

LAND USE CHANGES AND LAND DEGRADATION IN POST-SOCIALIST ROMANIA

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Key-words: land use change, land degradation, post-socialist period, Romania.

Changements dans l'utilisation des terrains et la dégradation des terrains dans la Roumanie post-socialiste. La communication se concentre sur l'analyse des principaux changements produits dans l'utilisation des terrains durant la période post-socialiste, quand on a passé d'une concentration excessive de la propriété sur la terre à un émiettement exagéré de celle-là, des exploitations à grande dimension aux petits ménages de type paysan, de subsistance. Ainsi, la superficie agricole du pays a été partagée à environ 15 millions de parcelles (la majorité sous 1 ha), groupées en 4,25 millions d'exploitations individuelles (99,5% sont des exploitations de petite dimension, à une surface agricole moyenne de 2,1 ha). En même temps, on constate une dégradation accentuée des terrains, comme résultat d'une utilisation irrégulière du fonds foncier, de l'abandon ou destruction des systèmes d'amélioration et de la faible fertilisation des terrains agricoles. Les plus importants processus de dégradation des sols qui portent préjudice à des surfaces étendues de terrains agricoles sont: l'érosion hydrique et celle éolienne, les glissements de terrain, la sécheresse, le compactage, l'excès d'eau, l'appauvrissement du sol en matières organiques et en éléments nutritifs, la salinisation, l'acidification etc. On utilise les données statistiques pour la période 1989–2006 et on met en évidence, au niveau national et régional, les changements survenus dans l'utilisation des terrains, en étroite liaison avec les phénomènes climatiques extrêmes.

1. INTRODUCTION

As of 1989, the fall of the communist regime led to a series of radical changes in all the areas of activity. The national economy experienced a transition from an old, centralised socialist system, to a new, free market-based system. One of the first economic branches to be severely affected by the restructuring process was agriculture, due to changes in the type of property, the type of farming and the spatial distribution of the main land cover/land use categories (conversion from one class to another). Some of these changes also had a negative effect on the quality of land (excessive fragmentation of the agricultural terrain, the emergence of a huge number of individual, subsistence farms, inadequate agricultural practices, severe degradation of farming land, etc.).

The intensification and expansion of land degradation processes were favoured both by anthropic and by some natural, climatic change-related factors.

2. DATA SOURCE

In order to identify and analyze the main land use changes during the post-socialist period were used various data sources: Corine Land Cover – CLC, EEA, 1990, 2000; the 1989–2006 statistical figures supplied by the National Institute of Statistics (Romanian Statistics Yearbook, Agricultural Farm Survey 2005, General Agricultural Census 2002) and very many additional data obtained from field surveys.

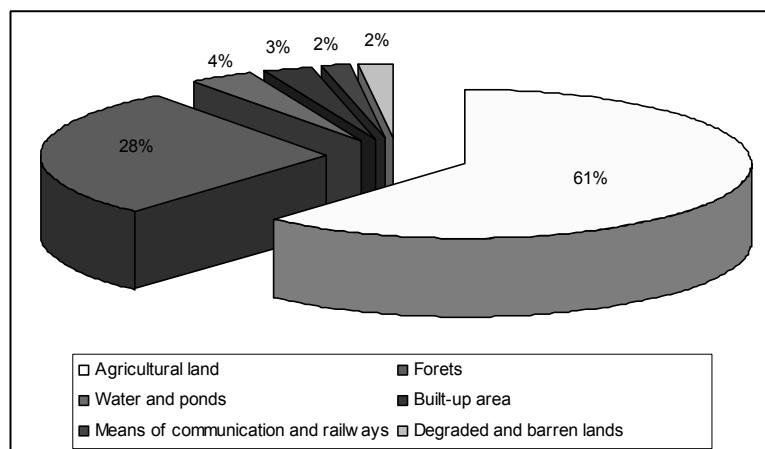
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3. LAND COVER AND LAND USE

