DEGRADATION OF AGRICULTURAL LANDS CAUSED BY EROSION (CASE STUDY, VERMES COMMUNE, CARAS-SEVERIN COUNTY)

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ABSTRACT

Soil erosion is the washing process of the genetic horizons of soil rich in humus and of nutritive elements important for plant development, appearing on sloped surfaces by water action, followed by downhill sedimentation or sedimentation in water courses which carry these materials in lakes and seas. Thus, the sloped soils remain exposed to erosion and degradation processes.

Because of land cultivation by inappropriate technologies, the quality of soils decreases and these are exposed to degradation of physical and chemical properties of horizon A and of subsequent others. Of course, this phenomenon is not immediately, its intensity and amplitude depends on anthropic factor (human activity), one of the most important factors, sometimes with disastrous consequences.

Territory is affected by surface erosion with different intensities, and partially was observed landslide, especially at the origin of erosion valleys. The surface affected by erosion with different intensities is approximately by 11,5%.

INTRODUCTION

Land surface is permanently influenced by two natural processes: internal (neo-tectonic, volcanism) and external (earth gravitation, water, and air).

Power of the external processes is related to earth gravitation and solar energy which is not uniformly distributed on whole surface due to several complex causes.

In the geological history of different regions was described the cold and warm, dry and wet periods which emphasize the intensity of erosion processes and bring the notion of erosion cycle.

Concomitantly with intensification of agriculture, the lands subjected to erosion phenomenon decreased because of their cultivation. Because of land cultivation by inappropriate technologies, the quality of soils decreases and these are exposed to degradation of physical and chemical properties of horizon A and of subsequent others.

The researched perimeter is located on three relief stages: Hills of Pogăniş, terraces of Pogăniş and Pogăniş meadow. These stages of relief come down in direction north east – south west and are fragmented by erosion valleys which come down in the high areas (hill toward meadow).

Territory is affected by surface erosion with different intensities, and partially was observed landslide, especially at the origin of erosion valleys. The surface affected by erosion with different intensities is approximately by 11,5%.

The soils suffered anthropic changes. Thus, we can talk about quantitative and qualitative change of organic matter of soils as result of deforestation and usage of pastures as arable lands, and also as result of compaction phenomena and structure deterioration of soils.

MATERIAL AND METHODS

There were made field measurements in order to quantify the lands affected by erosion and sizes of ravines, the degree and factors leading to erosion, geomorphological mapping and determinations in situ of several pedological and geotechnical parameters, direct cognition of lands belonging to Vermes commune affected by erosion, actualization of data regarding the phenomena of land degradation by erosion.

RESULTS AND DISCUSSION

Territory of Vermeş commune is located in the NV side of Caraş-Severin County, at the limit with Timiş County. **Coordinates: 45°31′12″N 21°39′34″E.**

Perimeter of Vermeş commune is placed in the area of western piedmonts.

There are distinguished three geomorphological units arranged in stages, with altitudes coming down from north toward south, south-west, i.e. from 300 to 120 m.

These units are distributed as follows:

1. Hills of Pogăniş;
2. Piedmont high plain;
3. Low plain or Meadow of Pogăniş.

Because of heterogeneous geological structure, diverse lithology, and genetic types of valleys, it was assumed that these hills have not the same origins as the rest of the hilly piedmont formations from Banat (3).

This area suffered epeirogenic movements concomitantly with whole western part of Carpathians.

In the submerse ages (Levantine), over the sunken crystalline foundation were deposed gross fluvial-lacustrine sediments which imposed a horizontal structure to the zone.

Orogenesis wallachian phase raised the hilly zone of this side and slightly came down the zone in the northern part.

This fact can be deducted analyzing the configuration and origins of valleys, consequent with south-northern direction toward Timiş valley and obsequent to contrary direction, toward south, to Pogăniş valley, configuration which indicates a low inclination of layers from south-south east toward north-north west.

