

VULNERABILITY TO MISCELLANEOUS TYPES OF PHYSICAL DEGRADATION OF AGRICULTURAL LANDS IN SOUTHERN IAȘI COUNTY

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Abstract

Agricultural areas in Iași County are subjected to complex processes of degradation, caused mainly by natural and anthropic factors, which either diminish or extend these processes which cause the diminution of agricultural production, the exclusion of some lands from the economic circuit or their concession by owners.

The results of the studies on the evolution of the slope agricultural land surface in the slop of the period 1990-2017 and of the concerns for soil erosion control, in order to maintain soil fertility and of the ecological balance in agroecosystems are presented in this paper. Special emphasis is placed on identifying the possibilities reduce soil erosion in tolerable limits by stimulating landowners interest to comply with anti-erosion protection requirements. I also made references to other factors that have led to the deterioration of the quality of soils such as soils salinization and prone.

Key words: agricultural land use, slope lands, land degradation, soil erosion control

Iasi County is located in the northeastern part of Romania and the central-eastern part of Moldova and borders north with Botosani County, northwest with Suceava, west with Neamt and south with Vaslui County. In the eastern part, the Prut River forms the border between Romania and the Republic of Moldova. Because it is fully occupied in the Plateau of Moldavia, Iasi County has a simple geological structure with a reduced tectonic fluctuation and a homogeneous lithology.

The morphology of the county relief highlights the presence of two steps: a high one in the south and west in the form of massive hills and plateaus, slightly inclined to the southeast, with medium altitudes of 300-350 m and the other lower in the north and northeast, with the aspect of the collinear plain and the average altitudes of 100-150m.

On the territory under investigation, the predominant soils are molisoils which are cambic chernozems, chernozems and gray soils, and on the slopes, characteristic soils are eroded molisolis and erode-soils.

In the paper there are statistical data on the evolution of the agricultural land fund in Iasi county between 1990 and 2017 and a current situation on degraded lands. An extensive study on the agricultural land is directed towards a contribution to the knowledge of the productive potential of agricultural land, highlighting the

quality and production classes of the land, limiting factors and degradation processes affecting certain agricultural stretches and grouping the sloping land after their degree of inclination.

The main factors involved in soil degradation on agricultural lands are reported in the paper. It also highlights the consequences of one of the most remarkable factors of degradation, namely soil erosion.

MATERIAL AND METHOD

In order to achieve the objectives, the data collected from the study of the topographical maps (sc 1: 50 000 and 1: 100 000) and the soils (1: 200 000) were processed, data regarding the evolution of the agricultural uses provided by the Department of Agriculture County Iasi, the classes land quality provided by the O.S.P.A Iași and a current situation of degraded lands by the ANIF Iași.

The data obtained show a concrete and actual situation of the agricultural land fund and a situation on the degraded land.

RESULTS AND DISCUSSIONS

In the Table 1 presents the agricultural land use by use categories during 1990-2017 and in Tab.2 the agricultural land fund with a slope of more than 5%.

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It is noticed that the agricultural area in 1990 was 377.7 thousand hectares and gradually decreased by about 1000 hectares, until 2000, and since 2005 there is a slight increase. At the end of 2017, the agricultural area amounted to 393.3 thousand hectares (*table 1*).

The structure of agricultural land, the arable area is dominant (69.47%), on second place are the pastures (19.6%), followed by the meadows (6.11%), vineyards and orchards by less than 3% each.

A comparison of the agricultural land fund existing in the year 1990 with the year 2017 highlights important changes. It should be noted that arable land surface increased by 2.1%, the meadows were also expanded by 1.07%, while pastures, vineyards and orchards decreased (1.89%, 0.65% and 0.86%).

Most of the arable land is located in the Moldavian Plain, part of Iasi County, followed by the Siret valley and the saddle Ruginoasa – Strunga. The smallest areas of the arable land meet in the Central Moldavian Plateau, where the forest is preserved on large surfaces.

