat present in our country is not arguable. The seeds infected by this bacterium are smaller than those not infected, they are also ripped with longitudinal stripes or punctured strips in the form of strips, brownish-blackish (Figure 6).

Figure 6 - Grains of wheat with the bile, Xanthomonas transluces var. cerealis (Source: http://www.scritub.com)

h) **Fusarium species namely Fusarium roseum var cerealis** with the forms: graminearum, culmorum and avenaceum are the most widespread and most dangerous for grain cereals, that produce the spice and grain rot. These fungi contribute to decreasing the germination of grain cereal seeds, both before and after storage. In years of cold and prolonged spring, where snow falls more than usual in the field, Fusarium nivale frequently appears to infect wheat, barley and rye.

Much more dangerous is the fusarium of corn cobs caused by several species of Fusarium, namely: F. moniliforme, F. roseum, F. graminearum, F. tricinctum, which produce rotting of different degrees of seeds. In F. moniliforme maize, it infects the scabs in the form of islands scattered on any part of the stump and produces cracking of the beans (Figure 7).

Figure 7 - Fusarium moniliforme infected maize stigma (Source: R. Munteanu)

i) **Fusarium roseum f. Graminearum** (Figure 8) and F. avenaceum as well as F. tricinctum can produce almost total rotting of the stump from the top to the base and the mycelium of the fungus and the beans have a red-burgundy or ruby - closed. Mycelium, covered beans are brown, dry and rotting dry. If the infection was strong and occurred early on, the pastures that surround the veins remain stuck to the grains and show black spots of varying sizes.

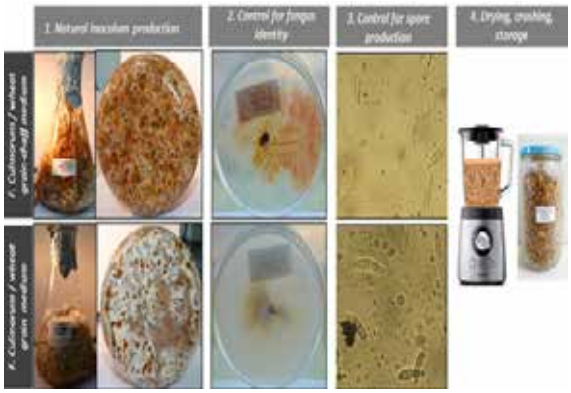


Figure 8 - Fusarium roseum f. Graminearum
(Source: http://www.staphyt.com)

Infected beans are glued to germination, their nutritional value is very low, and the mushrooms on them develop mycotoxins very dangerous for the health and life of animals and humans.
Fusarium of spice is a major disease in almost all areas cultivated with wheat from all over the world, including in Romania.
Some species of Fusarium genus may cause this spider fusariosis, although Gibberella zeae Schwain (Petch.), with the anamorphic Fusarium graminearum Schwabe, is the predominant pathogen in most areas of the world. This disease causes not only harvest losses but also the contamination of wheat with fusariotoxins which, due to cytotoxic and immunosuppressive properties, are harmful to humans and animals.

Results and discussions

A total of 56 samples of wheat, corn, and products derived from the period between September 2015 and November 2016 were analyzed for food intake of 2 mycotoxins: Aflatoxin B1 and Zearalenone.
The food products studied were: corn and wheat grains for Aflatoxin, and wheat flour, bakery products and cereals to determine

Table no. 1:
The results of Aflatoxins (µg/kg)

No. crt.	Grains	Numbers of sample examined	Positive sample	%	Extreme value detected	The maximum limit
1	Corn grains	12	5	42	0,5-2,0	5,0
2	Wheat grains	12	3	25	0,5-2,0	2,0
	Total	24	8	33	-	-

Source: R. Munteanu - calculation and interpretation

Table no. 2:
The result of Zearalenona (µg/kg)

No. crt.	Product	Numbers of sample examined	Positive sample	%	Extreme value detected	The maximum limit
1	Wheat flour	10	3	25	5-25	75
2	Bakery products	12	2	16	3-10	50
3	Cereal	10	1	8	5-20	50
	Total	32	6	17	-	-

Source: R. Munteanu - calculation and interpretation

Zearalenone. The determinations were made by the ELISA method at the Institute of Food Bioresources in Bucharest. The results of the determinations were presented in Table no. 1 and 2.

Conclusions

Aflatoxin B1 was detected in 33% of the analyzed samples with a maximum of 2.0 µg/kg in wheat and wheat grains and a minimum of 0.5 µg/kg. Zearalenone was detected in 17% of samples with values ranging from 3-25 µg/kg.

References

1. Ana Hulea, Gh. Tasca, C. Beratlief, 1982 - „Bolile si dăunătorii produselor agricole si hortiviticole după recoltare“, Editura Ceres, București.
2. Calvo Pamela, Nelson Louise, Kloepper J. W., 2014 - „Agricultural uses of plant biostimulants. Plant and Soil.“, An International Journal on Plant-Soil Relationships, 383:3-41.
3. Christensen C.M., Lopez F.L.C., 1963 - „Patology of strored seed“, Ed. II, McGraw Hill Book Co. Inc., New York, Toronto, London.
4. Dan V., 2001 - „Microbiologia alimentelor“, Editura Alma, Galati.
5. Dickson G.J., 1956 - „Diseases of field crops“, Ed. II, McGraw Hill Book Co. Inc., New York, Toronto, London.
6. European Biostimulants Industry Council 2013 - „Economic overview of the biostimulants sector in Europe“, 17 April 2013.
7. Gosman N., Bayles R., Jennings P, Kirby J., Nicholson P., 2007 - „Evaluation and characterization of resistance to fusarium head blight caused by Fusarium culmorum in UK winter wheat cultivars“, Plant Pathology, 56: 264-276.
8. Lemmens M., Haim K., Lew H., Ruckenbauer P., 2004 - „The effect of nitrogen fertilization on Fusarium head blight development and deoxynivalenol contamination in wheat“, Journal of Phytopathology, vol. 152, 1–8.
9. Lori G. A., Sisterna M. N., Sarandon S. J., Rizzo I., Chidichimo H., 2009 - „Fusarium head blight in wheat: impact of tillage and other agronomic practices under natural infection“, Crop Protection, vol. 28, 495–502.
10. Martin R. A., MacLeod J. A., Caldwel C., 1991 - „Influences of production inputs on incidence of infection by Fusarium species on cereal seed“, Plant Disease, vol. 75, 784–788.
11. Parry D. W., Jenkinson P., McLeod L., 1995 - „Fusarium ear blight (scab) in small grain cereals a review“, Plant Pathology, Vol. 44, Issue 2, 207–238.
12. Radu I.F.,Gherchi A., 1967 - „Pastrarea si prelucrarea produselor horticole“, Editura Agro-Silvica, Bucuresti.
13. Scoot de B. (1965) - „Toxigenic fungi isolated from cereal and vegetables products“, Mycopathology and Mycology Appl., 25(3/4):213.
14. Salontai Al., Muntean L., Savatti M., Bârsan M.,1988 - „Certificarea si controlul calitatii semintelor si materialului saditor la culturile de camp“, Editura Dacia, Cluj-Napoca.
15. Saulescu N. N., 1993 - „An evaluation of present wheat breeding priorities for Romania“, Lucrari Stiintifice U.S.A.B. 24 (1): 25-36.
16. Thierer L.V. si colab., 1971 -„Tehnologia receptionării, depozitării, conditionării și conservării produselor agricole“, Editura Ceres, București.
17. Valentina Dan, Brad Segal, Rodica Segal, Vitalie Teodoru, 1985 - „Determinarea calitatii produselor alimentare“, Editura Ceres, București.
18. https://www.nih.gov;
19. http://foodmycology.org;
20. http://www.scritub.com;
21. http://www.staphyt.com.
22. http://www.biostimulants.eu/.