Within relief of the zone, as witnesses of the strong tectonic movements and of connection existing between these relief forms and Central Banat Mountains, remained two prolonged crystalline horsts which have their base buried with materials detached from their own bodies.

In the area of piedmont hills can be found: in the higher parts, metamorphic rocks represented by sericite, chlorite schist, and amphibole schist, quartzite, and also materials resulted from their alteration, over which were deposed acid, skeletal soils; sedimentary rocks formed at their turn from clays of different colours, some of them low carbonated and with fine sands, low sandstones, and gravel. These were deposed in crossed layers, demonstrating the quaternary origin.

Sector of piedmont plain is dominated in north by Hills of Pogăniş and comes down in stages toward Pogăniş (5).

The crystalline peak Bleauca, which penetrates almost until plain level, generated a system of cones of dejection, which make difficult identification of the terraces zone, between piedmont plain and low plain. In addition to it, is the influence of the local area of subsidence, which determined the immersion of the last terraces and their covering with diluvial-pluvial materials.

Fig. 1 Prolonged crystalline horsts on the territory of Vermeş commune

Fig. 2 Quaternary parental material (Ogaşul Lupului), village Izgar, Vermeş commune

Numerous cones of dejection which came down from Hills of Pogăniş covered the eroded shoulders of terraces, so that nowadays, as relief forms, can be observed only several prolonged ridges starting from hills.

On the numerous outfalls having various granular compositions evolved preluvosoils and luvosoils.

Erosion decapitated in numerous parts the superficial soil profile. Depth erosion is represented by ditches of various sizes and gully erosions (2).

In the low plain (Meadow of Pogoniş) is present a typical reduction of Holocene divagation where both the local subsidence and the general subsidence of the superior course of Tisa river determined the covering of the old loam deposits and older alluviums with recent alluvial materials.

Starting with Diluvial age until XVIIIth Century, the river Pogăniş has not its bed rigorously fixed, and the plain functioned as an extended area of swamp sprinkled with sparse hills. Due to this fact, here can be observed a great variety of sedimentary materials (clays, sands, mud) which determined formation of a large range of soils.

Fig. 3 Ditches and gully erosions caused by erosions on the territory of Vermes commune

Depth erosion is concomitant with surface erosion, transition is gradually done. By concentration, the surface drainages give canals in „V" or „U" shape, and passing through a hardly erodable horizon they start to get large (2).

Usually, land erosions appear on versants without appropriate anti-erosion conditions and in places where working technology is inadequately applied.

The relief modelled by erosion can evolve toward two main directions:

- first situation is when landscape is dominated by sculptural forms with high density, with steep shores, uncovered by vegetation,
- second situation is when deep erosion forms or landslides are stabilized for a long time.

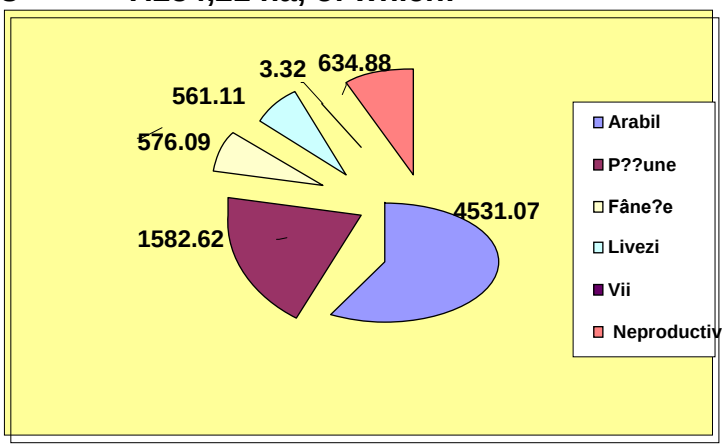
Erosion is influenced by intrinsic characteristics of soil. These directly influence the resistance of soil aggregates in detachment and transport conditions under influence of precipitations occurring in the area.

