LOSS OF FERTILE SOIL - A SERIOUS SITUATION IN RURAL AREAS

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Abstract

Most agricultural land in the Republic of Moldova (about 80%) is located on slopes with different inclination. The purpose of this paper is appreciation soil losses for ordinary chernozems with different degrees of erosion which leads to their degradation in the reception basin "Negrea". From the data analysis concerning soil losses washed it notes that they are in close contact with degree of erosion. In this way in the eroded ordinary chernozem soil losses constituted: poorly eroded - 9.3 t/ha, at the moderately eroded - 12.8 t/ha, increasing to 22.2 t/ha in the soil with strong degree of erosion. The effect to degrading of soil erosion it is not limited only to the removal of fertile layers but also the deterioration physical, chemical, hydric and biological its properties. The indirect impact of erosion process on environmental components it refers to training in the cycle of mineral and organic compounds from outside the agricultural lands. Regarding of loss of fertile soilsoils reception basin "Nergrea" accordance with data obtained, fall within the following classes of erosion danger: absent – not eroded and typical delluvial; moderate - poorly and moderately eroded; big - strongly eroded.

Key words: degradation, chernozem, soil losses, reception basin, Republic of Moldova, rural area.

In the Republic of Moldova about 80 percent of agricultural land is located on the slopes and exposed to erosion or erosion danger. The presence of large areas with poorly eroded soils indicates potential possibility of increased erosion on agricultural lands as a result of their irrational management. Soil degradation processes, including through erosion, are conditioned both the natural factors as well as anthropogenic activity (Cerbari V.V, 1996).

Natural conditions only create the manifestation prerequisites of the geological erosion processes and landslides. Currently erosion processes has accelerated due to anthropogenic activities. Deforestation, deep tilling steppes, capitalization of over the allowable limits of the land fund has contributed to activating various forms of erosion and landslides. An example of anthropogenic intervention in result of which the intensity of the erosion processes has considerably increased, is agrarian reform carried out without scientific argumentation.

It concerns, firstly, to artificial imbalance between natural ecosystems and agrosistems by capitalization of excessive, often unreasonable of lands, deforestation of forest strips, antierosional crop rotations exclusion of agricultural practice etc. An example of anthropogenic intervention in the result of intensity the erosion processes increased considerably is agrarian reform, carried out without scientific argumentation. Spraying lands in small parcels out the possibility of applying antierosional protective measures, and the soil tillage often performs in the direction "hill-valley".

The character concentrated of leakages on the slopes also brings a colossal damage. Leakages formed by abundant atmospheric precipitations destroying soil, divestment the root system of plants. Rill erosion comprises 40-50 percent of the surface of demonstration fields. Soil washing from the surface is associated with the laminar course of water down the slope. In this sense has a transfer of soil particles and their resubmission in the bottom of the slope as deluvial deposits. The intensity soil washing varies on different surfaces (Cerbari V.V, 1996; Nour D., Balteanschi D., 2004).

MATERIAL AND METHOD

The research was performed on sloppy clay-loam ordinary chernozems in the reception basin "Negrea", Hincesti district. Reception basin "Negrea" is located in the middle of the hydrographic basin of the rivulet Lapusnita and is typical for the reception basins formed as a result of fragmentation by erosion high terraces of the Prut river and their tributaries left. High terraces of the tributaries of the Prut river and

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the itself Prut river synchronous were formed in the Pleistocene and represents a unique relief in terms of genesis and lithology rock surface, characteristic of the Middle Prut Plain. Mapping the soil cover of the reception basin was performed at the scale the detailed research 1:5000.

The natural factors which favor soil erosion are: highly fragmented relief, the character of torrential atmospheric precipitation in the warm seasons of the year and ability to resist low against erosion of soils (Cerbari V.V, 1996). Erosion in the territory of reception basin "Negrea" became the main factor of unrecoverable destruction agricultural soil profile and diminishes their production capacity.

Potential erosion of soils located on different segments of the slope of the reception basin "Negrea" was determined under standard conditions on the plots of leakage control with area of 3 m^2.

Artificial rain was simulated using a portable aspersion device. For water supply it has been used tankers with the volume 3,000 liters. The quantity of water elapsing from the plots was determined by volumetric method.