DRINKING WATER, GOOD TO DRINK AT ANY TIME

Student PhD. Lucian CHIȚULESCU,
Lecturer PhD. Valentina Gabriela LAZIN, Lecturer PhD. Mădălina JURCOVAN
Bioterra University of Bucharest, No. 81, Gârlei Street, District 1, 013722, Bucharest, Romania
lucian_chitulescu@yahoo.com; valentinagabrielalazin@yahoo.ro

Abstract: *Water is essential in every stage of our lives. Mineral salts and trace elements in water are indispensable to our metabolism. Like the air we breathe, drinking water is important to our body. Consuming constantly drinking water as well as daily hygiene are the keys to our health. The water requirement of a healthy adult is estimated at about 1.5 liters per day. Our body eliminates about 2.5 liters a day. Foods consumed contain about one liter of water, so we need to drink at least 1.5 liters of water a day to avoid dehydration [2].*
Dehydration can have serious health consequences (low blood pressure, neurological problems, rapid deterioration of general condition). Therefore, it is advisable to drink water as often as small amounts at different times of the day than just in breaks. Experts recommend drinking eight to 10 glasses of water each day to maintain good health [1].
And especially, do not wait to be thirsty!

Key words: *health , drinking water, water resources, physico-chemical parameters*

Introduction

For domestic drinking, industrial and agricultural consumption, about 2,200 billion tons of water are emitted annually out of the circuit, of which about 50% return to the circuit as wasteful, harmful waters, for which neutralization requires the same amount of clean water . What will happen to the existing reserves for the extension of the pollution processes?
The minimum amount of water required by the human body is 5 l in 24 hours, of which about 2 l is the water consumed as such. The amount of water consumed increases in conditions of a warm environment or more intense physical activity. Water is not only used as a strictly physiological but also for other purposes for daily activity. Thus for the corrosive cleaning man uses about 40 liters of water every day, plus the water necessary for food preparation, maintenance of clothes, home etc Water is a molecule (H2O) that contains two hydrogen atoms each sharing a pair of electrons with an oxygen atom (see Figure 1).
When atoms share electrons in this way, a covalent bond is created. These bonds are essential to living organisms. In water molecules, oxygen and hydrogen atoms share electrons unequally. According to World Health Organization data, to cover the direct needs of the population, at least 100 l of water per day is needed per inhabitant. Waters used by humans for whatever purposes are loaded with different chemical and physical or biological elements that alter the natural composition of water [12]. In this article I have demonstrated that drinking water from different sources in Bucarest is drinking and according to the law.

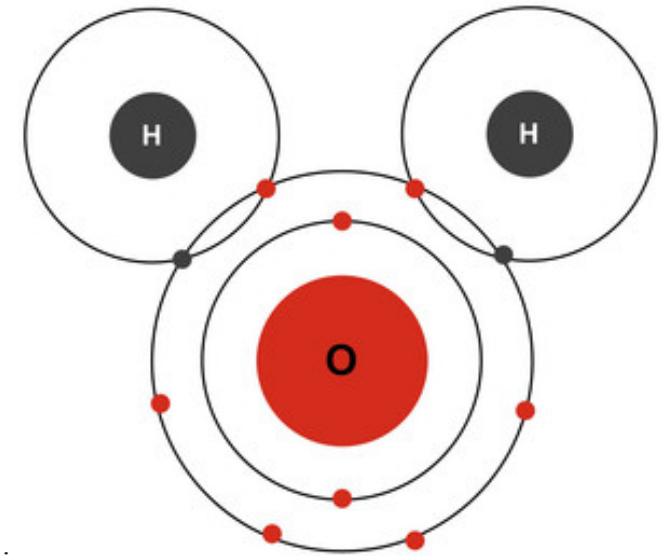


Figure 1: Water Molecule
(Source: http://healingearth.ijep.net/water/structure-water)

Materials and methods

In this study, were determined the following parameters: oxidation, nitrates, nitrites and pH. Oxidability represents the amount of oxygen what is consumed for the oxidation of organic substances in water or is an indirect index of the presence of easily oxidizable organic substances in water. Organic substances can form as a result of the vitality and decomposition of aquatic organisms and those that come into the water sources along with the rainfall, but the highest amount of the organic substances come from the waste water. The higher is oxidability, the more organic substances are in the water and the greater is the possibility of the presence of pathogenic microflora [7].

Nitrates (NO3-) are chemical components that have no color, odor or taste, that contaminates the groundwater due to intensive farming. Nitrogen fertilizers used for soil enrichment are the number one source of nitrates in drinking water, while the second largest source is human waste and animal waste.

Nitrites (NO2-), once ingested, nitrates are converted to nitrites, much more toxic substances than nitrate [8].

The pH represents the concentration of hydrogen ions in a solution, and the pH scale which ranging from 0.0 to 14.0 units is used to measure the acidity and alkalinity of the solution. The pH of the water is very important whether we are talking about tap water or the one from fountain, and only a pH between 6.5 and 9.0 is tolerable by the human body, although there are different needs internally and externally. The tap water values may vary from a region to another region. In the regions with limestone soil, the underground water obtained is, for example, more alkaline. With a pH from 0.0 to 7.0, the water can be considered acidic, if the pH is 7.0 the water is considered neutral, and above this level we can speak of alkaline

water. However, healthy skin normally has a pH between 4.5 and 6.0, which is slightly acidic, and therefore a range of cosmetics have the same level of pH [9].

Sample preparation was conducted in accordance with water standards [10]. All aqueous solutions were prepared with ultra-pure water. The reagents used were of high analytical purity (purity ≥ 99%).The reagents used were purchased from Sigma-Alhrich Chemie GmbH, Merck.

Standard work solutions were prepared on the day of determination by taking the appropriate volumes from the stock solution after equilibration at room temperature using ultrapure water for dilution. Sampling was done in hermetically sealed sterile containers. Apparatus used is the one for the analytical determination of physico-chemical parameters in water.