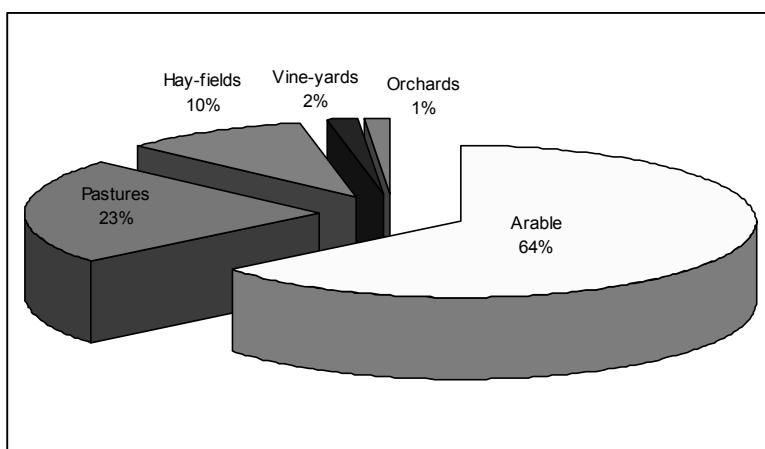
The main land cover/land use categories are the agricultural terrains (arable, pastures, hay-fields, orchards and vine-yards), the forest lands, water and ponds, roads and railways, built-up areas, degraded and barren lands.

In 2006, Romania had 14,730.9 thou ha of agricultural land (61.8% of the country's surface-area), 6,754.7 thou ha of forest ha (28.3%), 841.8 thou ha of terrains covered with waters and ponds (3.5%), 674.6 thou ha of built-up areas (2.8 %), 389.4 thou ha of roads and railways (1.6%) and 447.5 thou ha of degraded and barren lands (1.9 %) (Fig. 1).



Source : National Institute of Statistics

Fig.1 – Structure of land cover/use in Romania, 2006.



Source : National Institute of Statistics

Fig. 2 – Structure of agricultural land in Romania, 2006.

The agricultural surface included arable land (64.0%), pastures and hay-fields (33%), vine-yards (2%) and orchards (1%). Romania is one Europe's countries with the richest land resources, yet with only 0.6 ha agricultural and 0.41 arable terrain / inhabitant (Fig. 2).

The geographical distribution of the main land use categories. The diversity and specificity of soil and climate systems in Romania (spread out approximately equally among mountains, hills and

plains), as well as the general and regional particularities shaped by social history and economic conjuncture account for the dominantly agricultural land structure (over 62% agricultural terrain).

Most of this terrain (>80%) lies in the plains (Romanian Plain, West Plain, the Central and South Dobrogea Plateau), its share decreasing to 40–65% in the hills and to under 20% in the mountains.

The main factors that differentiate the principal land use categories in the territory (arable, pastures, vine-yards and orchards) are altitude and relief. While the proportion of arable land drops from more than 80% in the lowlands (plain, certain plateaus) to 40–60% in the rough hilly region and to under 20% in the mountain regions, the proportion of pastures and natural hay-fields is less than 10% in the plain and over 60% in the mountain. Vine-yards and orchards usually occur in certain hills (300–700 m high) and tablelands (1/3 of Romanian's vine-yards are found in the lowlands, at 150–300 m alt., whereas fruit-trees grow sometimes up to 800–1,000 m alt.). An azonal element are the large vine-yards and fruit tree covered sandy terrains of the Romanian Plain, or the higher terraces of the Danube or of other inland waters.

4. LAND USE CHANGES IN THE POST-SOCIALIST PERIOD

The fall of the communist regime in Romania at the end of the 1989 and the beginning of a period of transition to the market economy brought about a lot of changes in the use of land, a situation enhanced by the country's accession to the European Union and the implementation of the Common Agricultural Policy (CAP).

The key factors involved in these changes are of a political nature, associated with economic, technological, demographic and occasionally natural factors. However, none of these factors acted independently on the contrary, they were permanently interacting.

