

IV. LANDSCAPE ARCHITECTURE

THE EFFECT OF EROSION IN RURAL AREA AND RECOMMENDATIONS FOR DIMINISHING THE NEGATIVE CONSEQUENCES

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Abstract. The fertile soil is limited and irreplaceable resource. Nevertheless, every year, 12 million hectares of lands are lost because of the erosion processes. In the Republic of Moldova, soil degradation processes are conditioned both by natural conditions as well as anthropogenic factors. From the natural conditions, there are highlighted climatic phenomena (heavy rain, frequent periods of dryness and drought, strong winds), difficult terrain, lithogenesis and rock composition of the surface. Currently, on territory of the Republic of Moldova, about 40 % of agricultural lands are eroded soils of various degrees: weakly eroded – 23.2 %, moderately eroded – 11.7 % and strongly eroded – 4.9 % (Andrieș et al, 2008; Cerbari, 2007). Every year eroded land area increases by an average of 0.9 % and annual losses of fertile soil are estimated at 26 million tons. The balance of humus is profoundly deficient, the reserves of humus decrease annually by about 1 t/ha, nutritional elements – with 180-200 kg/ha. The aim of our research was pointing out the particularities spread in Negrea village, assessing changes and negative aspects of the characteristics of these soils as a result of erosion and appreciation of pretability to different agricultural uses. Pedological researches performed in the village Negrea have shown that the favorable climatic conditions, relief and soil, have led to total practical use of its agricultural land under perennial plantations. The high pretability for vineyards and orchards prevents the total silting of the land area. The order of the natural ordering of genetic horizons was derogation. The morphological description of the profiles was performed and it was elaborated the map of soils obtained from 1:5000 scale mapping, which demonstrates spatial distribution of soils with different degree of erosion. The data obtained confirmed that erosion in the territory of village Negrea is the main factor of irrecoverable destruction of agricultural soil profile and reduced its production capacity (Cojocaru, 2015).

Keywords: erosion, soil, pretability, morphological composition, rural area from the Republic of Moldova.

INTRODUCTION

Moldovan soils are rated as some of the most fertile in the world - about 1 billion tons of humus, 50 million tons of nitrogen, 60 million tons of phosphorus, 700 million tons of potassium. These soils represent the main natural wealth of the country and deserve unconditional, permanent attention of the state, of the profile institutions and, apart, of every inhabitant. In the years of reforms in Moldova, there were produced structural changes in the forms of land ownership, possession and use of agricultural land. Peasant farms have appeared, citizens have received the plots of land for fruit growing, vegetable growing and construction of houses, over a million new owners and users of agricultural land have appeared (Brânduș et al, 1999; Cerbari et al, 2005; Neamțu, 1996). To date, agriculture has become quite diversified from the point of view of organizational and institutional framework. Thus, soil erosion at present poses a threat and a risk phenomenon, which conditions the enormous losses for the economy, population and diminishes essentially the land fund of the republic.

The negative processes that lead to the degradation of the physical and chemical properties of soils (destructuring, compaction, salinisation, humus content, erosion, etc.) are intensifying. Every year, for social and economic needs, from agricultural land, considerable areas are taken out, this fact contributes to reducing the areas of land per capita (0.43 ha), while the norm is 0.60 ha. Issues of combating soil erosion in post-privatization period on Moldovan territory, in the villages, require special attention. Pedological researches performed in the village Negrea have shown that the favorable conditions of climate, relief and soil, have led to total practical use of its agricultural land under perennial plantations. The high pretability for vineyards and orchards prevents the total silting of land area (Cerbari, 2010; Puiu, 1980; Ungureanu et al, 2006).

The soil cover in the village Negrea consists of ordinary chernozems with varying degrees of erosion and delluvial soils. The main restrictive factors of the productive capacity of chernozems on the investigated territory are erosion, decreasing humus content, the gradual decrease of nutrient content for plants, irrational

exploitation, inadequate cultivation of soil and drought. The research was conducted in order to assess soil degradation by erosion and the danger of erosion on the village territory. Based on the results, measures to reduce the occurring negative consequences were proposed.

MATERIALS AND METHODS

The research aim consists in the prominence of morphological composition, evaluating the negative changes of soil characteristics in the village Negrea as a result of erosion and appreciation of their pretability at different agricultural use. The research was conducted on the lands of reception basin within the limits the village Negrea, Hincesti district. This reception basin is typical for the whole totally reception basins, formed as a result of fragmentation by erosion of high terraces of the Prut river and its tributary streams on the left. The object of study occupies the north-east and middle of the agricultural land of the village Negrea.

The methods of doing pedological field researches and analyses included: - detailed soil cover mapping at scale 1:5000 according to the existing instructions; - location and morphological description of soil profiles; - determination of morphometric indices of soil; - soil sampling for laboratory analysis; - determining the degree of soil erosion and others (Cojocaru, 2015).

RESULTS AND DISCUSSIONS

The damage caused to the national economy by soil erosion is colossal. The losses of weighted average of the annual harvest of eroded lands constitutes: arable land – 27 percent; lands with perennial plantations – 30 percent; grasslands – 37 percent.