Pastures are located on the slopes or in the river beds, the largest areas being recorded in the Plain of Moldavia, especially on the slopes affected by landslides and on the Prut, Jijia and Bahlui Valley, on salting lands, unsuitable for arable land.

The meadows are located in the higher and humid areas of the Central Moldavian Plateau, Dealul Mare- Hârlău and between Siret - Moldova.

Larger areas of vineyards and orchards are generally found in the area between Moldavian Plain and the high western and southern areas of the county. In general, the distribution of uses is in line with the nature of the pedoclimatic conditions.

The agricultural areas in the county include land with a slope of over 5% in the proportion of 54.7%, and 34.4% of the agricultural areas have slopes higher than 10% (*table 2*).

The reduction of the areas planted with vines was caused by the decommissioning of some of the vineyards of Iasi, Cotnari and Miroslava vineyards. Areas of orchards have been reduced due to their abandonment and deforestation by new owners.

Table 1

Agricultural lands fund in Iasi County between 1990-2017

The Year	Categories of use (thousands of hectares)										Total agricultural
	Arable		Pastures		Meadow		Vineyards		Orchards		
	k ha	%	k ha	%	k ha	%	k ha	%	k ha	%	
1990	254.1	67.37	81.1	21.49	19.9	5.04	13.2	3.45	9.4	2.39	377.7
1995	248.7	65.96	85.4	22.61	20.1	5.32	12.7	3.19	9.1	2.40	376
2000	248.7	65.96	85.4	22.61	20.1	5.32	12.7	3.19	9.1	2.40	376
2005	253.2	66.40	88.1	23.10	19.6	5	12.3	3.15	8.1	2.09	381.3
2010	255.5	67.11	85.4	22.37	22.3	5.79	11	2.90	6	1.58	380.2
2014	256.1	67.19	84.2	22.05	22.5	5.78	11.7	2.89	6.8	1.57	381.3
2017	273.1	69.47	77.7	19.60	24.4	6.11	11.4	2.80	6.7	1.53	393.3

Table 2

Agricultural lands funds with slope greater than 5% in Iasi County

Categories of use	1990		1997	
	thousand ha	%	thousand ha	%
Arable	135.5	61.3	134.2	60.8
Pastures	46.2	20.9	45.8	20.7
Meadow	18.1	8.2	20.9	9.5
Vineyards	12.6	5.7	11.2	5.1
Orchards	8.6	3.9	7.8	3.5
TOTAL	220.8	100	219.9	99.6

As can be seen from the data in Table 3, the largest change occurred in vine plantations, which decreased by about 1400 ha, while the main agricultural use, the arable, was reduced by 1100 ha. The pasture was reduced by about 400 ha, the orchards by 800 ha, and in the hayfields the increase of the areas by 2800 ha was recorded.

In the area surveyed the slope agricultural land decreased by about 0.5% (1000 ha). The reduction of agricultural land was mainly due to the uncontrolled expansion of the urban areas, but

also by the abandonment of extremely degraded lands.

Due to the natural and socio-economic conditions specific to Iasi County, a large part of the soils are affected by the degradation processes affecting their fertility.

According to the information provided from the specialists of the Agricultural Chamber and the Office of Studies soil and agrochemical Iasi, it follows that agricultural land in the county supports various types of physical degradation, these being presented in *table 3*.

Surface erosion, with a low degree of erodibility, is manifested on slopes with low inclines at the edge of the plateaus. Larger areas are in the Moldavian Plain, Siret Lane, Ruginoasa, Strunga. Moderate erosion affects slopes with medium slopes, soils with the top of chernozems and faeosomes. In case of luvisolles, the upper horizon, which is more vulnerable to erosion, is manifested on smaller slopes. In all areas of the

county, prolonged slopes are affected by moderate erosion even if they have a low slope.

The severe erosion of the surface affects the lands from Moldavian Plain, especially the slopes with north and northwest exhibition in the Central Moldavian Plateau, on the slopes of the valleys affluent to the Barlad River. The Suceava Plateau affects the upper part of the slopes in the Siret-Moldova interfluve. It is common in areas with landslides.

