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THE STATE AND EVOLUTION OF AGRICULTURAL LAND RESOURCES IN THE POST-SOCIALIST PERIOD IN ROMANIA

ABSTRACT

In Romania, after the 1989 Revolution, the land resources have acquired an increasingly important role in agriculture and rural area development. The main objective of this paper is to increase the awareness degree on the current situation and evolution of land resources as well as on the related opportunities and challenges. The land resource analysis revealed that Romania has significant agricultural land resources, with a favourable agricultural land structure, in which arable land prevails. The land reform implementation produced significant changes in the land ownership structure, and the private landed property prevails in all the agricultural categories of use. Romania is characterized by significant soil diversity, yet with almost half of its agricultural areas being affected by various constraining factors.

Key words: land resources, post-socialist period, Romania.

JEL Classification: Q00, Q24.

1. INTRODUCTION

In Romania, after the 1989 Revolution, the land resources have acquired an increasingly important role in agriculture and rural area development. The agricultural land resources are closely connected to the global food insecurity and poverty challenges, to the adaptation to the climate changes and their attenuation, as well as to natural resources degradation and exhaustion that impacts the lives of millions of rural residents.

2. STATE OF KNOWLEDGE

The land resources and their utilization modality represent a basic element for the improvement of food security throughout the world. The demographic pressure, the climate changes and the increased competition on the agricultural land are factors that may increase population's vulnerability to food insecurity.

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Most theoretical/conceptual approaches treat the agricultural land either as “land resource” or as “fertile soil”. The land resources are considered the core element of farm production, directly and indirectly influencing the farming activity (Zahiu, 1993).

The rational use of land resources implies several dimensions, namely: a) juridical dimension – targeting the legal framework importance in the organization and rational use of land resources; b) social-economic – targeting the influence of social processes, relations and policies on land use; c) natural-biologic – linked to the investigation of land operation as a component of nature and environment; d) technological – targeting the investigation of technical and technological activities on land while highlighting the relation between the rational use of land resources and the technical-scientific progress (Ioniță and Blidaru, 1999).

3. MATERIAL AND METHOD

The main objective of this paper is to increase the awareness on the situation and evolution of land resources as well as on the challenges and opportunities in relation to these. The investigated statistical data were collected from several sources (National Institute of Statistics, Ministry of Environment, etc.) and were processed in Excel, providing an overall picture of the availability, utilization and management of land resources at national level.

4. RESULTS AND DISCUSSIONS

Romania has significant agricultural land resources.

4.1. LAND RESOURCE

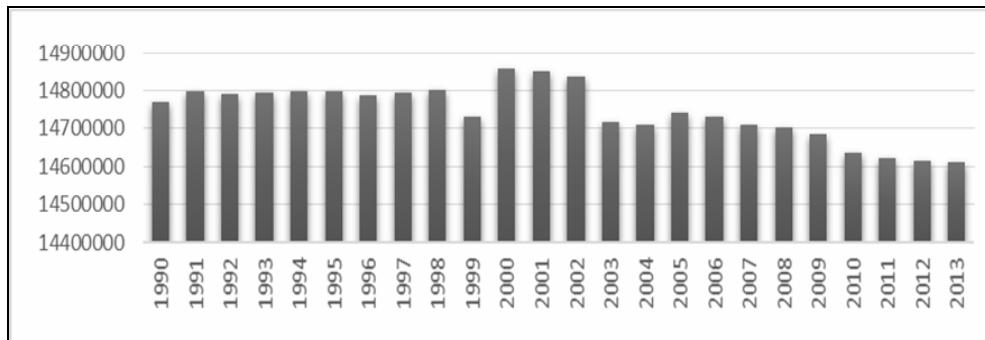
Agricultural land has a significant share of 61.29% in the country’s total area of 23,839,071 ha. By categories of use, arable land (9,289,254 ha) has the highest share, i.e. 64.26%. The pastures and hayfields come next, totalling 4,815,815 hectares (32.96%). The land under vineyards and orchards has quite a small share (406,814 ha) accounting for 2.79% of the agricultural land (Table 1).