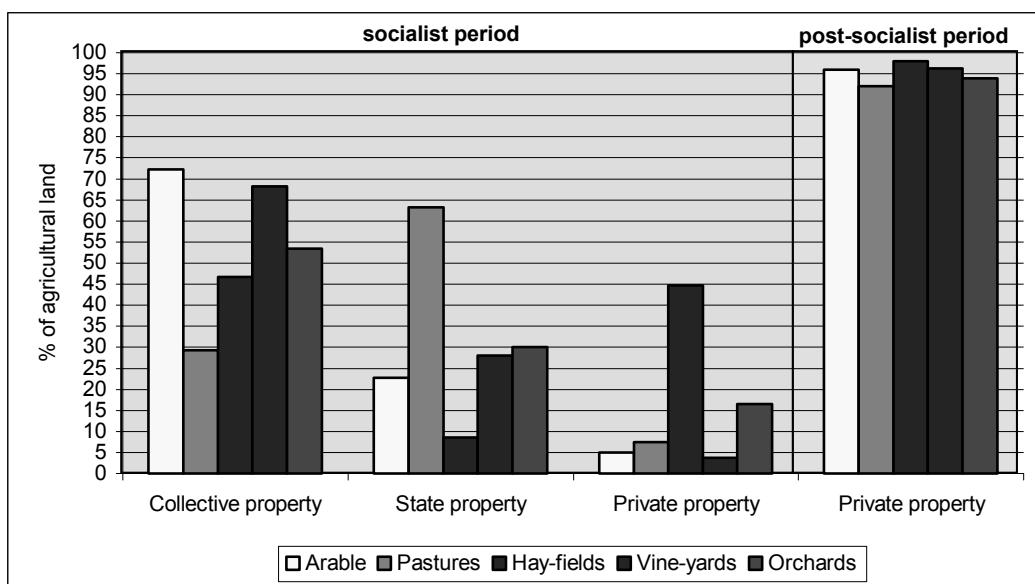
The major land use changes of the post-socialist period were linked to a new type of property over the agricultural and forest terrains and the establishment of the farmers' social-economic organizational structure. However, some changes had a negative impact, leading to excessive fragmentation of the agricultural terrain, the emergence of very many individual, subsistence farms as a rule, the poor development of services for agriculture (irrigation, fertilization, mechanization, etc.), all of which have resulted in the marked degradation of the productive quality of agricultural terrains.

CHANGES IN THE TYPE OF PROPERTY

One of the most important changes in the period of transition was the *expansion of private property* over agricultural and forest lands.

The socialist period (1945–1989) was dominated by *collective property* over all categories of land use, with the exception of pasture. *The state owned* most of the best categories – vine-yards and orchards, as well as pastures, while private owners possessed mainly pastures and natural hay-fields (Fig. 3).

The post-socialist period witnessed the steady expansion of private property in the wake of decollectivization and privatization, a process that begun in 1990, by the enactment of Land Law 18/1991, completed and modified by Law 169/1997, Law 1/2000 and Law 247/2005 had come into effect. The direct result of this new legislation was the continuous enlargement of private property, which came to possess over 95.3% of all agricultural land and more than 34.1% of all forest land (2006).



Source : National Institute of Statistics

Fig. 3 – Land fund by categories of use and forms of property.

CHANGES IN THE TYPE OF FARMING

The reform in agriculture engendered a new economic-social-based private property, with individual farms being outstanding, while the number of juristic person units kept decreasing.

Before 1989, the main forms of land exploitation were the collective farms (3,776 units in 1989), which owned over 68.8% of the overall agricultural area, at an average of 2,374 ha, and the state farms (411 units in 1989), which held 29.7% of the country's agricultural land (5,000 ha on average) (Table 1). Private farms amounted to a mere 9.5% agricultural land, and it consisted largely of pastures and natural hay-field situated in the hill and mountain regions.

Table 1
Comparative number and size of farms

	Socialist period (1989)		Post – socialist period (2005)	
	Collective farms	State farms	Individual farms	Juristic person units
Number	3,776	411	4,237,889	22,672
Average area (ha)	2,374	5,001	2.22	269.28

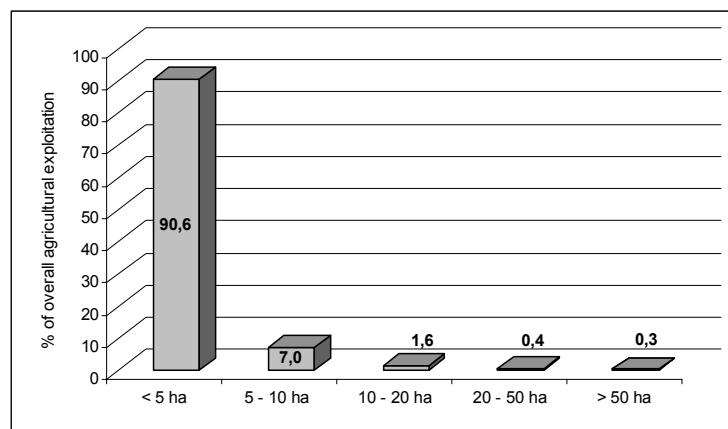
After 1989, under Land Law 18/1991, overconcentration of the landed property turned into excess fragmentation, and big farms gave way to small, peasant-type family farms.

