

EROSION - MAJOR PROBLEM IN THE EFFICIENT USE OF SLOPING LANDS

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Abstract

The rational use of soil, the main means of production in agriculture today represents for most countries a problem of the first order. In this paper we demonstrate that erosion is a major problem known fact that usually leads to worsening soil properties affecting them, washing them, thus contributing significantly to reducing agricultural production. For this purpose for the detection and assessment of soil erosion in hilly region of the Middle Prut a lot of research is necessary. Observations on liquid leakage and erosion study were made using specially arranged parcels. For achieving this goal it is necessary to establish the most effective measures for erosion control the extent research data recording. On the territory the researched object of Negrea village, Hincesti district biggest danger presents it of course - soil erosion.

Key words: plain Middle Prut, erosion, soil, liquid leaks, sloping lands.

INTRODUCTION

In order to obtain better results in the economic exploitation of the sloping lands it is necessary to know the degree of erosion and apply the whole system of erosion control measures. (Nour and Balteanschi, 2004).

Taking into account that the main problems that have sloping lands related to the retention and evacuation directed to storm water and restoring productive potential of eroded soils, it is necessary that measures are introduced should be adequate, with maximum efficiency and to take account all factors which determine the erosion.

Therefore, knowledge of the characteristics of this phenomenon, of the evolution and the factors which it determines constitutes an important element in establishing and appreciation of leaks on the slopes, to recommend the most effective measures erosion control (Cerbari, 2010).

On the village territory Negrea, Hincesti district biggest danger presents it of course - soil erosion. Whereas the area Plain Middle Prut was recorded in the relief fragmented and often lack of water in the soil (Ursu et al., 2005) due to the texture thereof clay loam, a very

important problem on sloping lands is represented by retention in the soil of certain higher quantities of water from heavy rains, thus reducing liquids leakage and the erosion.

At the same time, increase the agricultural production of these soils. A good soil is the fundamental component in ensuring the sustainable development of agriculture and society. Conservation of soil and fertility are as important as obtaining agricultural production. (Cerbari, 2010; Boincean et al., 2012).

So the research that is carried out in the Middle Prut Plain ultimately aiming to minimize the erosion of the sloping lands, to raise agricultural production almost to the level of those obtained of not eroded lands. Thus, it needs to influence all factors of vegetation, so that by harmonizing them to obtain the best results. Approximative distance from the Negrea community to the main sites is the following: Hincesti – 23 km, Chisinau – 60 km.

MATERIALS AND METHODS

The fact that more than half the agricultural area of the village territory Negrea are on sloping lands, therefore in permanent degradation potential danger, under the action

of the destructive process of erosion. In ensemble of factors acting on the land cover, erosion is a major a modelling agent who contributes to continuous change the general appearance of the land surface. The intensity of erosion processes is conditioned by the degree of inclination and length of slopes, soil texture, arable farming and in soil tillage (Ursu, 2006). The more the degree of soil erosion is higher, with that less erosion control resistance and more intensive erosion process (Cerbari, 2010). The research was conducted on an ordinary chernozem clay loam with varying degrees of erosion in a reception basin typical for hilly area of the Middle Prut, from Hincesti district. Observations on liquids leakage and erosion study were made using specially arranged parcels located on different segments of the slope with varying degrees of soil erosion. Organized experiences were placed by known methods. The parcels had rectangular shape with an area of 3 m². In part of the downstream was installed a metal trough and scored vessel for reception leakages (Figure 1).



Figure 1. The experimental parcels

For the calculation the water losses and soil after each simulated artificial rain with device portable sprinkler irrigation was determined volume the resulting mixture. The amount of eroded soil was calculated after the samples of the resulting mixture was decanted, dried and weighed.

RESULTS AND DISCUSSIONS

Research conducted the parcels to control the leakage of lands sloping from the village Negrea, shows that increasing the volume of fluid leakage (Table 1) from the soil poorly

eroded to the strong eroded are due to the decrease hidrostability of the structure, increasing the degree of compaction, reducing permeability for water in the soil (Nour and Balteanschi, 2004).

Table 1. The influence of the degree of soil erosion on leakage

Degree of erosion	Volume of leakage (mm)	Runoff coefficient	The speed of infiltration, mm/min	Turbidity, g/l
poorly	24.6	0.06...0.39	1.88...1.18	50.82...33.44
moderately	27.5	0.08...0.46	1.85...1.08	55.02...43.48
strong	31.0	0.12...0.52	1.77...0.97	80.54...67.88

The intensity of surface runoff appreciates the considerable analysis for the duration of artificial rain (Motoc, 1975).

