

CONSIDERATIONS ON LAND USE AND LAND DEGRADATION IN JIJIA'S UPPER CATCHMENT (HILIȘEU COUNTY)

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Abstract

Land degradation from Hilișeu county is mainly due to various erosion types, as areolar or liniar, but also by amplifying landslides (both with generalized spread). Also, land degradation is influenced by a considerable number of secondary processes whose is represented at punctual level. Soil cover, which is in direct contact with climatic factors, being strongly controlled by them, changes completely in its appearance and characteristics. On flat or slightly inclined surfaces, alteration products remain in place, contributing to the formation of eluvium that covers the sculptural interfluves. When the slope is increasing, alteration products start to move slowly. These processes are known as areolar erosion, depth erosion or wet landslides, processes that have an important role not only in the evolution of landscape, but also in the slope one. Their main reason is the force of gravity, but their mode of expression and their stage of development depends on a complex of natural and anthropogenic factors. The occurrence of areas affected by current geomorphological processes on arable surface (occupying a total of 2502.02 ha), is associated with the dysfunctional land use and ineffective style of exploitation. By using GIS techniques applied to topographic maps and orthophotos, subsequently verified by field research, was conducted the diachronic analysis of the current land use, but also the statistical analysis specific to the digital cartographic reliance previous obtained.

Key words: land use, land degradation, Hilișeu county

The importance of land as a physical resource is frequently undervalued by a wide range of environmental scientists as well as by policy makers and planners. Increases in agricultural output will have to come primarily from increased productivity from existing agricultural land (Davidson D., 2002). Land use always involves an area, a specific territory and can be considered a geographical concept, moreover that different regions of various natural areas reach different spatial patterns of land use. These spatial or territorial models actually result from different relationships which are established between the human need to act for purchasing the necessary for living in more favorable conditions, on the one hand, and the availability and ability to be effectively used in this way on the other side (Florea N., 2003).

Landslides, displacements, soil compaction, depth erosion represent important elements that contribute to land defacement from the studied area and implicitly, one major risk for the regions where could be met optimal conditions of formation of all these geomorphological processes. Soil degradation or physical damage is found mainly in soils used in agriculture, as a result of agricultural work to mobilize the top layer of soil

and ground traffic. The degree of physical impairment gets high values with increasing mechanization, as with lower organic matter content of the soil. Soil compaction is defined as a state of compression volume of soil mass caused by an external force applied to the soil. The degree of compaction can be negatively influenced by grazing, as well as agricultural machinery that exert compressive force on the ground. deterioration of soil structure is another form of partial destruction of the aggregates from the upper horizon, which occurs in plowing layer which is permanently detrimental and also lowers the effective agricultural technologies. Displacement process known as soil erosion in the broad sense, is a complex phenomenon that reffers to material removal of soil or underlying rock by moving water, by wind, landslides or collapses. The result is given by cropping or distortion soil cover. Unfortunately, these phenomena have a relatively high prevalence in the territory. The protection process of annihilation phenomena represented by coating with different soil fertile sediment, wastes or by changing the destination is much less extensive (Florea N., 2003). A special interest is presented, therefore, by land use, given current location and what could be improved in order to

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achieve a functional system to be perfect with sustainable applications features.