In the period 1990-2005, the agricultural land area experienced non-significant yearly oscillations; after 2005, a slightly decreasing trend followed (Figure 1). The agricultural area was down by 157145 hectares (1.06%) in the year 2013 compared to 1990, under the background of increasing areas under degraded land.

Table 1
Agricultural land distribution by categories of use in the year 2013

Category	U.M.	Agricultural land		1990-2013 differences (1990 = 100)	
		Ha	%	Ha	%
Agricultural, out of which:	ha	14611883	100.00	-157145	98.94
Arable	ha	9389254	64.26	-61141	99.35
Pastures	ha	3273961	22.41	+11452	100.35
Hayfields	ha	1541854	10.55	+76490	105.22
Vineyards and vine nurseries	ha	210270	1.44	-67101	75.81
Orchards and fruit-tree nurseries	ha	196544	1.35	-116845	62.72

Source: author's processing based on NIS data, TEMPO-ONLINE database, 2015.



Source: author's processing based on NIS data, TEMPO-ONLINE database, 2015.

Figure 1. Evolution of agricultural land area (ha) in the period 1990-2013.

Romania has a favourable agricultural land structure compared to France or Poland. Thus, the share of agricultural and arable land is higher than that in the other two countries. At the same time, the arable land resources per capita are by 57% higher than those of France and Poland.

Table 2
Structure of land resources in France, Poland and Romania in the year 2012

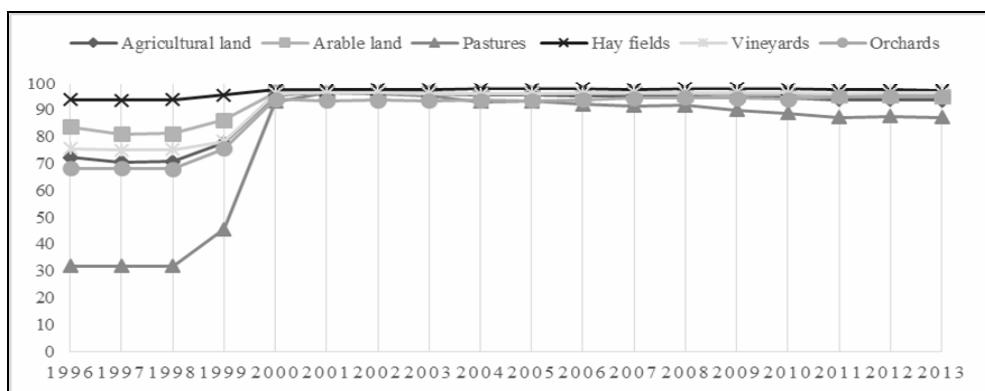
Country	Agricultural land share in total area (%)	Arable land share in total area (%)	Share of land under permanent crops in total area (%)	Arable land per capita (ha/capita)
France	52.7	33.4	1.8	0.28
Poland	47.4	35.7	1.8	0.28
Romania	59.7	38.2	1.9	0.44

Source: <http://data.worldbank.org/indicator>.

By categories of use, the situation is the following: the arable land and the land under vineyards and orchards decreased in area, while the pastures and hayfields were the only categories whose area increased. The most significant diminution was noticed in the case of orchards: most fruit plantations are old aged, older than 25 years, with low productive potential, under decline or abandoned.

According to the cropping system, more than half of the fruit-tree plantations are grown under extensive system and only one-third are cultivated under intensive system (MARD, 2014).

In Romania, significant changes in the agricultural land ownership have been produced following the land reform application. Thus, the share of agricultural land into private ownership has increased each year, to reach 93.63% in 2013, consisting of the private property of the state, of the territorial-administrative units, of the legal entities and natural persons. Private ownership prevails in all the categories of use of agricultural land (Figure 2). This change produced in the ownership system has significantly influenced the decisions on land resources allocation, soil conservation and protection, land market operation and last but not least, the economic performance of the agricultural sector.



Source: author's processing based on NIS data, TEMPO-ONLINE database, 2015.

Figure 2. Evolution of the agricultural land under private ownership, in the period 1997-2013.