Table no. 1:
The obtained results for sample 1 of water from school 1

Crt. No.	Organoleptic physico-chemical indicators	Reference for analysis	Maximum permissible values	Values obtained	Unit
1	pH	SR EN ISO 10523:2012	≥6,5 ; ≤9,5	7,40	pH units
2	Free residual chlorine	SR EN ISO 7393-2:2002	0,50	0,42	mg/l
3	Nitrites	SR EN 26777:2002	0,50	<0,028	mg/l
4	Nitrates	SR ISO 7890-3:2000	50	10,49	mg/l
5	Iron	SR ISO 6332:1996/C9 1:2006	200	77	µg/l
6	Oxidability	SR EN ISO 8467:2001	5,0	2,96	mgO_2/l
7	Total hardness	SR ISO 6059:2008	Minimum 5	6,6	German degrees
8	Taste	SR EN 1622:2007	Acceptable to the consumers and no abnormal change	Acceptable	-
9	Smell	SR EN 1622:2007	Acceptable to the consumers and no abnormal change	Acceptable	-

Source: By authors' calculation and interpretation

Results and discussions

In Romania, drinking water is defined and regulated by the law 458 / 2002 [11] regarding the quality of the drinking water, completed and subsequently amended. For the case study we analyzed quality parameters from five school of Bucharest (Table no. 1, 2 and 3).

Conclusions

The results of this study demonstrate that: network water for samples taken in different schools in Bucharest complies with the norms of European Union standards. The processes and methods of calculation for obtaining the physico-chemical parameters used in this study are standardized procedures, regulated by the legislation in force.

Table no. 2:
The obtained results for sample 1 of water from school 2

Crt. No.	Organoleptic physico-chemical indicators	Reference for analysis	Maximum permissible values	Values obtained	Unit
1	pH	SR EN ISO 10523:2012	≥6,5 ; ≤9,5	7,24	pH units
2	Free residual chlorine	SR EN ISO 7393-2:2002	0,50	0,36	mg/l
3	Nitrites	SR EN 26777:2002	0,50	<0,079	mg/l
4	Nitrates	SR ISO 7890-3:2000	50	11,29	mg/l
5	Iron	SR ISO 6332:1996/C9 1:2006	200	85	µg/l
6	Oxidability	SR EN ISO 8467:2001	5,0	1,45	mgO_2/l
7	Total hardness	SR ISO 6059:2008	Minimum 5	8,7	German degrees
8	Taste	SR EN 1622:2007	Acceptable to the consumers and no abnormal change	Acceptable	-
9	Smell	SR EN 1622:2007	Acceptable to the consumers and no abnormal change	Acceptable	-

Source: By authors' calculation and interpretation

Table no. 3:
The obtained results for sample 1 of water from school 3

Crt. No.	Organoleptic physico-chemical indicators	Reference for analysis	Maximum permissible values	Values obtained	Unit
1	pH	SR EN ISO 10523:2012	≥6,5 ; ≤9,5	6,84	pH units
2	Free residual chlorine	SR EN ISO 7393-2:2002	0,50	0,21	mg/l
3	Nitrites	SR EN 26777:2002	0,50	<0,024	mg/l
4	Nitrates	SR ISO 7890-3:2000	50	17,44	mg/l
5	Iron	SR ISO 6332:1996/C91:2006	200	100	µg/l
6	Oxidability	SR EN ISO 8467:2001	5,0	2,25	mgO_2/l
7	Total hardness	SR ISO 6059:2008	Minimum 5	9,2	German degrees
8	Taste	SR EN 1622:2007	Acceptable to the consumers and no abnormal change	Acceptable	-
9	Smell	SR EN 1622:2007	Acceptable to the consumers and no abnormal change	Acceptable	-

Source: By authors' calculation and interpretation

References

[1] www.apanovabucuresti.com;
[2] Manescu S. (1994) - „Sanitary Environmental Chemistry“, Medical Publishing, Bucharest, pp. 20 - 36;
[3] http://healingearth.ijep.net/water/structure-water;
[4] Vaicum L. (1974) - „Chemistry and Water Biology“, Technical Publishing House, Bucharest, pp. 32 - 33;
[5] Newton D.E. (2003) - „Encyclopedia of water“, Greenwood Press, pp. 147-149;
[6] Newton D.E. (2003) - „Encyclopedia of water“, Greenwood Press, pp. 153-156;
[7] Von Gunten U. (2003) - „Ozonation of drinking water: Part I. Oxidation kinetics and product formation“, Water Resources Journal, nr.37, pp.1443–1467;
[8] Cheremisinoff N.P. (2002) - „Handbook of water and wastewater treatment technologies“, Woburn, pp. 48-57;
[9] Stevenson D.G. (1997) - „Water Treatment Unit Processes“, Imperial Colleg Press, London, UK, pp. 35;
[10] World Health Organisation (2011) - „Guidelines for Drinking-water Quality“, Fourth Edition;
[11] Law no. 458 (2002) – „Water Quality Law in Romania“;
[12] http://www.high-health.info/apa/.

STRUCTURAL TRENDS IN LAND USE IN TERMS OF AGRO-ENVIRONMENTAL INDICATORS

Senior researcher II PhD Camelia GAVRILESCU,
Senior researcher III PhD Crina TURTOI
Institute of Agricultural Economics, Romanian Academy
Emails: cami_gavrilescu@yahoo.com; cturtoi@yahoo.com

Abstract: *The growing demand for information regarding the relationship between land use and environment largely reflects the higher priority given to environmental concerns in developing agricultural policy. The use of land resources has direct impact on environmental change, influencing the quality of life, ecosystems and overall infrastructure. Changes in land use categories, climate change, technological progress and shifts in population structure are some of the key drivers influencing agricultural land use and landscapes. Based on the conceptual analytical framework provided by the agri-environmental indicators, the paper highlights the structural trends in land use changes, cropping patterns and livestock patterns, at national and European level.*

Key words: *agri-environmental indicators, land use, cropping patterns, livestock patterns.*

Introduction

Limited land resources are under the constant pressure of the natural and anthropogenic stressors (soil erosion, loss of fertility, desertification, loss of biodiversity, deforestation, land degradation, water degradation, food shortages, biomass deficiency, water scarcity, poverty, social disturbances, etc.), but also under the impact of the global climate change. The analysis of the structural trends in the utilization of the farm lands is one of the basic determinants in elaborating agri-environment policies, which, through financial incentives and advice, can guide farmers to protect and strengthen the natural environment on the land they manage.

Having in view that the cross-compliance rules include also the obligation to maintain the ratio between the area of permanent pastures and meadows and the total agricultural area as declared by farmers in 2007 (referred to as reference report), any farmer requesting financial support from European and national funds must comply with these rules throughout the year on all plots of the holding, regardless of their size (including those not eligible for production and those no longer used for production). A good knowledge of the operating structures at farm level is essential for understanding the management system of the farm, necessary for implementing adequate measures for the sustainable management of land resources.

The use of agricultural land for other purposes is generally linked to changes in the environment designed to facilitate human activities. In general, this phenomenon is related to economic growth. There are many activities involving land use, resulting in land use change from agricultural land to artificial areas: urban expansion (housing and industrial developments), transport

infrastructure (motorways, railways, etc.), tourism and leisure facilities. Increased land-related activities often lead to higher land prices and less access to land. How we use land can have a major impact on environmental conditions.