In 2005, Romania numbers over 4,25 million farms, of which 99.5% are individually owned, and use 65% of the overall agricultural area. The average agricultural area/individual farm is 2.1 ha, at an average of 3.7 parcels/farm (Tab1). Juristic person units hold no more than 0.5% of all the farms, averaging 268.28 hectares, with 9.66 parcels/juristic person unit. A parcel has 27.95 hectares.

The size of farms (total agricultural area and agricultural area used) plays an important part in the effective utilization of the agricultural terrain. But Romanian agriculture is characterized by small and very small farms, whose owners have little money, are poorly trained and elderly. Therefore, implementing production technologies, promoting efficient management and marketing liable to

making agriculture more productive and competitive is almost impossible. The majority of individual farms practice a subsistence agriculture, the products being intended to meet their owner's needs.

In terms of the class-size of agricultural area used, small and very small farms (under 5 ha) are seen to prevail. They represent 90.6% of existing farms (Fig. 4). On the other hand, large and very large farms (50–100 ha and over 100 ha) with a trading profile represent only 0.3%.



Source : National Institute of Statistics

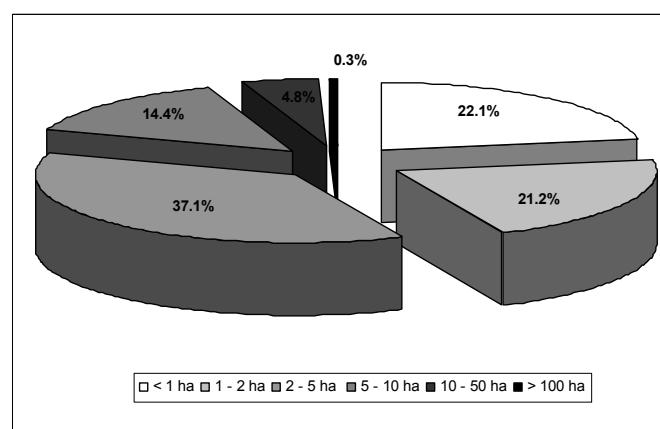
Fig. 4 – Farms by class-size of agricultural area used, 2005.

The very large number of small farms, whose production is meant only for self-consumption, makes Romanian agriculture uncompetitive, also hampering the sustainable use of agricultural terrain.

However, the 2002–2005 period witnessed a decrease in the total number of farms, while the average area used kept increasing. Thus, the number of individual farms dropped by some 5% and that of juristic person units by over 19.4%; the average area/farm grew from 1.73 ha in 2002 to 2.15 ha in 2005.

FRAGMENTATION OF AGRICULTURAL LANDS

The crumbling of farming land is one of the negative effects of Land Law 18/1991, affecting land use by steadily degrading the terrains' productive capacity and discouraging the practice of a sustainable and competitive agriculture.



Source : National Institute of Statistics

Fig. 5 – Agricultural area: size of parcels (ha), 2005.

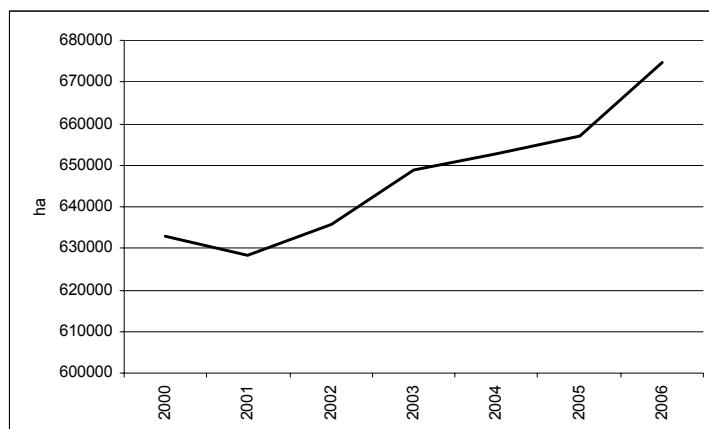
The Land Law provided for the retrocession of agricultural terrain to over 4 million owners, the area received by each owner consisting of several parcels in terms of the terrain configuration, its fertility, location of crops in the field, etc. So, estimates put the number of parcels existing in Romanian agriculture to over 15 million, most of them (over 42%) less than 2 ha (Fig. 5).

LAND USE DYNAMICS

The changes experienced over the 1990–2006 period regarded the spatial dynamics of land use and of land cover categories (conversion from one category to another).

