CURRENT ASPECTS OF SOIL EROSION WORK ON AGRICULTURAL LAND DURING THE PERIOD 1990-2016 IN IASI COUNTY

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Abstract. *Most agricultural lands in Iasi County are located on slopes with different degrees of inclination. Areas affected by erosion all over the territory are significant and from 1990 until now the situation has worsened. For all slope agricultural land it is necessary to perform land improvement works on soil erosion control. Combating erosion, improving eroded land and bringing it to a high degree of fertility requires arrangements, measures and works to be applied differently for each situation. As early as the 1960s - 1970s, measures were taken to prevent and combat this degradation process by making anti-erosion arrangements on appreciable surfaces, these consist of: agrotechnical works to combat soil erosion on agricultural land with arable land and landscaping works with vineyards and orchards, improvement of pastures. The objectives are aimed at analyzing the exploitation behavior of soil erosion control works on the slopes of the studied area for a period of 16 years and proposals on the prospects of combating soil erosion. At the same time, also the destruction of important soil protection and soil conserving works on the slopes (brooks, terraces, debris, banquets and coastal canals). Considering that at the county, surfaces with lands requiring landscaping are also significant in relation to the pace at which such arrangements have been made so far, in the perspective of this, special financial efforts are needed for their extension. Rehabilitation of anti-erosion works and the execution of new ones are imperative in the county.*

Keywords: *anti – erosion works, soil losses, landscaping, Iasi County*

INTRODUCTION

The relief of the Iasi county is relatively unitary, fitting in the major relief form Moldavia Plateau. There are two relief steps, one high (300-350 m) in the west and south, and a lower lowland plain in the northeast (average altitudes of 100-150 m). Valuing the existing relief, the most widespread activity is agriculture in its various forms: cultivation of lands - especially in the north - eastern part of the plain, viticulture in the north - west or livestock breeding.

The hydrographic basin is richly represented, the county being located between the Siret river and the Prut river, while their tributaries cross the whole territory. Approximately 30% of the county's area is occupied by the meadows of the rivers Jijia, Jijioara, Miletin and Bahlui, an important fact for the development of agriculture (soils suitable for different types of agricultural crops).

The hydrographic network of Iași County is also defining for the morphology of the county, through the valleys and meadows associated with the watercourses, which imparts to the territory a dominant north-west and southeast natural orientation. This diagonal profililng

also constitutes the dominant location of the human settlements, the watercourses being an indispensable element of their formation. In conclusion, the major hydrographic network has a structuring role at the level of the territory, defining the relief, the constitution of the human settlements, the landscape, but also the agricultural practices and their specific installations.

From a pedological point of view, the territory of Iasi County belongs to the moldovan - sarmatian province, which is characterized by the interference of the eastern - european soil types with the central european ones. The distribution and the characteristics of the factors, the appearance of a wide range of zonal soils, such as the typical levigated chernozems, with a wide spread in the Moldavian Plain and even the Siret Valley, are characterized by high fertility, intensely used in agriculture. These soils provide the best conditions for crops of wheat, corn, sugar beet, sunflower, etc.

In the southeastern part of the Suceava Plateau there are several strips of levigated chernozem soils, favorable to cereal crops, potatoes, while in the northern part in the Central Moldavian Plateau there were formed gray ash-illuvial soils. In the southern part of the county there is an important forest area for Iasi county.

The agricultural lands in the county funicular fund are affected by various limiting factors such as surface erosion from a low degree to excessive erosion, deep erosion, active or semi-stabilized landslides with major reactivation potential, excess humidity caused by surface and groundwater, salinisation and alkalization, complex degradation, etc. The most frequent limiting factors are very severe and excessive soil erosion, deep erosion and excess moisture.

The construction of the anti-erosion facilities began methodically in 1971 in Iasi county, they were continued until 1990 and they were realized in stages and on hydrographic basins, with priority being given to the arrangement of each basin with the works of the slopes.

After 1990, practically there have been no further work was done to combat soil erosion. There were, however, concerns from the ANIF branches for the exploitation and maintenance of the existing works.

The objectives of the study are to show behavior in exploitation for works soil erosion on the slopes of the county and also the evolution and prevention for soil erosion.