MATERIAL AND METHOD

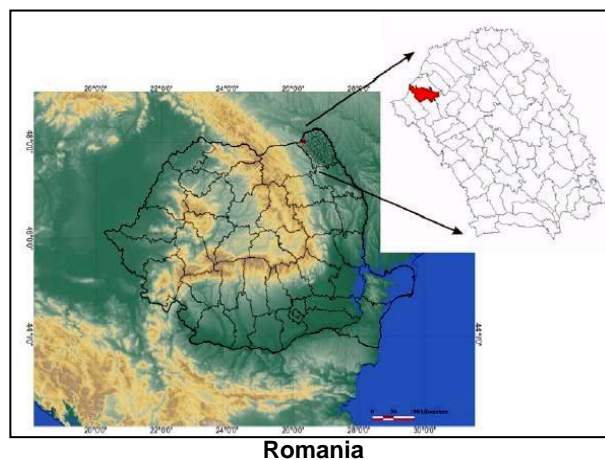
The application of GIS to land evaluation is ideal given the focus on the input, management, processing and display of spatially referenced datasets (Davidson D., 2002). The used software for this project (TNTMips 6.9 version) consists of data input subsystems for digitizing maps or importing existing files such as on topography or soils, the geo-referencing of data and linkage to associated relational databases, the analysis of data from simple overlay analysis to the incorporation of dynamic models, and output subsystems to produce the specific maps, tables and reports. The general method relied primarily on identifying land mapping units with a range of topographic variables and land categories; it was then possible to find the entire swath that includes mapping units which described the destination for individual crops. Beyond the aerial photos and orthophotomaps of the Hilișeu County, which were introduced and analyzed using GIS, the phase field had an important contribution to our study, especially for identifying new areas of land degradation that could not be interfered exactly at their real dimension on the digital maps. Field phase was conducted concurrently with information, documentation and data analysis phase, aiming mainly to update the information included on topographic maps, obtain samples for different stages of work and validation through verification field's test results. Was performed a series of photographs that capture the main features landscape elements in terms of the processes taking place and their physiognomy. After combining the two stages, field phase and digital mapping one, the whole obtained data has been statistically analyzed for evaluating the specific criteria of land use and the major areas affected by degradation processes. Spatial analyzes performed were based primarily on information retrieval classified numerical quantification for quantitative estimation of participation of each factor separately. Therefore, on the basis of disaggregated, we extracted histograms for analysis, taking into account the proportion of the classes obtained.

RESULTS AND DISCUSSIONS

Hilișeu Horia County is located in the northern part of the county of Botoșani, the contact limit between the Plain of Moldavia and Suceava Plateau, represented by Bour – Ibănești hill. The county is composed of five villages: Hilișeu Horia,

Hilișeu Cloșca, Hilișeu Crisan, Ezer and Corjăuți. The village is situated between 48°03'33" and 48°01'60" north latitude and 26°25'00" and 26°15'00" east longitude. Maximum and minimum altitudes within village are 410 or 146 m (*fig. 1*).

Figure 1 Hilișeu's position in the county and in



In terms of land use in the village, the total of agricultural terrain, including non-agricultural area that consists of forests, bushes, roads, buildings, watercourses, ponds and unproductive land is 4732.88 ha (*tab. 1*). Distribution by type of use is shown in the table below.

Table 1

Categories of land use	
Arable	2502.02 ha
Land under construction	64.48 ha
Gardens (complex arable)	209.64 ha
Orchards	2.73 ha
Forests	1200.96 ha
Pastures	433.55 ha
Water surfaces	105.29 ha
Unproductive land	25.21 ha
Bushes	133.01 ha
Hygrophilic vegetation	48.02 ha
TOTAL GENERAL: 4732.88 ha	

From this area, 3.304 hectares are agricultural land, the difference in surface being represented by reed, roads and buildings. The percentage is quite high for forests, which occupy about a quarter of the village. Arable land deals half of the territory (*fig. 2*).

Highlighted key findings from these values, by dividing each value to the total agricultural area, it appears that the spatial distribution is more or less consistent with the natural and climatic conditions. The presence of the water surfaces is correlated through their localization on 105.29 ha, many of them having the role of anthropogenic lake.