Materials and methods

The main purpose of the study is to identify the trends in the land use of the Romanian agricultural holdings. The study was done by analysing the set of agri-environment indicators (AEIs) for characterizing the land use, in the frame of DPSIR model (Driving forces, Pressures, State, Impacts, and Responses). According to the DPSIR framework there is a chain of causal links starting with 'Driving forces' (economic sectors, human activities) through 'Pressures' (emissions, waste) to 'States' (physical, chemical and biological) and 'Impacts' on ecosystems, human health and functions, eventually leading to political 'Responses' (prioritisation, target setting, indicators). Within DPSIR frame, under driving forces, the agri-environmental indicators are structure on four sub-domains: (i) Input use, (ii) Land use, (iii) Farm management, (iv) Trends [1]. Agri-environment indicators with reference to the land use sub-domain are used to monitor progress and assess the impact of specific measures under Priority Axis 2 of the National Rural Development Plan. Land use sub-domain, associated to DPSIR's Domain 'Driving forces', is measured by the following agri-environment indicators: (i) AEI 9 – Land use change; (ii) AEI 10.1 – Cropping patterns; (iii) AEI 10.2 – Livestock patterns

Results and discussions

AEI 9 (Land use change) provides information on the area on which it was changed the land destination from agriculture to artificial surfaces and is defined as the exits from agricultural land use, broken down by non–agricultural sectors. Basicaly it represents the conversion of agricultural land to non agricultural use [2].

Main indicator for assessing land use change is the percentage of the total agricultural area that has changed to artificial surfaces, compared to a reference period; supporting indicator is land use change from agricultural land to artificial surfaces (ha) between the compared years. Information for this indicator derives from European Environment Agency. The most recent period for available information is 2000-2006.

Data sources: (i) EEA – Corine Land Cover (CLC); (ii) Eurostat-LUCAS. CLC inventory was initiated in 1985 (reference year 1990). Updates have been produced in 2000, 2006, and 2012.

The total area of land use change from agricultural land cover to artificial surfaces between 2000 and 2006 amounts to 524,181 ha in 39 European countries, which represents an overall change in land use of 0.23%.

The area of land use change from agriculture to artificial surfaces varies significantly between the countries. The conversion of agricultural land to housing, services and recreation sector play the most important role to European level, accounting for 38% of the total land use change area in Europe. Particularly in the Balkan countries the change in land use category towards housing sector is very high. The second largest driver at European level is the land use change from

agriculture to construction sites (28% of the total European land taken by artificial areas), followed by the change from agriculture to industrial and commercial sites (18%), from agriculture to mines and waste dumpsites accounts for (11%) and from agriculture to transport facilities (6%) - Figure 1.

In Romania, total area of land use change from agricultural land cover to artificial surfaces between 2000 and 2006 amounts to roughly 8,377 ha (an overall change in land use of 0.06%). The sector share of land converted from agriculture to artificial surfaces indicates which sectors took up most agricultural land (Figure 2).

During the analised period, most of the changes in agricultural land towards other lnad use categories in Romania was driven the housing, services and recreation sector (58%), followed by industrial and commercial sites (23%) construction sites (11%), mines and waste dumpsites (6%) and transport facilities (1%) (Figure 2).

AEI 10.1 (Cropping patterns) provides information on the trends in the share of the utilised agricultural area (UAA) occupied by the main agricultural land uses (arable land, permanent grassland and land under permanent crops), and they are measured by the following indicators:

Main indicator: - Share (%) of main agricultural land types (arable land, permanent grassland and land under permanent crops) in total UAA.

Supporting indicator: - Areas (in hectares) occupied by arable crops, permanent grassland and permanent crops.

Data sources for the AEI 10.1 and are the Farm Structure Surveys carried out in Romania at 2-3 years starting with 2002 Agricultural census, sample based or exhaustive [3]. Last available information is the FSS carried out in 2013.

In 2013 in the EU-28 the total utilised agricultural area (UAA) covered 174 million hectares. More than 70% of all that land was located in just seven Member States: France (16% of the EU-28 total), Spain (13%), the United Kingdom and Germany (10% each). Poland (8%), Romania and Italy (7% each) (Figure 3).

Out of the total UAA at EU-28 level (174 million hectares), 60% is covered by arable land (104.2 million hectares), 34% is covered by pastures and meadows (59.6 million hectares) and 6% is covered by permanent crops (10.3 million hectares). Kitchen gardens cover 0.2% of UAA (286 thousand hectares) (Figure 4).

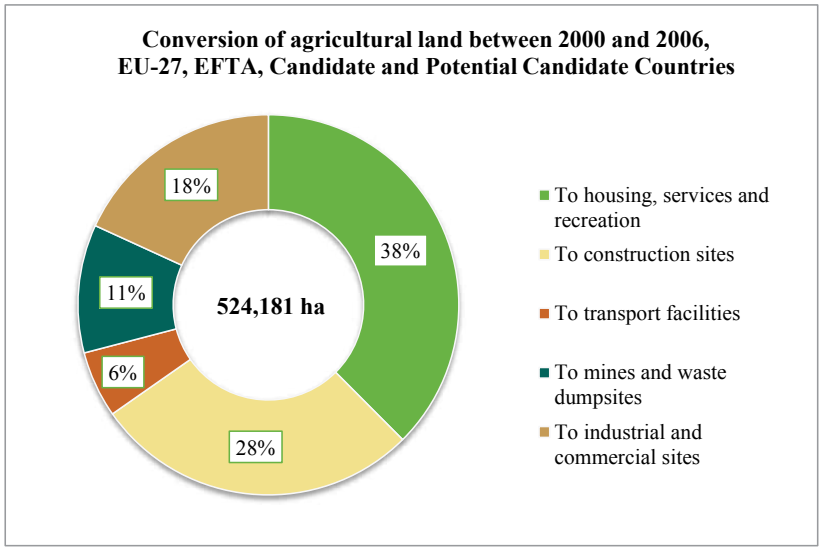
By land use categories of UAA, in Romania there are located: 8% of total EU-28 arable land, 55% of total EU-28 kitchen gardens, 3% of total EU-28 permanent crops and 7% of total EU-28 permanent pastures and meadows (Figure 5).

About 58% of total arable land of EU-28 is located in five Member States: France (18%), Germany (11%), Spain (11%), Poland (10%) and Romania (8%). Except Italy and United Kingdom (operating each 6%) and Hungary and Bulgaria (operating each 3%), the other 19 Member States are operating all together 23% of the total EU-28 arable land, in shares of less than 2.5% each.

More than 55% of the total EU-28 area under kitchen gardens is located in Romania, while 39% is located in other seven countries: Poland (11%), Italy (7%), Portugal (5%), Hungary (5%), Latvia (4%), Greece (35) and France (2%). The other 20 Member States are operating 6% of the total area under kitchen gardens.