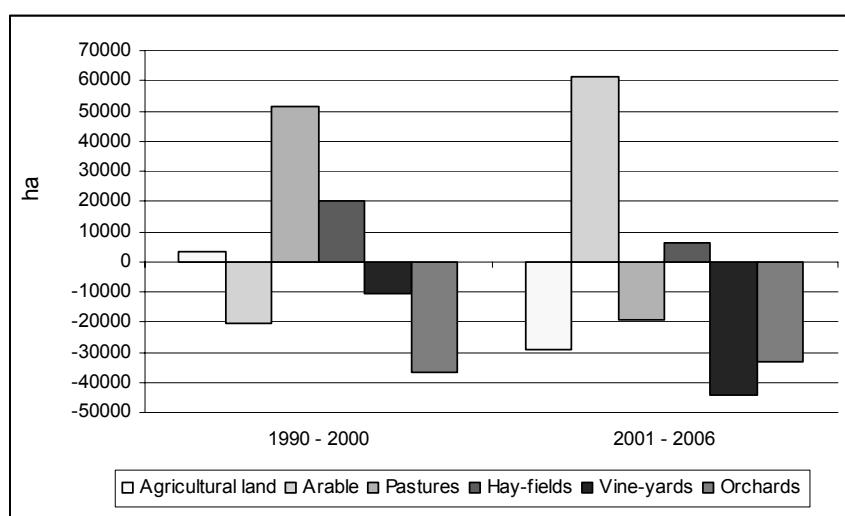
The post-socialist land use classes with the most significant changes were the following:

– the overall agricultural area, which dropped by 38.0 thou ha in favour of built-up terrains that registered a remarkable development. This conversion from agricultural to built-up terrain is particularly obvious in the vicinity of the large urban centres, which are preferred by the population for house-building. Built-up areas over 2000–2006 increased by 41.7 thou hectares (Fig. 6).



Source : National Institute of Statistics

Fig. 6 – The evolution of built-up areas.

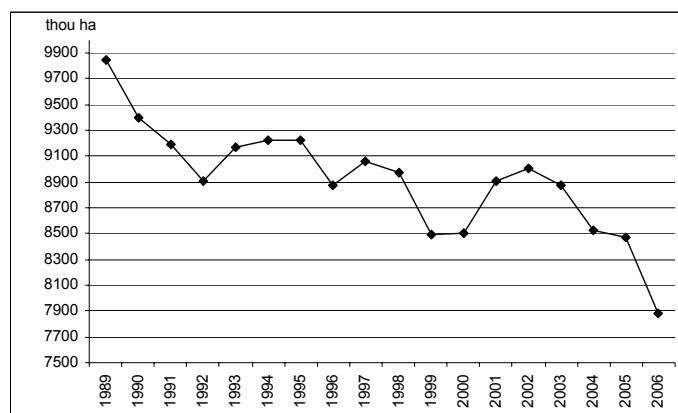


Source : National Institute of Statistics

Fig. 7 – Land use dynamics.

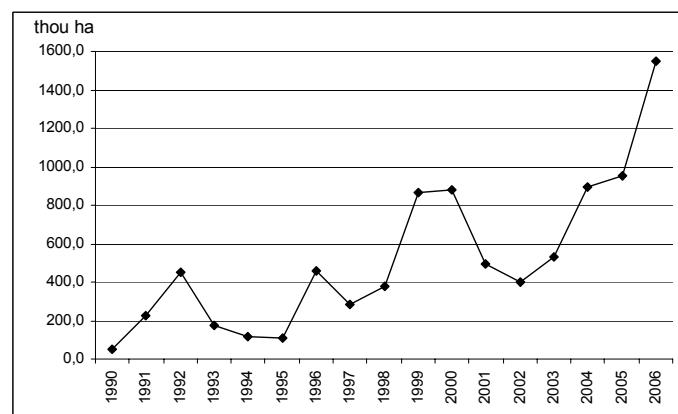
– the structure of agricultural land underwent only some small changes to the effect of the arable area, orchards and vine-yards shrinking, while pastures and natural hay-fields expanded. Over 1990–2000, the arable terrain was reduced considerably, having been abandoned by the new owners who were unable to work the land they had received under Land Law 18/1991. Orchards and vine-yards had the same fate, many of them being abandoned or cleared. As the area covered with the more profitable land use categories (vine-yards, orchards and arable lands) kept shrinking, pastures and hay-fields (lower use categories) would expand very much. After 2000, the period that preceded Romania's accession to the European Union, things seemed to change somehow, arable areas would increase, but vine-yards and orchards continued to decrease (Fig. 7).