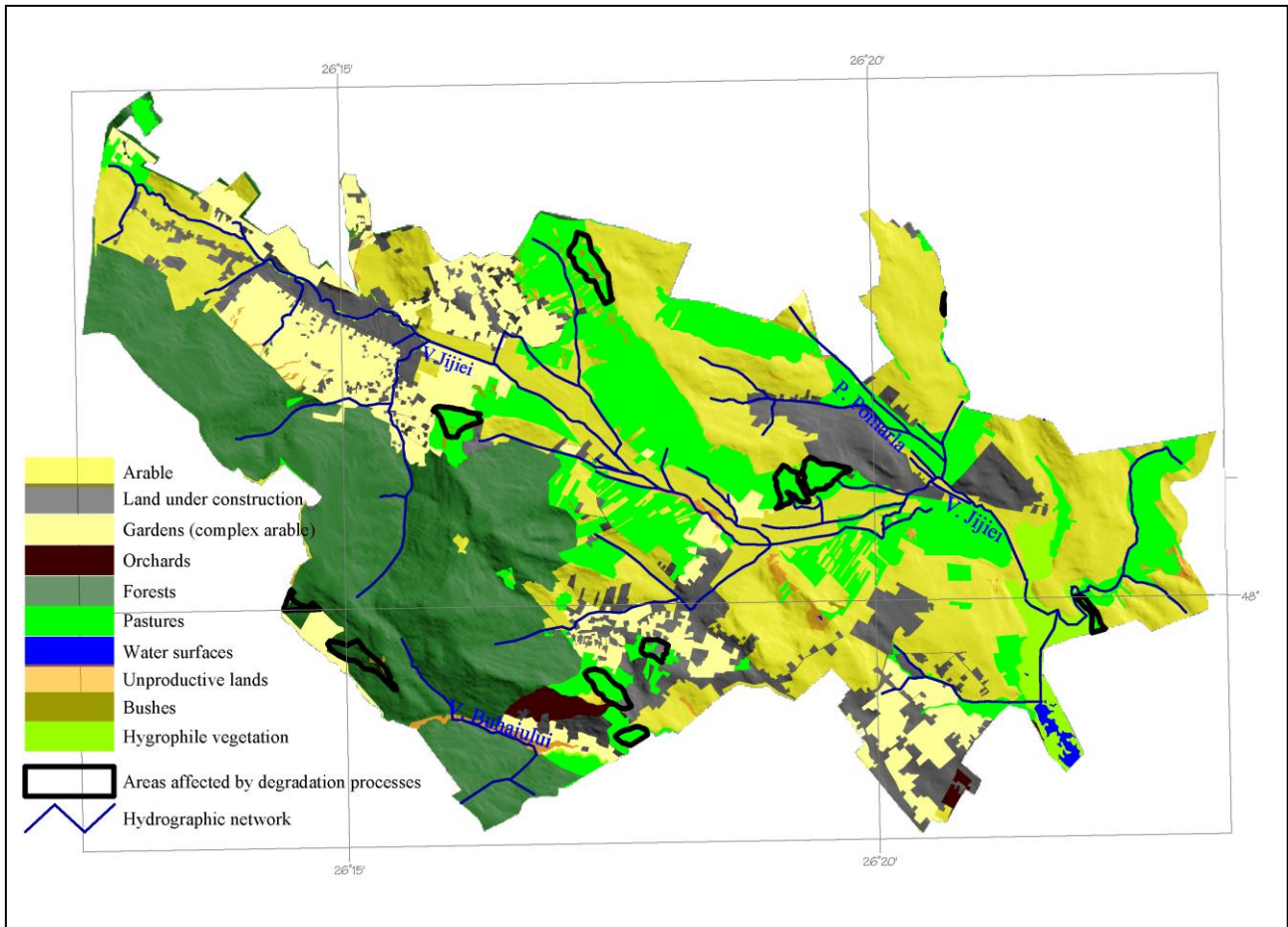


Figure 2 Land use categories in Hiliseu

Also, land use involves a rational placement of the exploited surfaces related to the agricultural interest, but the territorial reality releases the classic aspect that was kept at a majoritary level, being often met hill-valley culture; this type of culture is considered one of the most amplifier factors of the erosional processes. The arable surfaces blend harmoniously on the field with the one occupied by pastures, but there are also areas that have the trend to extend in an uncontrolable way, fact that confirms an absence of durability and suitability planification.

Regarding the land degradation, areolar erosion is a form of erosion that takes place at surface's level, from the actions raindrops, rain water drainage, snow melt and wind. As a result of these processes eroded soil is nearly uniform throughout the area, gaining in an early phase a bright color, indicating the removal of the horizon rich in humus and at the maximum washing phase occurs total soil cover removal and appearance of parental deposits (slopes > 6 °). The most important role in the development and evolution of soil erosion is concerned with the use of land and vegetation type occupying the lands. As extended land is occupied by agricultural system, the role of this process increases, being seen in the

differentiation the arable land (between annual plants: weeding and straw and perennial plants) depending on the stage of vegetation that can intercept water droplets rain (fig. 3).



Figure 3 Association forms of surface erosion with landslides in Hiliseu Horia

By surface erosion reach lower soil horizons which, in many cases, have physical properties less favorable than the upper horizons. Of physical properties affected are clearly differentiated bulk density and useful water capacity (Moțoc M., 1963, Ionita I., 2000). For most eroded soils bulk

density increases and Barbu N. (1974), Barbu N. (1979) points out that the value of useful water capacity of eroded soil from Moldova is reduced by 10-30%. Forest, due to its specific features, has a lower flush than the land cultivated with cereals and even lawns. However, even in the woods, the washing process is not lacking. The proof is in the forest streams of muddy water during heavy rain. Differences appear in the case of land cultivated with cereals. Are characterized by stable land soils cultivated with cereals, than others.