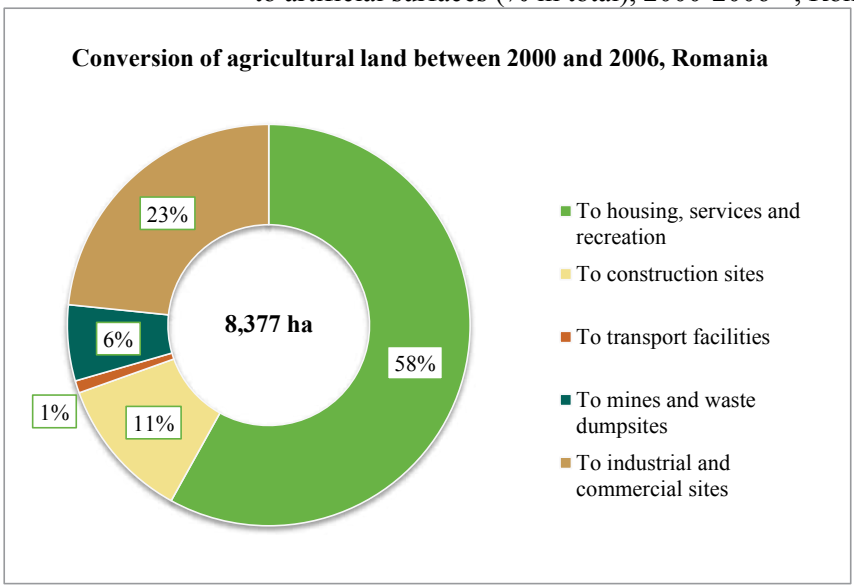
Almost 85% of the total permanent crops of EU-28 are located in five Member States: Spain (39%), Italy (20%), France (10%), Greece (9%) and Portugal (7%).

Figure 1:
Land use change of agricultural land (ha) and conversion of agricultural land to artificial surfaces (% in total), 2000-2006(*), EU-27, EFTA, Candidate and Potential Candidate Countries



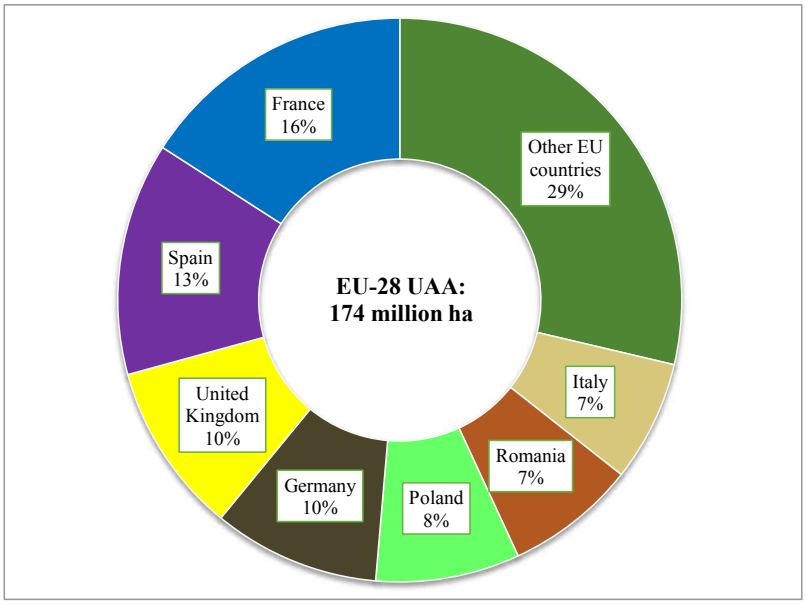
Source: European Environment Agency
(*)The changes in agricultural land include the conversion of agricultural land into artificial surfaces and to forest/semi-natural land. Agricultural land can also change when forest/semi-natural land is converted into agricultural land.

Figure 2:
Land use change of agricultural land (ha) and conversion of agricultural land to artificial surfaces (% in total), 2000-2006(*), Romania



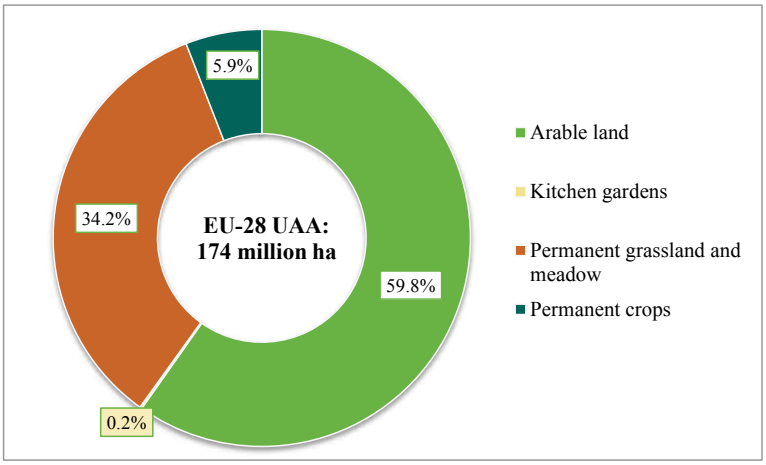
Source: European Environment Agency
(*)The changes in agricultural land include the conversion of agricultural land into artificial surfaces and to forest/semi-natural land. Agricultural land can also change when forest/semi-natural land is converted into agricultural land.

Figure 3:
Share in total utilized agricultural area (UAA) in the EU-28, 2013 (%)



Source: Eurostat

Figure 4:
Share of areas occupied by arable crops, permanent pastures and meadows, permanent crops and kitchen gardens in total utilized agricultural area (UAA), EU-28, 2013