MATERIAL AND METHOD

In order to achieve the proposed objective, the data obtained from the study of the topographical maps (sc 1: 50,000 and 1: 100,000) and the soils (sc 1: 200,000), the information on the evolution of agricultural use and the anti-erosion works, as well as the findings fieldwork on slope processes and soil erosion control work by the research team involved in the topic.

In order to identify the problems on the agricultural land and the quality of the soil in the county, as well as the evolution of the anti-erosion works, official information was

provided by the competent institutions: ANIF Moldova Branch, the Office for Pedotechnical and Agrochemical Studies Iasi and ISPIF Iasi.

RESULTS AND DISCUSSIONS

In order to prevent and combat soil erosion on agricultural land in the county, were executend until 1990 , at the same time with the implementation of organizational and agrofitothenic anti-erosion measures , a series of hydromeliorative erosion control works and forest protection plantations.

For the interception and evacuation of the surface leaks were executed 637 km of grassy outlets and for the capture of the coastal springs were made drains in total length over 3550 km. Ensuring the normal conditions of agricultural exploitation and the need for anti-erosion protection imposed the design and construction in the hydrographic basins of 4463 km of technological roads with related works of art, including 2752 footbridges.

Reducing the slopes of the torrential valleys and regularization of the riverbeds, in order to alleviate the floods and to reduce the solid debit in the production of large waters was achieved through the construction of a large number of transversal hydrotechnical construction works (2228 concrete falls, 425 concrete dams, 164 dams of earth). The works executed are given in detail in table no.1.

Table 1

Land improvement works on agricultural land before 1990

Nr. Crt	Name of works	U/M	Prut-hydrographic basin	Siret-hydrographic basin	Total in Iasi county
1	Terraces	ha	802	137	939
2	Leakage management channels	km	439	284	723
3	Grassy outlets	km	216	171	387
4	Drains	km	883	140	1023
5	Roads	km	2059	797	2856
6	Foodbridges	pieces	1414	428	1842
7	Concrete falls	pieces	477	1132	1609
8	Dams of earth	pieces	42	22	64
9	Concrete dams	pieces	48	158	206
10	Forest protection plantations	ha	968	1147	2115

Land excessively eroded, fragmented by numerous evolved forms of erosion in the depth and/or affected by landslide – unusable of any use agricultural – have been planted with species forestry protection. Thus, starting with the decade of the 8 century were wooded 2115 ha of land virtually unproductive and which were rich sources of silt in the floods of torrential.

Currently, after 1-3 decades of commissioning, efficiency improvement of facilities erosion control applied in the river basins with the most active erosion processes in the county

of Iasi differ especially depending on the location of the works, their type and their vulnerability to anthropogenic activity and the reciprocal influence of natural factors.

The favorable conditions for the soil erosion on the sloping agricultural lands in the county, called for framing the manifestation of this process in a resonable, harmless limits, the use of anti-erosion culture systems. Prior to the year 1990, the land for arable destination were cultivated along top-levles of level curves , with crops in strips and grass strips or agro-terraces, in the ratio of over 96%. Only 4% of the total slope of the arable was carried out agrotechnical works on the slope of the slope.

The interest in supporting the agro-technical works of the soil was materialized on the vineyards on the slopes with relatively small slopes, between 5-10%, by the position of the rows of the vineyards in the general direction of the level curves and on the lands with higher slopes the application of the grassed bands, coastal channels and outlets, or by setting up plantations on terraces.

The table below presents the evolution between 1990 and 1997 of the use categories and of the crop farming systems on the sloping agricultural land in Iasi County.

Table.2

The evolution during the period 1990 - 1997 of the use categories and of the crop farming systems on the sloping agricultural lands in Iasi County