Table 3

Types of soil degradation in Iasi County in the year 2014

Type of degradation		Area* (thousand ha)	% - from the total area (384 155 ha)
Surface erosion (land eroded by water)	➤ weak	62.7	16.32
	➤ moderate	55.1	14.34
	➤ severe	19.4	5.06
	➤ very severe	12.1	3.14
	➤ excessive	20.3	5.29
Total		169.55	44.14
Landslides	➤ in furrows	0.021	0.006
	➤ in waves	58.10	15.13
	➤ in steps	11.11	2.90
	➤ flowing	0.28	0.07
	➤ crash	0.40	0.10
Total		69.91	18.20
Depth erosion	➤ runoff, gutters	20.3	0.53
	➤ gully with a depth of up to 2 m	2.79	0.73
	➤ gullies	3.23	0.84
Total		8.05	2.09
Salting	➤ weak	33.1	8.803
	➤ moderate	13.1	3.48
	➤ severe	7.07	1.88
	➤ very severe	2.19	0.58
	➤ excessive	0.57	0.15
Total		55.99	14.58
leization and pseudogleization	➤ weak	29.82	7.76
	➤ moderate	34.80	9.06
	➤ severe	20.38	5.31
	➤ very severe	14.5	3.78
	➤ excessive	7.26	1.89
Total		106.76	27.79

* Some types of degradation overlap, so % expresses individual values that summarize exceed 100%

The very high degree of erodibility affects the upper part of the slopes, the terrace forefront and the waves of slip, and the excessive erosion characterizes the heavily inclined slopes, the terrace tops. Cornices sliding, the body of semi-active and active slides.

The most affected areas with landslides are in:

➤ the Moldavian Plain, especially the slopes with north-western, northern and eastern exposure due to the monoclinical character of the geological deposits and the consequently character of the valleys;

➤ the coast of transition of the Big Hill-Hirlau, between Deleni and Targu Frumos, with great relief energy;

➤ the Iasi Coast, between Handresti and Tomesti;

➤ Prut's face, between Tomesti and Gorban.

Lands with salting soils are almost entirely in the Moldavian Plain, but also in the Prut, Jijia, Bahlui and their tributaries. Small areas also appear in the Siret plain in Lespezi, Lunca Pascani, Stolniceni Prajescu. The corresponding soils are of the salsodisol class, namely solonceac and solonete, or sodium or saline subtypes of other soil types.

Gleic soils are mostly found in narrow meadows and narrow valleys in the presence of the groundwater level near the land surface. The affected area is 106.76 thousand hectares, respectively 27,79% of the agricultural area of the county, pedologically mapped.

The depth of the degradation of land quality in recent years, defined by the occurrence of natural phenomena, often supported and by anthropic intervention in the local landscape, is important to draw an alarm signal in order to elaborate and develop effective measures and works that to reduce the rate of soil degradation.

CONCLUSIONS

The characteristics of the natural environment and the inappropriate anthropogenic interventions on the sloping lands of Iași County favor large soil degradation processes, especially through erosion and landslides. Of the total agricultural area of the county, a large part is characterized by slopes higher than 5%, being favorable to erosion and other processes of the slope.

After the year 1990 the agricultural area has expanded by approximately 4.5%. The agricultural land fund comprises 7.35% of lands in an advanced state of degradation through excessive surface erosion, deep erosion, landslides and other degradation.

Because the labor workforce is insufficient in most of the rural settlements in the studied area and the material possibilities of the small landowners are precarious, it is rational to regulate by law the framework favorable to the emergence of medium and large farms which offer favorable conditions for application of agrotechnics and activity good profit.

To initiate and intensify the process of restoration and modernization of agriculture on sloping land and lifting of living standards in the hill area, it is opportune: the material stimulation of agricultural specialists to work in the field of vocational training, the persuasion of a policy of educating of the population in the spirit of respect for soil, water and the environment. A methodical observation of the evolution of soil properties is useful and necessary, especially due to the consequences of the anthropic factor.

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