Although in the last 25 years, the land structure experienced radical changes, the general cadastral works on agricultural land covered quite a small area (Baciu, 2014, estimates that only 10-15% of the agricultural land was subject to cadastral surveys). The cadastral works dating before 1989 do no longer fit the present situation, when the agricultural land was restituted to former owners. Although the cadastral survey of agricultural land areas was mentioned in the programs of several governments in power, it has remained a mere promise.

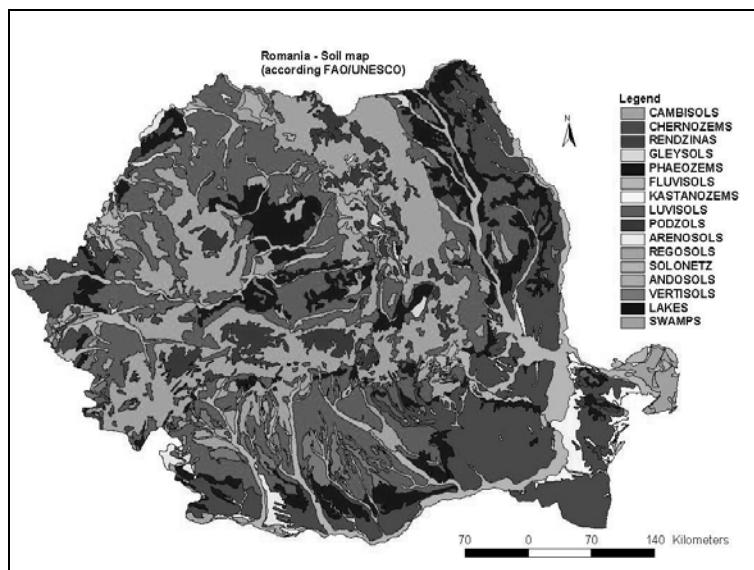
The current structural pattern of the agricultural land provides for significant rural economy development possibilities, by the practice of a multifunctional agriculture. The accurate knowledge of the situation and evolution of the structure of categories of use may represent for decision-makers an important instrument in the implementation of certain economic and social measures that should lead to the sustainable and efficient use of land resources. The structure of the agricultural land use, in general, characterizes the agricultural production potential, the directions of agriculture specialization and intensification and the general production profile.

4.2. SOIL RESOURCES

Soil, as non-renewable resource that has vital functions in the development of human activities, represents the main resource in agriculture, with a vital role in the food security for the population. Romania is characterized by a significant diversity of soil resources (Figure 3).

Soil condition is considered an important indicator of environment characteristics and evolution, useful for the quantitative and qualitative assessment of the specific resources utilization or of the efficiency of land reclamation works, a valuable element for the human society development prospects. Hera (2009) considers that soil is “one of the most complex natural systems of our world, a structured aggregate of substances under continuous transformation, a biological complex in which life is thriving, a precious filter for maintaining a normal environment, a multi-functional system, a unique and indispensable life generating power”.

Romania has good-quality soils. According to the production potential of agricultural land, established on the basis of soil rating scores, the agricultural land areas are grouped into five classes, namely: class I includes the agricultural land areas with the best quality soils and class V consists of the land areas with soils that are not suitable for the farming practice. The quality classes provide information on soil suitability for agricultural uses. From the analysis of data from Table 3, the situation is the following: the arable land areas are mainly grouped in the quality classes II (28.40%) and III (38.83%); most pastures and hayfields are found in the classes III-V; the vineyards and orchards cover a larger area from classes II-IV.



Source: National Research Institute for Soil Science, Agrochemistry and Environment.

Figure 3. Romania's soil map.

Table 3
Agricultural land * by quality classes,
according to the soil rating scores, 2013 **

Category of use	UM	Quality classes					
		Class I	Class II	Class III	Class IV	Class V	
Arable	ha	580760.36	2631193.31	3597347.95	1779092.47	676133.22	9264527.31
	%	6.27	28.40	38.83	19.2	7.3	100
Pastures and hayfields	ha	86147.60	412213.27	1312668.93	1812781.57	1130629.05	4754440.42
	%	1.81	8.67	27.61	38.13	23.78	100
Vineyards	ha	8268.58	63699.38	80884.12	82111.95	26497.40	261461.43
	%	3.16	24.36	30.94	31.4	10.13	100
Orchards	ha	1848.10	26594.07	79558.52	104951.91	35103.05	248055.65
	%	0.75	10.72	32.07	42.31	14.15	100
Agricultural	ha	677024.64	3133700.03	5070459.52	3778937.90	1868362.72	14528484.81

* investigated agricultural area

** distribution of agricultural land areas by quality classes according to the average national soil rating score, for the year 2013 (partially), without applying the soil melioration measures.