The researched area is characterised by annual mean temperatures by 10-11^{0}C and annual precipitations ranging between 701-800 mm. The arable surface is represented as follows:

Total agricultural lands = 7.254,21 ha, of which:

- Arable = 4.531,07 ha
- Pastures = 1.582,62 ha
- Hayfields = 546,09 ha
- Orchards = 561,11 ha
- Vineyards = 33,32 h

Other terrains (unproductive) = 634,88 ha



Researches have been carried out during years 2008-2011, field measurements have been made yearly in September, in the same period being collected soil samples for laboratory analyses.

The surface affected by erosion identified in field is approximately 27,3%.

Sizes of ravines ranges from 0,5-219m length to 15,5m width, with maximal depth by 3,65 m.

Fig. 4 Field measurements of erosion within territory of Vermes commune

The annual mean precipitations were: 2008-725mm; 2009-750mm; 2010-710mm; 2011-720mm. Due to precipitations it can be observed in image how was sculpted the erosion forms in the shores of ravine.

In this perimeter erosion appeared as result of the property transfer, remaining uncultivated for about 5-8 years. The economic damages both for community and for recent owners reach values enough large, because of weeding in proportion by over 70%, and eliminating the extension of forestry vegetation and the deteriorated access roads due to chaotic circuits during the rainy periods. The lack of adequate measures of conservation and restoration of eroded roads led to deterioration of other neighbour lands.

Evolution of ravines within studied area significantly increased in 4 years of observations, approximately with 1-3m yearly as length, 0,5m depth, and 0,70m width, determining degradation of soil properties under aspects concerning the fertility.

There were identified 21 ravines of different sizes and 3 perimeters affected by landslides. Because of vegetation lack, degradation of these terrains will go on depending on precipitations fallen on this arable land surface.

An important factor is the livestock which vertiginously increased, and the grazing which is inappropriately coordinated, and the grazing period on these lands increased with 15-20%, determining important damages to vegetation.

CONCLUSIONS

In context of conservation and increasing the fertility of agricultural lands is required a detailed analysis of the limiting factors and agricultural yields.

Analysis takes into account the inventory of degradations or limitations within the researched perimeter, establishing the intensity degree and the areas of appearance, areas where intervention is possible by prevention measures or improving works.

In order to make a forecast regarding the evolution of soil cover and also to indicate the optimal solutions of improvement is required a detailed analysis of the degradation processes and of areas occupied by these phenomena.

Perimeter of Vermeş commune is located in the area of high plain and hills, fact which place a part of lands in slope.

Slope represents a limiting factor, because it influences the tillage system, mechanics, structure of crops, etc.

Depending on slope size, shape of versants, their length and exposition, structure of crops and land exploitation, on versants appear processes of surface erosion.

Through erosion is intensively or less intensively washed the fertile layer of soil, meaning the food source of crops, decreasing in great proportion.

As well, on versants, due to surface drainages, the water reserve of soils decreases.

Depending on land slope, the limiting categories are classified as follows:

Extremely severe limitations caused by slope, found in 131,52 ha, meaning 1,81%.

Very severe limitations caused by slope, found in a surface by 269,74 ha, meaning 3,72%.

Severe limitations caused by slope, found in a surface by 706.96 ha, meaning 9,75%.

Moderate limitations caused by slope, found in a surface by 1183,29 ha, meaning 16,31%.

Low limitations caused by slope, found in a surface by 1829,92 ha, meaning 25,53%.

Lands without limitations caused by slope, found in a surface by 3132,78 ha, meaning 43,19%.

As result of specific conditions, in relatively large areas appeared landslides in furrows and waves, which in present are partially semi-stabilized.

Severe limitations caused by landslides were found in a surface by 163,89 ha, i.e. 2,26%.

Low limitations caused by landslides occupy a surface by 7065,36 ha, i.e. 97,40%.

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