From the above mentioned, we consider that in the conditions of Moldova, erosion control is a decisive measure in diminishing the soil degradation process (Cerbari, 2007; Cojocaru, 2015; Zaslavschii, 1979).

Fig. 1. Map of soils in the village Negrea, research scale 1:5000, in 2014.



According to legend of the soil map (Fig. 1), the diversity of soil units in territory of village Negrea, is formed mainly from soils with different degrees of erosion (Tab. No.1).

Table 1. The surface of soils that haven't been eroded and soils with varying degrees of erosion in territory of village Negrea

№	Name of soils	Area	
		ha	%
Agricultural land used for growing crops, vineyards and orchards			
1	not eroded	36.0	10.5
2	delluvial	22.1	6.4
3	weakly eroded	95.7	27.9
4	moderately eroded	93.5	27.3
5	strongly eroded	49.8	14.5
6	very strongly eroded, erodosoils	2.5	0.7
Total of eroded soils of cultivated agricultural lands		241.5	70.4
Total of cultivated agricultural lands		299.6	87.3

The pedological research showed that in the areas of the village Negrea (Cojocaru, 2015) that were used in the past completely under orchards and vineyards located on micro-terrace slopes and correctly organized territorially, the erosion process of soils was partially stopped (Fig. 2.).



Fig.2. Orchard on the micro-terrace slope



Fig. 3. The manifestation of erosion process on slopes after the deforestation of perennial plantations and levelling the micro-terraces

Currently the perennial plantings are largely deforested and the lands are planted with annual crops and used for arable farming, fact that leads to the intensification of the erosion processes (Fig. 3).

Soil erosion control measures will be planned in the fields – on some elementary agricultural territorial units. The problem of combating erosion and soil protection in the post-privatization period in Moldova is not given due attention. As a result, the area damaged by this process increases continuously; erosion affects the physical, chemical and biological soil properties becoming the main cause of degradation of agricultural lands (Câmpeanu et al, 2006; Cerbari et al, 2005; Dobrovolschi et al, 2007; Florea et al, 1987; Neamțu, 1996; Ungureanu et al, 2006).

For the investigated area, there are proposed general principles, the order of execution and the set of works for the implementation of erosion control measures under the terms of studied territory. They serve as a basis for the development and organization of erosion control in the territory and the application of agro-technical processes, phyto-reclamation, forestry and the most simple hydraulic erosion control measures.

Under the principles of anti-erosion protection of soils, it is understood the assessment of the danger of erosion, drawing up measures and technologies to combat erosion processes, their implementation in agricultural practice. In the territory of the village Negrea, according to the legend of the map in question, the fields, according to the danger of erosion, are divided into three groups: low, moderate and high (Table No. 2). For each group of soils, depending on the danger of erosion, control measures are recommended, given the concrete situation of groups (Cojocaru, 2015).

Table 2. Legend of the map of erosion danger for agricultural land in the territory of the village Negrea

№	The danger of erosion on agricultural land	Proposed erosion control measures
1	weak	Superficial flow regulation on the roads surrounding the lands by building grassed ditches along them. Introducing, on fields, agro-technical measures: erosion control crop rotations; subsoiling; implementation of the system of works for soil conservation; harmless fertilization.
2	moderate	Superficial flow regulation on the roads surrounding the lands by building grassed ditches along them. Introducing, on fields, agro-technical measures: erosion control crop rotations; subsoiling; implementation of the system of works for soil conservation; work with preservation of stubble; harmless fertilization. Mole drainage systems with a series of soil fissures on lands with hoed crops. Cultivation of alternative crops into strips.
3	high	Superficial flow regularization on the roads surrounding the lands by building grassed ditches along them. Cultivation of alternative crops into strips with grass strips. The structuring crops on slopes with consideration of the degree of soil protection. Mole drainage systems with a series of soil fissures on lands with hoed crops. Building on the investigated area of a system of grassed ditches necessary to evacuate the excess rainwater.

At the recommendation of measures to combat erosion within the land, parallel to soil map, it will also be used the erosion hazard map, developed on the basis of the soil map and of the existing plan of land use.

On this map, taking into account the structure of the soil cover, of the slope of the land, the kind of

agricultural use and others, all of lands were separated into groups according to the danger of erosion: absent, reduced, moderate, high and very high (Brânduș et al, 1999; Câmpeanu et al, 2006; Cojocaru, 2015; Florea et al, 1987; Zaslavschii, 1979).

CONCLUSIONS

1. Currently there is a risk that gullies will evolve into ruts and ravines, destroying the agricultural fields and contributing to their degradation and their desertification, with serious social consequences for the local population.
2. On the researched lands, the following processes of soil degradation are widespread: water erosion into the surface and depth, silting of soils with sediments poor in humus, destructuring and compaction of the secondary, recently arable layer, decreasing the reserves of nutrients.
3. Erosion control works in the village Negrea, must be carried out on the basis of a reasoned scientific project that provides a systematic approach to the problem.

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