Category use	Culture sistem		Surface				The situation in 1997 compared to 1990
			1990		1997		
			thousands of ha	%	thousands of hectares	%	
ARABLE	Worked in the hill-valley direction		5.4	4.0	75.5	55.8	It increases14 times
	Worked in the direction of the level curves		93.6	69.2	49.9	36.9	Is reduced by 1.9 times
	Crops in strips		21.8	16.1	5.0	3.7	Is reduced by 4.4 times
	Crops with grassed bands		13.7	10.1	3.4	2.5	Is reduced by 4 times
	Crops of agro-terracces		0.8	0,6	0.4	0.3	It is halved
Total ARABlE in slope			135.3	100	134.2	99.2	Is reduced with 0.8%
VINEYARDS	Plantationon	with the rows on the direction of the hill-valley	-	-	0.2	1.6	It increases by 1.6%
		with rows on level curves	9.4	74.5	8.6	68.1	Is reduced with 8.6%
		equipped with grassed bands	1.6	12.6	1.3	10.4	Is reduced with 17.5%
		terraced	1.6	12.3	1.0	8.2	Is reduced with 33.4%
		with sloping coastal channels	0.1	0.6	0.1	0.6	Remain unchanged
Total VINEZARDS în slope			12.7	100	11.2	88.9	It reduced with 11.1%
ORCHARDS	**Plantation**	classics in subtle land	5.3	61.6	5.4	63.1	It increases by 2.3%
		intensive in unruly terrain	2.3	26.3	1.2	14.3	It is reduced with 45.4%
		on the terraces	0.9	9.9	0.9	9.9	Remain unchanged

		continue					
		on individual terraces	0.1	0.9	0.2	2.1	It increases 2.3 times
		with coastal channels	0.1	1.3	0.1	1.3	Remain unchanged
Total ORCHARDS in slope			8.7	100	7.8	90.7	Reduced by 9.3%
PASTURES	Undeveloped, grazed unrestricted		28.4	61.5	41.3	89.4	It increases 1.4 times
	Improved, parceled and rational grazing		6.7	14.4	1.6	3.5	It is reduced by 4.2 times
	Improved - leveling, fertilization, reforestation, etc		10.5	22.7	2.7	5.8	It is reduced by 3.9 times
	Equipped with waves or level channels		0.6	0.2	0.2	0.4	It is reduced by 3 times
Total PASTURES in slope			46.2	100	45.8	99.1	It is reduced by 9%

According to the data in Table No.2, it is obvious that in the case of orchards, in 1990, classical plantation prevailed in the land with hardened soil (66.6% of the area of orchards) where erosion was irrelevant.

Even though some pastures have not been furnished , most of them degraded and grazed without limitations, were dominant on the slopes in the county (61.5%) and in 1990, administrated the works for the improvement of the grassy carpet, the pasture was parceled and ensure rational grazing .

Immediately after the application of the Land Fund Law no. 18/1991, most of the agricultural land, especially the arable land, was transferred to the owners of the land, without any evidence regarding the soil protection and the administration of the received land. After ownership, most of the owners, being small farms, without solid production and financial means, were put into the situation of unregulated farming, in which all production is used just by the producer.

The main negative consequence of the defective application of Law 18 on the arable land in the slope is the drastic reduction of surfaces on which anti-erosion culture systems are practiced. As shown in Table No.2, this is evidenced, primarily by an increase of about 14 times the arable surface worked in the hill-valley direction.

Simultaneously with the extension of the lands in the county has land worked on the direction of the greatest slope , the area exploited along the level curves decreased on average by 1.9 times, the crops in strips are currently applied on smaller land plots than in the year 1990 by 4.4 times, the system with grassy strips is practiced on 4 times reduced surfaces and cultivation on agro-terraces is also reduced.

The natural consequence of these transformations is the intensification of soil erosion and other slope processes that easily degrade the productive potential of the land. The trend is also amplified due to the excessive use of agricultural use with mechanical or animal traction on the slopes, the almost exclusive practice of the monoclature, insufficient fertilization.

In the absence of anti-erosion crop systems, in addition to erosion acceleration and agricultural production decline, other undesirable effects are also highlighted, such as the appreciable increase in the costs of agro-technical works, clogging of lowland, lakes and commune roads, water pollution in general, environmental degradation surrounding.

It is worth mentioning that alongside the large farms of commercial companies with hip financial capital and agricultural research resorts, where a modern agriculture with anti-erosion protection is practiced on the slopes, there are currently more than 100 small-scale agricultural associations set up on various criteria and technical guidance in most cases of agronomic engineers.

In these associations, where rational technologies are applied, using anti-erosion culture systems and protecting the soil erosion control works previously performed, crops superior to those made in rudimentary agriculture are practiced without practicing elementary soil protection requirements on the slopes.