Abandoned arable lands. Over the past 17 years the cultivated area decreased significantly, from 9,6 million hectares in 1989 to 7,8 million hectares in 2006 (Fig. 8). Each year, important arable lands remained uncultivated (8,8 mill. ha between 1990 and 2006) (Fig. 9). The main causes behind this situation were people's uncertainty with regard to landed property, the precarious financial condition of the new owners, the inadequate farm structure, the high proportion of elderly people (aged over 65) among the group of individual farm owners, the lack of materials and money to work the land, insecurity in selling the surplus of products at prices allowing resumption of the process of production, and last but not least, the lack of prospects in the conditions of an adverse economic milieu. What did contribute to leaving the land barren was also the poor assistance farmers received from the state.



Source : National Institute of Statistics

Fig. 8 – Cultivated area.



Source : National Institute of Statistics

Fig. 9 – Uncultivated area.

As livestock kept decreasing, pastures and natural hay-fields would also be abandoned, although in terms of biodiversity, they represent the most valuable ecosystems of agricultural terrains. However, as mowing and grazing became a past practice in some areas, habitats were degrading and the landscape itself suffered important changes. Moreover, the tendency to turn grazes into arable land had a negative effect on biodiversity.

LAND DEGRADATION

The impact of anthropic and natural factors over the 1990–2007 period would enhance land degradation and the expansion of areas affected by them.

Political and administrative factors had a significant impact on agricultural land quality leading to an excessive fragmentation of arable land and a very high proportion of small and very small-sized individual households (under 2 ha) with little financial resources. Technological and economic factors also contributed to land degradation through inadequate agricultural practices, deforestation, inadequate productive services: little mechanization, difficulties in implementing the new technologies, poor and arbitrary fertilization of crops, irrigation systems and other land improvement systems abandoned or destroyed, etc.

The natural factors involved in degrading the quality of land were some extreme natural phenomena, e.g. droughts, floods and landslides. Each year, larger or smaller agricultural areas were affected by long period of drought with dramatic effects on crops and land quality. It is the south-east of Romania which suffered most from droughts (Dobrogea, The Bărăgan Plain and south of the Moldavian Plateau), regions also hit by desertification. The severe floods of 1990 impaired vast areas, damaged the settlement network, the roads and various terrains. There were cases when whole villages had to be relocated, roads were impracticable, and important terrains could no longer be used for agriculture. Lands were also degraded by landsliding, which had a distinct impact on hilly areas of Subcarpathians, Moldavian Plateau and Transylvanian Depression.

The quality of agricultural lands. Romania has an overall agricultural area of 4.8 million hectares, of which approximately 12 million hectares (7.5 mill. ha arable land) feature one or more quality limiting factors.

The distribution of agricultural lands by capability classes.

Classifying soils into one of the five capability classes depends on their productive potential estimated in terms of capability marks set by complex soil studies. According to this criterion, land capability for various uses in Romania, without melioration measures being taken, looks as follows: only 2.8% of the agricultural lands fall into class I, while 27.3% rank in class V – very poor (Table 2).

Table 2

The distribution of agricultural lands by capability classes, 2005

Capability class	Land use							
	Agricultural land		Arable land		Pastures and hay-fields		Vine-yards and orchards	
Total area	Thou ha	%	Thou ha	%	Thou ha	%	Thou ha	%
– capability class	14,800	100.0	9,351	100.0	4,906	100.0	543	100.0
I very good	411	2.8	355	3.8	54	1.1	2	0.4
II good	3,656	24.7	3,353	35.9	220	4.5	83	15.3
III moderate	3,086	20.8	2,369	25.3	597	12.1	121	22.3
IV poor	3,613	24.4	1,726	18.4	1,750	35.7	137	25.2
V very poor	4,034	27.3	1,549	16.6	2,285	46.6	200	36.8

Source: National Institute of Statistics

Classifying land agricultural use by capability classes differs very much with the category. Most arable lands fall into the first three classes, pastures and hay-fields, vine-yards and orchards into the last two classes. It is obvious that pastures and natural hay-fields are affected by soil erosion and landslide, as over 46.6% of these areas are listed in class V – very poor.

The factors exerting the greatest impact on soil quality are drought, excess humidity and various forms of erosion, and they affected twice the as many areas in 2002, comparing with 1992 (Table 3).