Source: Ministry of the Environment and Climate Change, 2014, p. 90.

The territorial distribution of land areas by quality classes is not uniform: most agricultural land areas with high soil rating scores are found in the Romanian Plain and in the Western Plain.

Romania's soils are largely affected by various restrictive factors (Table 4). These have an adverse impact upon soil characteristics and functions as well as upon their bio-productive capacity. Thus, the quantity and quality of the obtained agricultural products is also affected, with negative influences upon the population's food security and life quality. The restrictive factors of soil quality are either natural factors (climate, relief units, edaphic characteristics, etc.) or agricultural and industrial anthropic actions. Most often, the restrictive factors act together, further decreasing the soil quality.

Among the natural factors, the low and very low humus reserve in soil is a real obstacle to farm production development for 51.23% of total agricultural land. At the same time, drought affects almost half of agricultural land (most land areas are in the category of land equipped with irrigation facilities). Among the anthropic degradation processes, soil erosion by water represents one of the most critical problems, affecting 43.12% of agricultural land areas. In the same category, soil structure deterioration and compaction ("plough sole") can be noticed on 6.5 million hectares.

Table 4
Agricultural area affected by various restrictive factors
of soil productive capacity*, in the year 2013

Name of factor	Affected area	
	Thousand hectares	Share of total agricultural area (%)
Natural restrictive factors		
Drought	7100	48.59
Periodical excess soil moisture	3781	25.88
Excessive soil skeleton on the soil surface	300	2.05
Soil salinization, out of which with high alkalinity	614 223	4.20 1.53
Primary compaction of soil	2060	14.10
Low and very low humus reserve in soil	7485	51.23
Strong and moderate acidity	3424	23.43
Low and very low availability of mobile phosphorous in soil	6330	43.32
Low and very low availability of mobile potassium	787	5.39
Poor availability of nitrogen	5110	34.97
Microelements (zinc) deficiencies	1500	10.27
Anthropic degradation processes		
Soil erosion by water	6300	43.12
Soil erosion by wind	378	2.59
Crust formation	2300	15.74
Landslides	702	4.80
Secondary compaction of soil due to inadequate tillage (<i>plough sole</i>)	6500	44.48
Physical-chemical and chemical soil pollution, out of which:	900	6.16
- pollution with substances carried by the wind	363	2.48
- soil destruction by different excavations	24	0.16
Land coverage with solid waste and residues	18	0.12

* The same area can be affected by one or several restrictive factors.

Source: authors' processing of data from the Ministry of the Environment and Climate Change, 2014.

4.3. SOIL QUALITY CONSERVATION

Each year, soil loses significant amounts of macro- and micro- chemical elements with the harvesting of crops, resulting in its fertility diminution. This phenomenon has even a larger intensity in the case of intensive crop farming

systems. In order to maintain soil fertility, the application of chemical and organic fertilizers is of utmost importance. In Romania, in the transition period, fertilizer use had very low values, and the applied fertilizers could not replace the nutrients lost with the harvesting of crops. Thus, in the year 2013, the chemical fertilizer consumption represented only 44.59% of the fertilizer consumption in the year 1990: while in the year 1990 about 146.52 kg active ingredient/ha were applied, in the year 2013 only 79.40 kg active ingredient/ha were applied. The most significant diminution was found in the case of potash fertilizers (Table 5). The experts consider that chemical fertilizer utilization, in the recommended amounts depending on the soil type and crop and applied in the optimum vegetative phase, is the most reliable and fastest method to increase the yields and preserve soil fertility (Hera, 2015).