The vineyards had during the research period an evolution characterized by: reducing the area of use by 11.1%, decreasing the share of plantations with rows along the level curves and those equipped with grass strips or terraces as well as the increase over 1.5 times plantations in small plots with the vineyards oriented on the highest slope.

The reduction of the wine-growing area was mainly due to the abandonment of plantations belonging to the former Agricultural Cooperatives of Production or intercooperative associates, plantations which in most cases met the anti-erosion requirements.

With regard to the new plantations with the rows in the direction of the hill-valley, they are usually made up of small plots (less than 1 ha), located in the vicinity of urban areas, in some cases on sites prior to co-operation and do not offer conditions soil erosion protection or mechanized execution of agro-technical works.

Orchards on the lands sloping, were modified in proportions lower than other uses.

Pastures represent the use located on the site of the-II as surface as arable, with approximately 20% of the total agricultural land. So before the year 1990 and in the period that followed until now, most of the land occupied by this use is represented by grasslands the least productive, with the composition floristic poor, having the grassy carpet in various stages of degradation by erosion, landslides etc. The main cause of degradation of pastures lies in the grazing abusive, about 7-8 months out of the year, without any restriction, in any weather, including when the soil is very wet.

In 2016, according to the data provided by ANIF Moldova Branch, the total area with soil erosion control works is 103 615 ha, compared to 118 151 ha on 31.12.1989. The reduction of such significant areas is due to the application of Law 18/1991 and due to the lack of maintenance of the already executed facilities due to the lack of financial resources.

Table 3

The surface of the land with soil erosion control works by category of use

The year	Surface area in hectares						
	Total landscaped surface	Landscaped agricultural area	Arable	Pasture	Meadows	Vineyards	Orchards
1989	127 671	118 151	-	-	-	-	-
1997	114 102	103 582	64 097	12 582	16 576	5151	5176
2000	114 102	103 582	64 097	12 582	16 576	5151	5176
2007	114 102	103 575	64 090	12 582	16 576	5151	5176
2008	114 268	103 664	64 060	12 701	16 576	5151	5176
2009	114 268	103 649	64 046	12 701	16 575	5151	5176
2010	114 268	103 638	64 046	12 690	16 575	5151	5176
2011	114 268	103 627	64 035	12 690	16 575	5151	5176
2012	114 268	103 615	64 023	12 690	16 575	5151	5176
2016	114 268	103 615	64 023	12 690	16 575	5151	5176

According to Table no.3, regarding the evolution of the anti-erosion works, one can notice that during the study period, the investment was small and compared to 1990 the situation was not improved, on the contrary, the total agricultural area under construction decreased by 14 563 ha. It is also noticed that only in the case of arable land, pastures and very little in the meadows, there are little implications for erosion control, while in vineyards and orchards the situation is the same for 16 years.

The negative impact of the anthropic factor in Iași County was noted with maximum intensity after the faulty application of the Law 18/1991, manifested by:

- the division of the arable land on the old sites, which led to the emergence of lots oriented with the long side on the sloping slope, thus contravening the most elementary rules for preventing and fighting soil erosion;
- fragmentation of land in small and very small plots and lack of a scheme of agricultural exploitation roads wich have led to the deterioration of even the eradication of soil erosion control systems consisting of grass strips, crops in strips, banquet terraces or protective crops.
- landscaping of terraces within massifs planted with vines wich were largely destroyed as a result of the wishes of new owners to get rows of vines from the hillside in valley;
- the excessively degraded surfaces by surface erosion and / or depth erosion that have been afforested with forest protection plantings have been cleared by the new owner.

CONCLUSIONS

At present, due to reduced funds, there is a weaker concern for the maintenance and restoration of land improvement works. Considering that in the last 20 years the areas with degraded lands in the county have expanded significantly due to the lack of maintenance of the existing facilities and the aggravation of the effects of some atmospheric factors on the agricultural lands and households, it is necessary to relaunch the actions to stop these phenomena that produce important material losses.

Hydroameliorative works are the basic elements of rural development, both for the local economy and for environmental protection. In the pedoclimatic, relief, hydrological and hydrogeological conditions of the county, it is considered necessary to work on about 60% of the total agricultural area

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