Table 3

Soil quality limiting factors and size of affected area, 1992–2002

Soil quality limiting factors	Affected area		
	1992		2002
	Thou ha	Thou ha	As per cent of total agricultural land
Frequent droughts	3,900	7,100	48
Frequent moisture excess	900	3,781	26
Water erosion	4,065	6,300	43
Landslides	700	702	5
Wind erosion	387	378	3
Salty soils	600	614	4
Soil compaction due to inadequate cultivation	6,500	6,500	44
Soil natural compaction	2,060	2,060	14
Crust formation	2,300	2,300	16
Small and very small humus deposit	7,114	7,485	58
Strong and moderate acidity	2,350	3,437	23
High alkalinity	165	223	1
Very poor and poor content of mobile phosphorus	4,475	6,330	42
Poor content of nitrogen	3,438	5,110	34
Microelement deficiency (zinc)	1,500	1,500	10
Chemical pollution	900	900	6
Oil and salt water pollution	50	50	0
Pollution by wind-borne substances	147	147	1

Source: National Institute of Statistics

Poor fertilization of crops. The agrochemical degradation of agricultural soil, because soils failed to be adequately fertilized, is yet another major problem. Soils with small and very small humus reserve, low phosphorus and nitrogen content, high acidity and alkalinity would largely expand over the 1990–2002 period. Compared to 1990, the quantity of natural fertilizers was halved, there were three times fewer and seven times fewer pesticide. This meant that each year vast cultivated terrains remained unfertilized. In agriculture based only on the soil's natural fertility, and failing to compensate for the loss of soil fertilizing elements by applying chemical and organic fertilization, does not stimulate the regeneration rate of soil nutrients through natural processes, so that soil reserves and fertility are exhausted. Looking at the nitrogen balance on soil surface, which indicates the difference between the nitrogen impact and output/year, allows the appropriate use of fertilizer quantities over three periods: 1) 1985–1990, a nitrogen surplus of up to 50 kg/ha agricultural land; 2) 1991–1996, a fall in the nitrogen surplus down to 12 kg/ha; 3) 1997–1998, nitrogen deficiency in the soil. A similar situation had the phosphorus and potash fertilizers (Popescu *et al.*, 2004). In 2005, the 461 thou tons of chemical fertilizers lay far behind the optimum mineral content of 1,957 thou tons (estimates of the Institute of Soil and Agrochemistry Research).

In most cases, chemical fertilizers are arbitrarily used, not based on agrochemical studies to establish optimum doses and spraying time in terms of the needs of crop plants and the level of soil supply with nutrients.

Land improvement systems destroyed or abandoned. In 1989, the irrigated area was of 3,067 thou ha, drained area 3,082 thou ha, dammed area 216 thou ha, soil erosion control area 2,208 thou ha (Fig. 10). In the 1990s all these works kept degrading, negatively affecting soil quality and land productivity. The south and south-eastern regions of Romania, hit by extreme droughts and desertification even, have large areas provided with irrigation systems (2,486 thou ha), but unfortunately most of these systems were either destroyed, or are in an advanced stage of degradation. In 2006, only 3.14% of the overall managed agricultural area was irrigated (out of 3 mill ha provided with irrigation systems). The lack of irrigation in the conditions of a very dry period and lasting drought (in 2000) decreased to cereal output by 40% compared to the previous year.