RESULTS AND DISCUSSIONS

The research aim consists of the prominence influence of the degree of soil erosion on runoff and soil loss from rural area in the village Negrea, the central part of the country. Duration of artificial rain has made 30 minutes; it had an intensity of 2 *mm/min*.

Order to maintain the stable over time the flow rate of 6 *l/min* to the aspersion device has been connected to the water control.

Value of washing soil was estimated by determining the turbidity of the samples taken over the every 5 minutes into flasks with a volume of 500 cm^3.

The results (*table 1*) show that from amount of water applied to 60 mm, the volume of liquid leakage of poorly eroded soil constituted 41 %, moderately eroded soil from 46% and at strong degree of erosion with 52%.

Increase in the volume liquids leaks (*Figures 1* and *2*) from poorly eroded at the strong eroded is explained by the decrease hidrostability of structure, increasing the degree of compaction and reduce lacunar space (Boaghe Lilea, 2010).

According to some estimates slopes with inclination of 1-5 degrees are located over 60% of arable soils, on the slope size between 5 and 8 degrees locates about 15% of this category of soils and about 5% are located on the slopes with a slope greater than 8 degrees.

Therefore, on the slope lands sizes less than 1° and without risk of erosion of arable soils occupy not less than 20 percent (Constantinov I.S., 1987; Krupenikov I.A al., 2006).

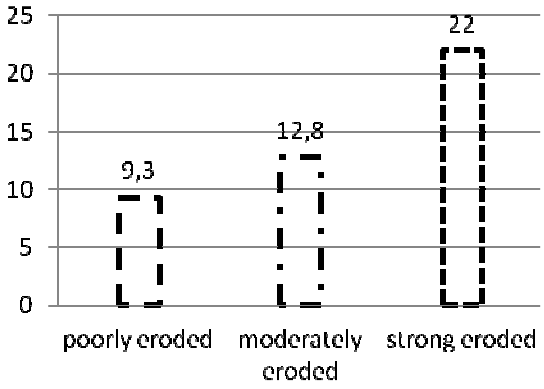

Figure 1 **Total loss of soil, t/ha**

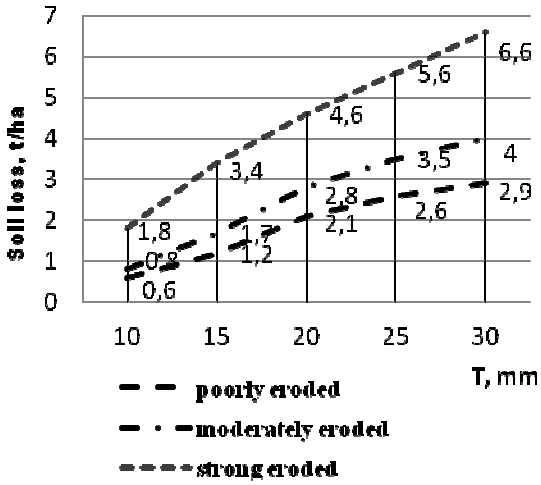

Figure 2 **The influence of the degree of erosion on soil loss**

The intensity of surface runoff registers sensitive changes during artificial rain. Accordance with data obtained, depending on the degree of soil erosion, the runoff coefficient increased from 0.06 to 0.12 at the beginning of observations to 0.39 to 0.52 at the end thereof. Between values of discharge coefficient and rate of infiltration of rainwater exists is an inverse correlation. Thus, the rate of infiltration decreases from 1.77 to 1.88 mm/min at the beginning of rain to 1.18 to 0.97 mm/min at the end of it (*figure 3*).

Reception basin soils with different degrees of erosion differ essentially after turbidity leakage.

Ordinary chernozems with different degrees of erosion registered on the essential differences relating to the turbidity of leakage.

The soil cover of the reception basin „Negrea" is an exemplification of indestructible unit between the interaction of soil, vegetation (life), environment and human in a hilly region.

Soils on the slopes are affected by denudation and evolve through a denudation-compensation of the pedogenesis. The soils on slopes are affected by denudation and evolve

through a denudation-compensation pedogenesis, it means that there is a certain development of the soil in depth during the relatively long period of slow denudation.