Source: Eurostat

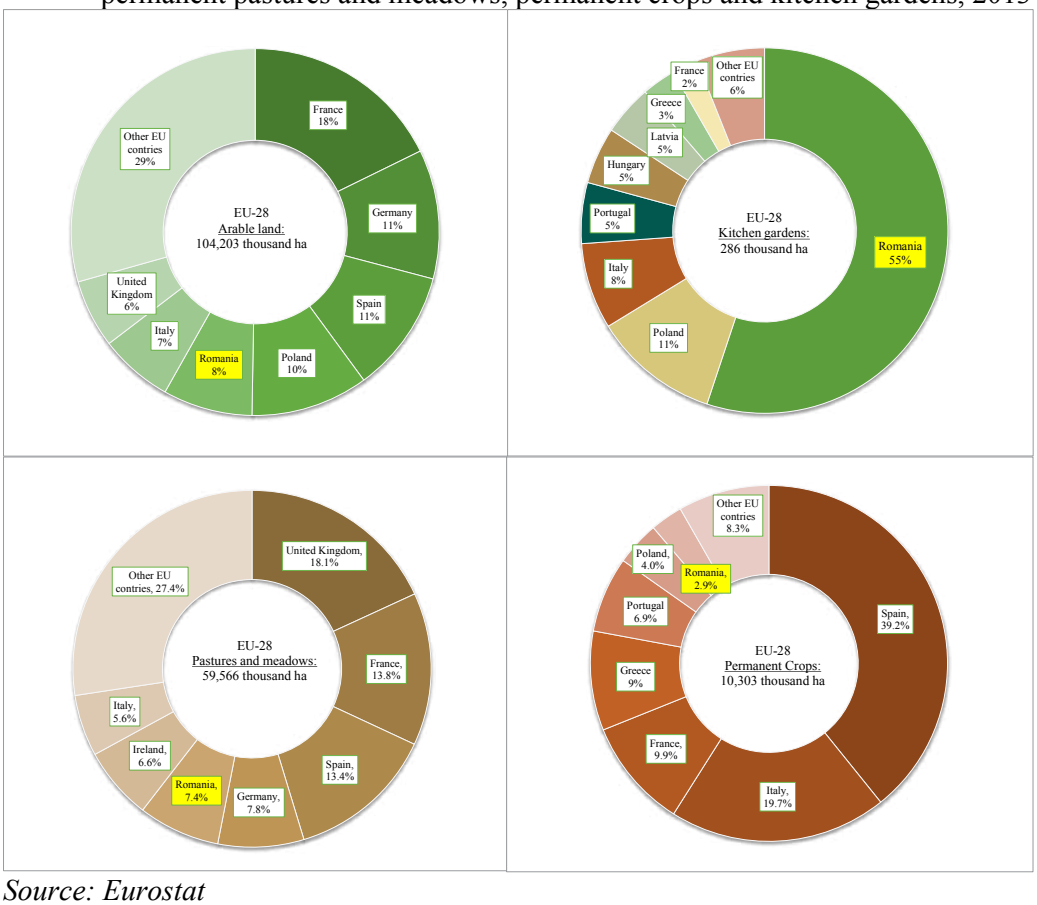
Other four countries are operating almost 10% of total permanent crops of EU-28: Poland (4.0%), Romania (3%), Germany (2%) and Hungary (1%), while the rest of 19 countries are operating all together 5% of the total area under permanent crops, in shares of less than 1% each.

About 78% of the total permanent pastures and meadows of EU-28 are located in eight Member States: United Kingdom (18%), France (14%), Spain (13%), Germany (8%), Romania (7%), Ireland (7%), Italy (6%) and Poland (5%). The other 20 countries are operating all together 22% of the total area under permanent pastures and meadows, in different shares of less than 3.5% each.

According to the results of the Fram structure survey 2013 (FSS 2013), total UAA in Romania amounts 13 million hectares, of which 63% is arable land, 34% permanent pastures and meadows, 2% permanent crops and 1% kitchen gardens (Figure 6).

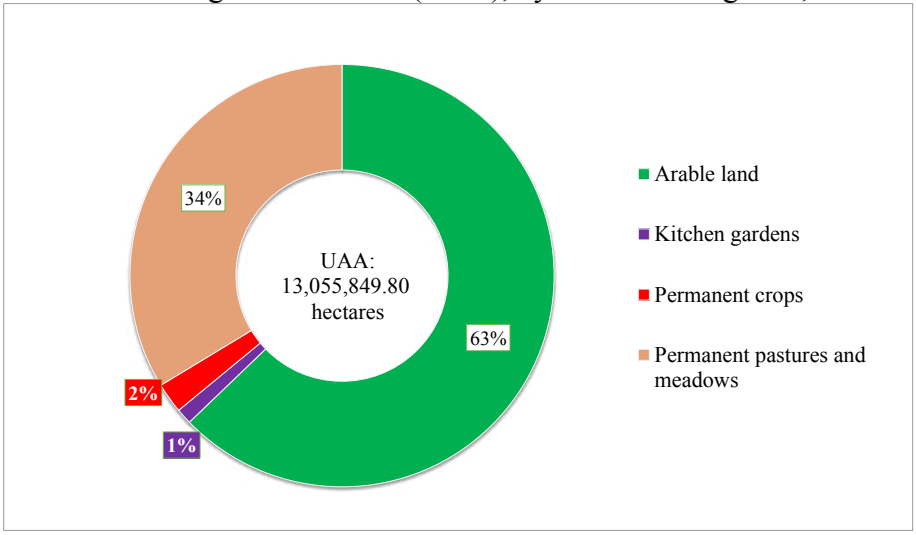
The trend of the structure of the utilised agricultural area during 2002-2013 indicates almost the same shares in the distribution of UAA by land use categories (Figure 7). In absolute figures, as compared with 2002, the total utilised agricultural area decresed in 2013 with 875 thousand hectares. This decrease had the following structure: 66% exited from arable land, 1% from kitchen gardens, 5% from permanent crops and 28% from permanent pastures and meadows.

Figure 5:
Share of of country areas in total EU-28 areas occupied by arable crops, permanent pastures and meadows, permanent crops and kitchen gardens, 2013



Source: Eurostat

Figure 6:
Utilised agricultural area (UAA), by land use categories, Romania, 2013