Table 5
Utilization of chemical fertilizers in agriculture in the period 1990-2013

Indicator	Chemical fertilizers				Organic fertilizers
	total	nitrogen	phosphorous	potash	
Total fertilizer consumption 1990 (tons)	1103075	656094	313108	133873	24790872
Total fertilizer consumption 2013 (tons)	491831	344468	113823	33540	13580267
Evolution of total fertilizer consumption 1990-2013 (%)	44.59	52.50	36.35	25.05	54.78
Fertilizer consumption per hectare 1990 (kg/ha)	146.52	:	:	:	29997.91
Fertilizer consumption per hectare 2013 (kg/ha)	79.40	:	:	:	21946.09

Source: authors' processing of NIS data, TEMPO-ONLINE database.

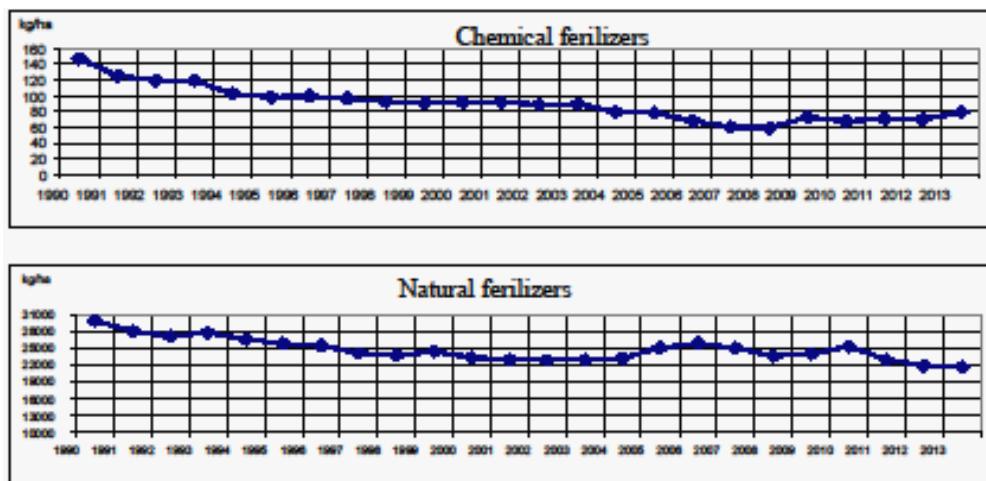
On a comparative basis, in the year 2012, in Romania only 36.4% of the amount of fertilizers used per arable land hectare in France was used and 23.3% of the amount applied in Poland.

Table 6
Evolution of chemical fertilizer consumption per arable land hectare in Romania, France and Poland in the period 2010-2012

Country	2010	2011	2012
France	150.5	141.3	136.9
Poland	178.9	169.7	213.3
Romania	52.5	54.1	49.8

Source: <http://data.worldbank.org/indicator/AG.CON.FERT.ZS>.

Figure 4 presents the total chemical and organic fertilizer consumption per hectare. One can notice a strong diminution in the case of chemical fertilizers and a less strong decrease in the case of organic fertilizers. The low amounts of fertilizers applied per hectare generally put a low pressure on soil throughout the transition period.



Source: authors' processing of NIS data, TEMPO-ONLINE database.

Figure 4. Evolution of the amount of chemical and organic fertilizers applied per hectare in the period 1990-2013.

In the investigated period, together with the extensivization tendency and low utilization of fertilizers, one could also notice the existence of inadequate farming practices, dominated by the inadequate use of chemical fertilizers, as a result of the lack of knowledge and skills, or of limited soil resources. This resulted in the aggravation of soil degradation phenomena.

The use of phyto-sanitary substances plays an important role in ensuring the necessary food for a population under continuous growth. The use of phyto-sanitary substances leads to agricultural productivity increase in the context in which the losses induced by diseases, pests and weeds can reach one-third of harvest. In the transition period, the consumption of phyto-sanitary products decreased, while the areas and crops treated with such substances also decreased. This trend was mainly determined by the agricultural sector restructuring, change in the ownership regime and increase of prices of phyto-sanitary treatments. At the same time, the current range of products of phyto-sanitary use is characterized by high biological activity at low application rates (g/ha) and by the low number of applications.