According to data obtained to poorly eroded soil, runoff coefficient increased from 0.06 at the beginning of observations to 0.39 at the end thereof, the average being 0.21.

The moderately eroded soil those indicators make up the respectively 0.08-0.46 and strongly eroded at 0.12-0.52.

From the data obtained it follows that between the values of runoff coefficient and the speed of infiltration of rainwater there is inverse correlation.

Thus, with the increase in runoff coefficient, the speed of infiltration decreases in the degree of erosion of 1.77-1.88 mm/min at the beginning of the rain to 0.97-1.18 mm/min it's finishing.

Reception basin soils with varying degrees of erosion are distinguished essentially after turbidity leakage.

From the data presented show that middle turbidity to poorly eroded soil was 41.22 g/l to moderately eroded soil with 48.47 g/l and strongly eroded at 73.28 g/l (Figure 2).

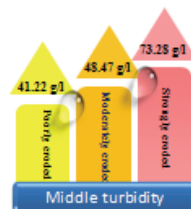


Figure 2. The middle turbidity of the degree of soil erosion

The main feature of soil cover of fields is a predominance of cernozems (black soils) ordinary in its structure (Cerbari, 2010). In conditions of Moldova important natural factor in the formation of stable harvests and treble are atmospheric precipitations. In the area village Negrea the amount of precipitation in a multiannual cycle is 505 mm (www.meteo.md). It is worth mentioning that leakage turbidity values essential diminishes to time, irrespective of the degree of soil erosion. The biggest charging of leakages with washed earth material shall be recorded at the initial stage. Toward the end of artificial rain the turbidity leakages is reduced in the middle by about 24%.

It has been demonstrated, that the largest losses of soil are produced always at rapid precipitation, because of thereof maximum intensity corresponds to the lowest capacity of the infiltration of the soil, which is already wet. So in addition to others known factors as topography, vegetation and others, it is apparent that both the number and intensity of torrential rains as well as time thereof directly helps to trigger and amplification erosion phenomenon.

Is apparent that water leakage on sloping land represents reserves which for agricultural are lost and do not contribute to soil and plants supplying with water required (Motoc, 1975).

The effect of degrading in soil erosion is not just limited to the removal of fertile layers, but at the deteriorating of physical, chemical, hydric and biological properties of thereof.

From the above analysis emerge a conclusion and the need to undertake a complex of measures amelioration and erosion control for reducing liquids eventual leakages from the slopes (Boiangiu, 1961).

Organizing of erosion control will present the first condition and the first component of measurement systems drafted for each separate agricultural land.

Each measure, erosion control process and technology has certain possibilities retaining and adjusting of superficial leakages (Ursu, 2001; Ursu, 2006).

Measuring systems will be placed in the field crop rotations in the agronomic cycle that include perennial grasses, alfalfa, vetch, rye grass and sainfoin.

The density agrotechnical measures depend on the inclination and slope length agricultural crop, texture and degree of soil erosion.

The data recorded in the research results, shows that erosion processes are very active and an accelerated evolution in the hilly area of the Middle Prut (Ursu et al., 2005). Less evident on typical and molic delluvial soils, inversely through the fact of deposit of the alluvial material (Soil Science Dictionary, 1977).

The main task of pedological investigations on slope agricultural land, is the conservation and enhancement their effective fertility to obtain foreseen harvests (Boincean, 2013).

CONCLUSIONS

The values of liquid and solid leakages are determined by the degree of soil erosion. The weak eroded soil runoff coefficient was 0.21 in the middle at 0.27 eroded soil moderately and strongly eroded at 0.33.

The measures and procedures for the protection of soil in the reception basin from the area of the Middle Prut must be applied in a differentiated way and correlated with the intensity of erosion.

It has been demonstrated; that the biggest losses of soil always are produced to rapid precipitation because of their maximum intensity corresponds to the lowest capacity of the infiltration of the soil, which is already wet. Of surface erosion process is irreversible and eroded soils practically cannot restored. If the degree of soil erosion is greater resistance erosion smallest and the erosion process more intense.

The direct consequence of worsening soil properties affecting them the erosion is the reduction in agricultural production more so as the process is more advanced. Erosion on the territory of test/demonstrative fields provokes every year the loss of big quantities of fertile soil and nutritious elements and lead to the reduction of soil fertility and their bonitation points.

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