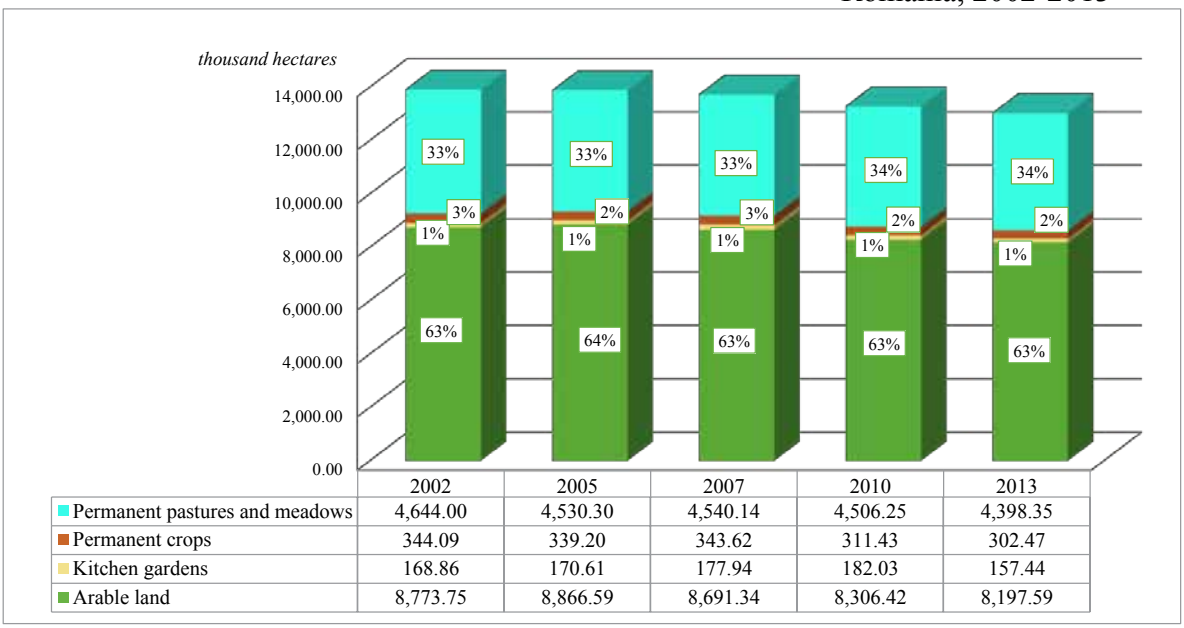


Source: National Institute of Statistics, Romania, Farm Structure Survey, 2013

AEI 10.2 (Livestock patterns) provides information on the trends in the share of major livestock types (cattle, sheep, pigs and poultry) and density of livestock units (LSU) on agricultural land and is measured by the following indicators:
- Main indicator:
Total livestock density (LSU/ha of UAA)
- Supporting indicator:
Number of animals of cattle, equidae, sheep, pigs and poultry;
Share (%) of major livestock types (cattle, equidae, sheep, pigs and poultry) in total livestock population;
Grazing livestock density (grazing LSU/ha of fodder area).
In 2013 the EU-28 had a total of 130 million livestock units (LSU), structured as follows: 48% cattle, 26% pigs, 15% poultry, 8% sheep, 2% equidae and 1% goats (Figure 9). In absolute terms, France had the highest number of total livestock units (21.8 million LSU), followed by Germany (18.4 million LSU), Spain (14.5 million LSU) and the United Kingdom (13.2 million LSU). The lowest number of LSU was reported in Malta (34 930 LSU). With 5 million LSU Romania is placed on the 9th place (4% of EU-28 livestok polulation) (Figure 8). In 2013, Romania had a total of 4,975,300 livestock units (LSU), structured as follows: 33% cattle, 20% pigs, 18% poultry, 18% sheep, 8% equidae and 3% goats (Figure 9).

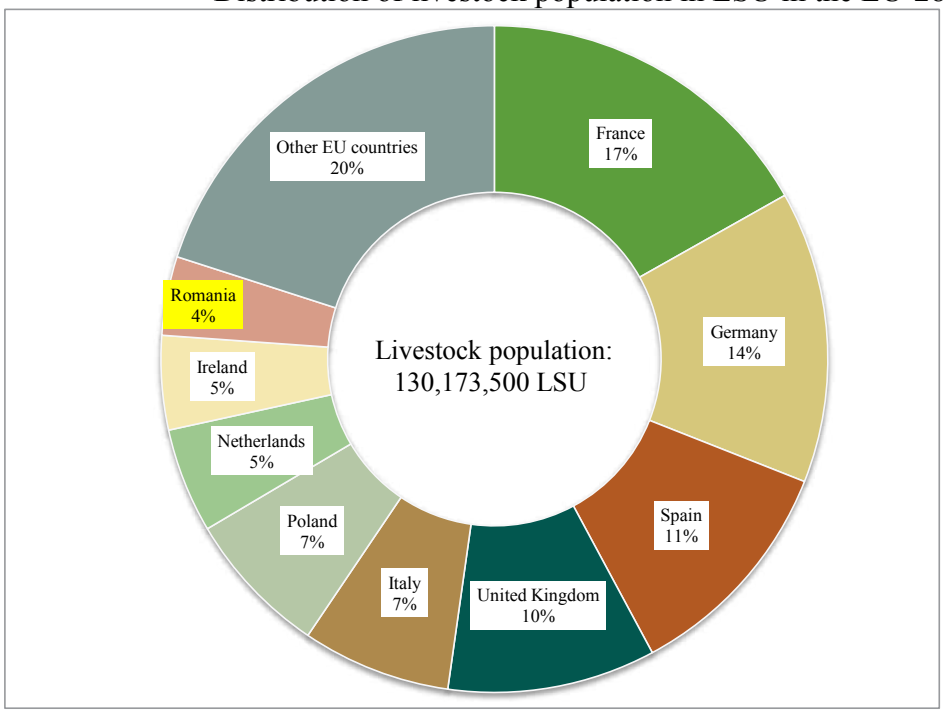
In 2013, in the EU-28 the total livestock density equaled 0.7 LSU per hectare of UAA, while the grazing livestock density reached 1.0 LSU of grazing livestock per hectare of fodder area. The highest total livestock densities that exceeded 2.5 were observed in the Netherlands, Malta and Belgium (3.6, 3.2 and 2.7 respectively). In these countries as well as in Cyprus the highest grazing livestock densities were found as well (2.6 in Cyprus and Malta, 2.5 in the Netherlands and 2.3 in Belgium). In 2013, in Romania the total livestock density equaled 0.4 LSU per hectare of UAA, while the grazing livestock density reached 0.6 LSU of grazing livestock per hectare of fodder area.

Figure 7:
Trend in Utilised agricultural area (UAA), by land use categories, Romania, 2002-2013



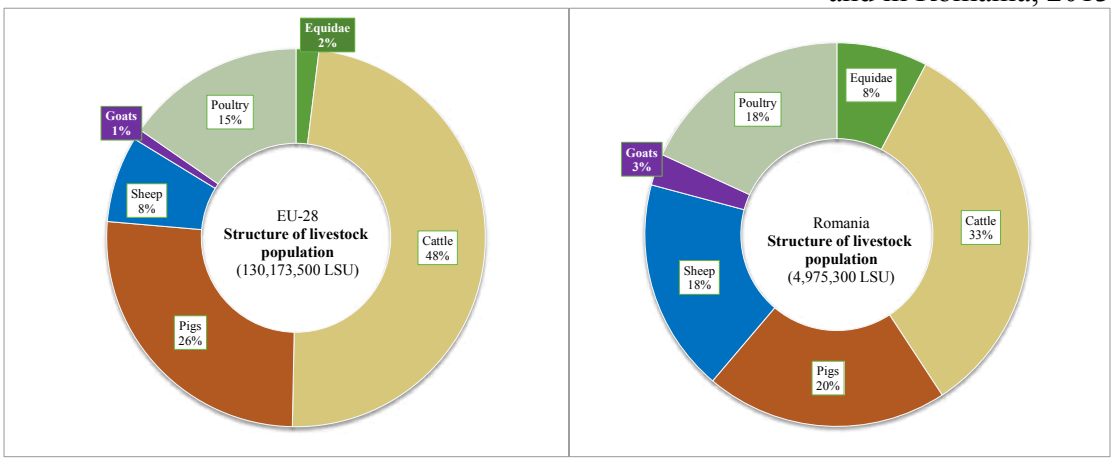
	2002	2005	2007	2010	2013
Permanent pastures and meadows	4,644.00	4,530.30	4,540.14	4,506.25	4,398.35
Permanent crops	344.09	339.20	343.62	311.43	302.47
Kitchen gardens	168.86	170.61	177.94	182.03	157.44
Arable land	8,773.75	8,866.59	8,691.34	8,306.42	8,197.59

Figure 8:
Distribution of livestock population in LSU in the EU-28, 2013



Source: Eurostat

Figure 9:
Structure of livestock population in LSU in the EU-28 (including Norway) and in Romania, 2013