In Romania's agriculture, the pesticide use is rather a desideratum than a reality, putting a low pressure on soils. In the year 2013, the total amount of applied phyto-sanitary products was much lower compared to that in the year 1990 for all types of products (insecticides, fungicides, herbicides) (Table 7). However, we must not forget that the use of phyto-sanitary products contributed to productivity increase in time and it diminished the expansion of agriculture to other land areas (natural parks, forests, etc.), thus leading to the conservation of soil resources.

The phyto-sanitary products can be also harmful if they are not properly used. Thus, although their utilization trend was low throughout the transition period, a series of agricultural land areas were affected by the wrong use of phyto-sanitary products (lack of adequate knowledge, mainly in the case of small farmers).

Table 7
Evolution of phyto-sanitary products consumption in the period 1990-2013

Indicator	Insecticides	Fungicides	Herbicides
Total consumption 1990 (kg a.i.)	18597861	16454706	16451091
Total consumption 2013 (kg a.i.)	850103	2194060	3903714
1990-2013 differences (kg a.i.)	-17747758	-14260646	-12547377
1990-2013 differences (%)	4.57	13.33	23.73
Total area on which phyto-sanitary products were applied 1990 (ha)	2407859	2385095	4314343
Total area on which phyto-sanitary products were applied 2013 (ha)	1799582	2093070	3825368
1990-2013 differences (ha)	-608277	-292025	-488975
1990-2013 differences (%)	74.74	87.76	88.67
Quantity of phyto-sanitary substances applied per hectare in 1990 (kg a.i./ha)	7.72	6.90	3.81
Quantity of phyto-sanitary substances applied per hectare in 2013	0.47	1.05	1.02
1990-2013 differences (kg a.i./ha)	-7.25	-5.85	-2.79
1990-2013 differences (%)	6.12	15.19	26.76

Source: authors' processing of NIS data, TEMPO-ONLINE database.

Romania invested a lot of capital in the land reclamation works. Thus, in the year 2013, the agricultural area equipped with irrigation facilities accounted for 20.85%, the area equipped with drainage facilities 19.26%, while the areas equipped with soil erosion control equipment represented 14.65% (Table 8).

The role of the land reclamation works is to prevent agricultural land deterioration caused by the natural factors (drought, flooding, moisture excess, etc.) or by the anthropic activities.

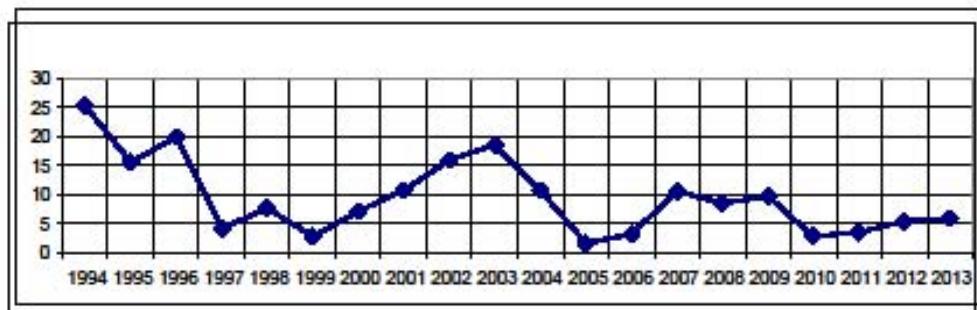
The land reclamation works have in view the increase of soil productive potential and the introduction of non-productive land areas into the economic circuit and they experienced continuous deterioration in the period 1990-2013. Thus, in the year 2013, compared to 1997, the following changes in the areas equipped for land reclamation works were produced: the diminution of the land area equipped with irrigation facilities by 43099 ha and of the land area equipped for drainage works by 47777 ha. The land areas equipped for soil erosion control works increased by 9454 ha. However, the situation of these facilities is far from being satisfactory. Many of the areas equipped with facilities are not functional due to the lack of operation equipment, to the deterioration of different component parts, lack of maintenance and operation capital.