From the results determinations observed medium values of turbidity at the poorly eroded soil up to 41.22 g/l; from soil to moderate erosion 48.47 g/l and strongly eroded at the 79.29 g/l.

Table 1

The influence of the degree of erosion on drain and soil losses

The time of measurement, min	The volume of leaks, mm	Runoff coefficient	The speed of infiltration, mm/min	Turbidity, g/l	Soil losses, t/ha
Soil poorly eroded					
10	1,2	0,06	1,88	50,82	0,6
15	2,7	0,10	1,74	45,24	1,2
20	5,2	0,20	1,54	39,96	2,1
25	7,0	0,30	1,36	36,62	2,6
30	8,5	0,39	1,18	33,44	2,9
Total	**24,6**	-	-	-	**9,3**
Soil moderately eroded					
10	1,5	0,08	1,85	55,02	0,8
15	3,3	0,16	1,68	50,48	1,7
20	5,8	0,27	1,47	47,80	2,8
25	7,7	0,37	1,27	45,56	3,5
30	9,2	0,46	1,08	43,48	4,0
Total	**27,5**	-	-	-	**12,8**
Soil strong eroded					
10	2,3	0,12	1,77	80,54	1,8
15	4,5	0,23	1,55	76,88	3,4
20	6,3	0,33	1,34	73,02	4,6
25	8,2	0,44	1,15	68,06	5,6
30	9,7	0,52	0,97	67,88	6,6
Total	**31,0**	-	-	-	**22,0**

Figure 3 **Determining the volume and turbidity leaks under the influence of artificial rain of certain intensity**

It noted that turbidity values leakage decreases in/or during rain, regardless of the degree of soil erosion.

It was established that the highest loading of leakages with washing earth material is recorded at an early stage immediately after the start leakages. Towards the end of the observations of turbidity value of leakages is reduced by about 24% in the middle, regardless of the degree of soil erosion. This regularity has been demonstrated also for ordinary chernozems in the south of the republic (Boaghe Lilea, 2010; Constantinov I.S., 1987).

The biggest loading leakages with washing earth material are recorded at the initial stage.

From the data analysis concerning soil losses washed it notes that they are in close contact with degree of erosion. Thus at poorly eroded soil losses constituted 9.3 t/ha, at the moderately eroded 12.8 t/ha and increasing to 22.2 t/ha in the soil with strong degree of erosion. Therefore, the allowable limit of the soil losses is exceeded by 1.6 to 3.7 times.

The effect of degrading the soil erosion is not limited only the removal fertile layers and worsening physical, chemical, hydric and biological of these properties. The indirect impact of erosion on the environmental components, especially that aquatic refers to training cycle of large quantities of mineral and organic compounds. In most cases, the final points of migration of these compounds are ponds and accumulation lakes

located in places depressionary or river courses inland.

According to statistics the level of silting aquatic basins as a result of soil erosion varies from 11-54 % (Nour D., Balteanschi D., 2004).

At present there is a risk as gullies to evolve in trenches and gullies destroying agricultural lands and contributing to their degradation and desertification with consequences serious social for local people.

CONCLUSIONS

Sloppy soils included in the arable after grubbing vine plantations on the slopes, is characterized by low erosion resistance due to the appearance of the surface of horizons with low humus content, the structural hidrostability and low water permeability.

The diversity of relief forms, rocks and agricultural use conditional existence on the territory reception basin ”Negrea” with complex cover of soils, in which the predominant component ordinary chernozems with varying degrees of erosion (83%).

Technological processes to prevent and / or combat soil erosion in the Reception basin “Negrea” should be differentiated and correlated with the intensity of erosion processes.

Values leakage and soil losses are determined by the degree of erosion. The volume of leakages decreased from 24.6 mm at poorly eroded soil to 31.0 mm at the soil with strong degree of erosion. Such regularity is also valid for soil losses which constituted 9.3 t/ha and respectively 22.0 t/ha.

The problem degradation and combating soil erosion in rural area in Moldova require particular attention.

Measures of diminishing soils degradation on the slopes in the reception basin “Negrea” is necessary to be planned by taking into consideration the degree of soil erosion, inclination of lands, agricultural use category.

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