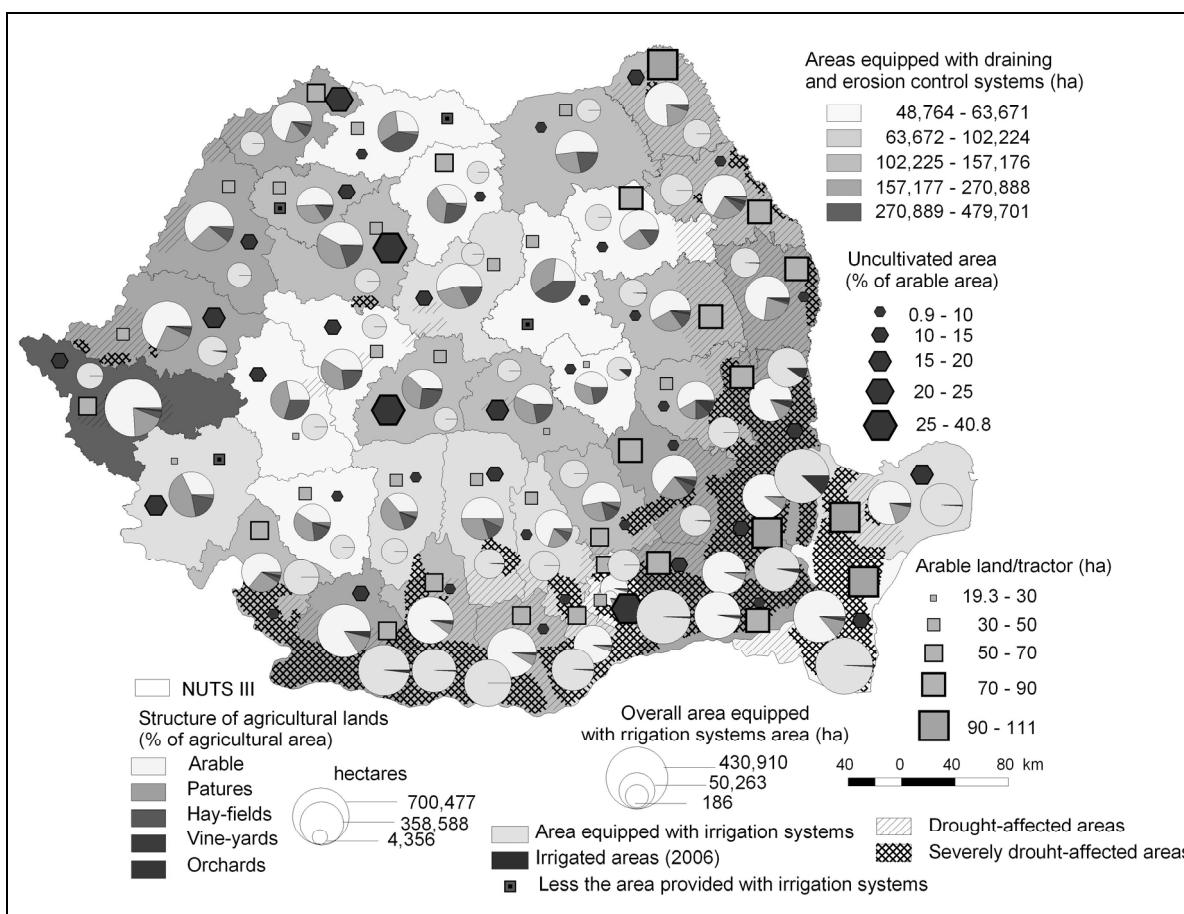


Fig. 10 – Types of land management in Romania.

Poorly mechanized agricultural works. This drawback and the difficulty of implementing new technologies are largely the result of low financial resources and the inadequate farm structure. In 2006, there was one tractor/54 ha arable land (the EU average being of one tractor/20 ha arable land) and one cereal harvester combine 204.7 ha of cereal crops. In the case of the other agricultural equipments (ploughs, motor cultivators, sowing machines, sprayers and dusting machines, straw and hay packing presses, etc.) the situation is by far worse, their numbers being much below the minimum necessary for mechanical works to be carried out in the optimum periods established by cultivation technologies, fact that entails huge crops losses. The insufficient number of tractors and agricultural machines, wear and obsolescence, and tariffs too high for smaller farmers makes many go back to animal traction and manual labour.

6. CONCLUSIONS

Characteristic features of *the post-socialist period* are the changes seen in land use, brought about primarily by a specific economic transition period. Passing from the former centralized system to a free-market economy associated with the expansion of private property over agricultural and forest lands was a major turn over the result of decollectivization and privatization under a new legislation enacted beginning with 1990. Also the type of farming would change, in that big farms of the socialist period gave way to small peasant – type family exploitations (over 99.5% of all agricultural farms).

Other land use changes, but of lower scope and breadth were connected mainly with the significant reduction of areas occupied by the better, more profitable categories (orchards and vineyards) in favour of the lower, less profitable ones (pastures and hay-fields). After 2000, in particular, the agricultural area kept shrinking, while built-up terrains, especially those close to the big urban centres, would expand.

The transition period featured also some negative changes, of which the marked *fragmentation of farming land* into small-sized parcels (most of them under 2 ha) and the steady *decline of the land's productive potential*, had the greatest impact.

Before and after Romania's EU accession, the extent of land fragmentation decreased as the total number of farms dropped and the average individual farm area increased. Accession to and implementation of the EU agricultural policies represent a step forward in the development of the country's farming sector, the practice of this type of activity on the line of environmental protection, as well as the adoption of other measure and action plans conductive to the sustainable use of natural resource.

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Received July 29, 2010