Table 8
Evolution of agricultural land equipped for land reclamation works in the period 1997-2013

Year	Total agricultural land (ha)	Agricul. land equipped with irrigation facilities (ha)	Share of agricult. land equipped with irrigation facilities (%)	Agricul. land equipped with drainage facilities (ha)	Share of agricult. land equipped with drainage facilities (%)	Agricul. land equipped with soil erosion control equipment (ha)	Share on agricult. land equipped with soil erosion control (%)
1997	14793989	3089065	20.88	2949913	19.94	2131524	14.41
1998	14801663	3084580	20.84	2950603	19.93	2132195	14.41
1999	14730711	3084040	20.94	2952099	20.04	2132557	14.48
2000	14856845	3081665	20.74	2952174	19.87	2133022	14.36
2001	14852341	3081360	20.75	2952174	19.88	2134128	14.37
2002	14836585	3077100	20.74	2950348	19.89	2135519	14.39
2003	14717426	3077069	20.91	2950451	20.05	2135951	14.51
2004	14711552	3077438	20.92	2950505	20.06	2136918	14.53
2005	14741214	3076912	20.87	2949917	20.01	2137557	14.50
2006	14730956	3058180	20.76	2915732	19.79	2132574	14.48
2007	14709299	3057047	20.78	2911441	19.79	2134250	14.51
2008	14702279	3058136	20.80	2909177	19.79	2137828	14.54
2009	14684963	3056877	20.82	2907638	19.80	2139876	14.57
2010	14634436	3052865	20.86	2906607	19.86	2140229	14.62
2011	14621427	3047460	20.84	2903652	19.86	2141248	14.64
2012	14615057	3046341	20.84	2903045	19.86	2141170	14.65
2013	14611883	3045966	20.85	2902136	19.86	2140978	14.65
2013/1997	-182106	-43099		-47777		9454	

Source: authors' processing of NIS data, TEMPO-ONLINE database.

Although Romania has important areas equipped with irrigation facilities, which are among the largest areas in Europe equipped for this purpose, the effects are not seen in the obtained harvests, due to the partial use of the equipped areas (Figure5).



Source: authors' processing of NIS data, TEMPO-ONLINE database.

Figure 5. Evolution of the share of the effectively irrigated area (at least one irrigation water application) in the period 1994-2013.

The irrigation systems from Romania, compared to the well-performing countries in this field, are characterized by low extensivization and utilization yields. The oversized land reclamation systems resulted in the impossibility to properly operate the equipped areas in economic terms. The utilization of irrigations had extremely low levels throughout the transition period, ranging from minimum 1.49% in 2005 to maximum 25.25% in 1994.

5. CONCLUSIONS

The analysis of land resources revealed that Romania has significant agricultural resources, with a favourable agricultural land structure in which arable land prevails. In the post-socialist period the most noticeable trend was the consolidation of the share of pastures and hayfields in total agricultural area together with the significant diminution of land areas under highly-intensive agricultural categories of use, vineyards and orchards. In the same period, as a consequence of land reform implementation, private ownership became prevalent in all the agricultural categories of use.

Romania is characterized by significant soil diversity, with high shares of quality soils, mainly in the plain area. However, a significantly large area is affected by constraining factors: almost half of Romania's agricultural land is affected by the small humus reserve in soil, by drought, moisture excess and "plough sole".

As regards soil quality conservation, positive effects come from the low pressure on soil resulting from the utilization of small amounts of fertilizers and phyto-sanitary substances applied per hectare. This adds to the significant capital invested in the land reclamation facilities, mainly in the irrigation infrastructure. However, soils are affected by a series of negative factors, namely: low utilization of chemical and organic fertilizers, insufficient for replacing the nutrients extracted by crop harvesting; frequent inadequate use of chemical fertilizers and phyto-pharmaceutical substances under the background of the lack of the necessary knowledge, skills and finance of small landowners; tendency to reduce the use of phyto-sanitary products and to diminish the land areas and crops on which these products are applied, resulting in lower yields; low level of farmers' awareness of the farming practices that reduce pollution and favour soil conservation; continuous deterioration of land reclamation works in the period 1990-2013; lack of funds for the maintenance and operation of land reclamation facilities; extremely low level or irrigation utilization.

6. ACKNOWLEDGEMENT

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