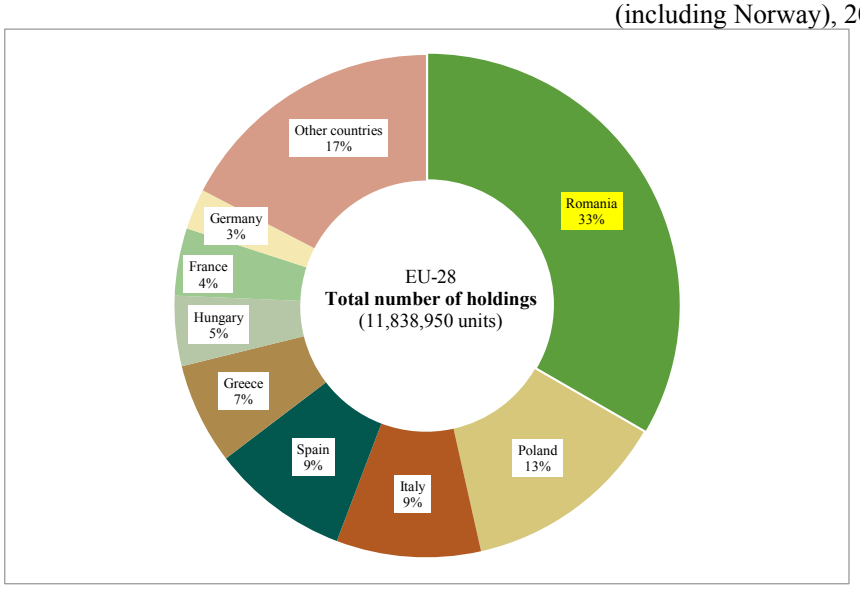


Source: Eurostat

In 2013, out of the total number of holdings in the EU-28 (11.8 million holdings), 58 % were holdings with livestock (6.2 million holdings). About 33% of the total number of holdings in the EU-28 was located in Romania (3.6 million holdings) (Figure 10). Romania had 2.7 million holdings with livestock (75% of the total number of holdings Romania).

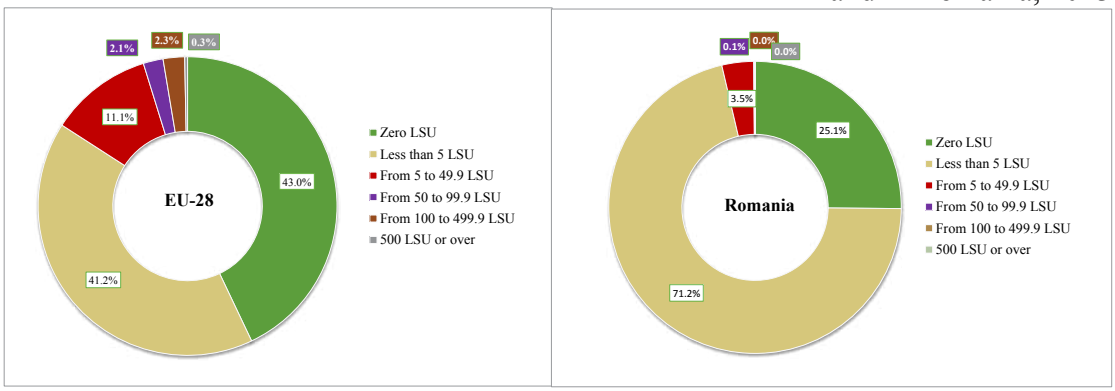
At EU-28 level 41% of holdings had only a small amount of livestock (less than 5 LSU). In Romania 25% holdings are sized "zero LSU", 71% of the holdings are sized less than 5 LSU, 3.5% are sized 5-49.9 LSU and only 0.1% are sized 50-99.9 LSU (Figure 11).

Figure 10:
Distribution of agricultural holdings in the EU-28 (including Norway), 2013



Source: Eurostat

Figure 11:
Holdings by size of the holding in LSU, in the EU-28 (including Norway) and in Romania, 2013



Source: Eurostat

Conclusions

The results of the monitoring and assessment of land use practices by agricultural holdings should take into account that making decisions on the use of natural resources at their disposal belongs directly to agricultural producers.

The successful implementation of any of the conclusions resulting from the monitoring of land use indicators depends on the acceptance/cooperation of agricultural producers, which is largely determined by the following factors:

- The level of incentives set by policy makers;
- Training level of the agricultural producer (farm manager);
- Market requirements.

A substantial proportion of agricultural land is not covered by agri-environmental schemes (agricultural producers with less than 1 hectare are excluded from subsidies) and, as such, the possibility of stimulating them to consolidate the land and convert to more sustainable production models , with an efficient use of resources, is diminished.

References

1. EUROSTAT (2006), Communication from the Commission to the Council and the European Parliament - Development of agri-environmental indicators for monitoring the integration of environmental concerns into the common agricultural policy {SEC(2006) 1136);

2. EUROSTAT (2012), European Commission, Eurostat, Handbook on implementing the FSS and SAPM definitions, Rev 10., CPSA/SB/ Ver. 10, Luxembourg, 2012;

3. *** National Institute of Statistics, Romania, Results of the Farm Structure Surveys 2002, 2005, 2007, 2010 and 2013 (2002 and 2010 were years of full census).

INTERNATIONAL PARTNERS

REPUBLIC OF MOLDOVA

University of the Academy of Sciences of Moldova

EGIPT

Khadiga Mohamed Gaafar – Higher Institute for Specific Studies
May Mohamed El Batran – Higher Institute for Specific Studies
Mohamed Mahmout El Batran – Higher Institute for Specific Studies

ITALIA

Balestri Gino – D.A.G.A. Sezione Scienze Zootecniche, Università di Pisa
Doni S. – Istituto per lo Studio degli Ecosistemi (ISE), Pisa
Fantoni Elena – Comune di San Giuliano Terme Pisa
Fontanelli Marco – University of Pisa
Fratini Roberto – Department of Florence University
Gajo Paolo – Florence University
Ginanni M. – University of Pisa
Lorenzini G. – Dipartimento di Scienze Zootecniche, Università di Firenze
Macci C. – Istituto per lo Studio degli Ecosistemi (ISE), Pisa
Mani Danilo – D.A.G.A. Sezione Scienze Zootecniche, Università di Pisa
Martini Andreea – Dipartimento di Scienze Zootecniche, Università di Firenze
Masciandaro Graziana - ISE-CNR Pisa
Migliorini P. – Università degli Studi di Scienze Gastronomiche
Peruzzi A. – Centro Interdipartimentale di Ricerce Agro-Ambientali "Enrico Avanzi", University of Pisa
Peruzzi E. – Istituto per lo Studio degli Ecosistemi (ISE), Pisa
Pistoia Alessandro – D.A.G.A. Sezione Scienze Zootecniche, Università di Pisa
Poli Piera – D.A.G.A. Sezione Scienze Zootecniche, Università di Pisa
Raffaelli M. – University of Pisa
Siboni Eugenio – Società Produttori Sementi SpA, International Marketing Manager, Argelato (BO)

BRASIL

Guilhermino, M.M. – Universidade Federal do Rio Grande do Norte (UFRN), Natal, RN

Code NURC : 882 category „C"
ISSN: 1454 – 816X
The journal is indexed in the following International Databases:
ReportLinker.com, SCOPUS, Google Scholar, INDEX COPERNICUS, CABI, EBSCO.