Depth erosion is characterized by the larger forms and their permanent nature. Causes and development conditions are generally the same as in surface erosion type: quick drain powered by heavy rain form or intense melting of large amounts of snow accumulated in winter, fragmented landscape, steep slopes. Deep erosion can not arise controlled by intact vegetation conditions, grassland or forest. It is growing especially where there is an anthropogenic intervention that disturb the natural balance. The main forms of depth erosion within the Horia Hilișeu village are channels, ruts and ravines.

Bottom erosion is the destructive action of water moving on place where flowing. Since at the action of erosion and detachment of the route of flowing water are also involved materials drifted by water is associated, the erosion being associated with transportation.

Outside the areolar erosion and linear erosion, field trips complete range of current geomorphological processes prevailing in the region. They take place mainly due to the action of gravity and include: slips, subsidence and solifluxion. Landslides are the most important geomorphological processes this class. On the area of interest, the sliding characteristic landforms have a fairly common spread on field, due mainly to the lithological constitution (clay-marl). Land stability depends on the permanent interaction of the factors, predisposing and temporary aggravating, triggers, that influence the emergence and development of landslides. Permanent factors are represented by geological, geomorphological, structural terms and the temporary ones by hydrological and climate, hydrogeological, seismic conditions and anthropogenic forest.

Throughout the Horia Hilișeu village exist the most favorable conditions for producing landslides, which by their frequency and extension get remarked in the landscape. The emergence and development of gravitational processes linked to a complex of factors, including: clay formations, free aquifer layers and captive-date occurring on slopes, especially in the cornices, large enough

slopes in some sectors (over 15) and relatively highlighted energy of the landscape.

Solifluxion is a superficial slip of land (less than 1 m), with small steps aspect, evolved from ground movement of a virgin land usually on a waterproof substrate. Solifluxion occupies small areas in studied area, often combined with other process on the modeling slopes. Frequently might be met on grassy slopes of the Jijia and Buhai valleys.

Among the processes that significantly reduces productive potential of land are included the landslides. They are one of the most important and spectacular morphogenetic processes across the slopes of Hilișeu County. In the studied area can be met several categories of landslides: monticular slip type has a wide spread, usually accompanied by other types of landslides. Delluvial slip, consisting of a mixture of clays, clay, marl, has a fragmentation surface covered with protruding or blunt monticles, with low altitudes (0.5-2 m) and wet depressions, sometimes transformed into swamps and marshes. While the waving slips type develop on the slopes formed from mixing plastic rocks and determine the waves to evolve in parallel lines, the lenticular type is often met on slopes where rocks alternate (clay with sand), where, near the surface appear some lenticular aquifers or stronger moistured outbreaks (fig. 4).

Mixed landslides evolve on slopes with a high relief energy, affected by areolar erosion and depth one, where clay and marl accompanied by loess are soaked by groundwater, producing advanced land degradation.



Figure 4 Water pooling on clayey slope in Hilișeu county

Sliding on steps occur on slopes with high slopes, trained in permeable and impermeable rocks alternating with rich underground aquifers (fig.5).



Figure 5 Landslide with muddy flow aspect

Regarding erosion, in Hilișeu are affected 1097 ha agricultural land, of which 256 ha are affected by poor erosion, 319 ha of moderate intensity and 483 ha are affected by intensive erosional processes (fig. 6).

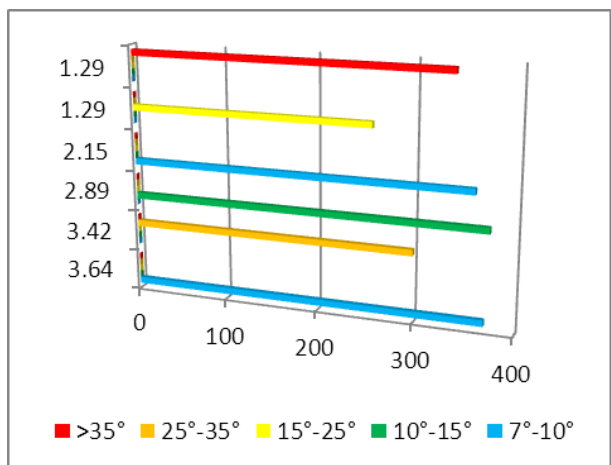


Figure 6 The percent of landslide's surface on the slope and altitude intervals

CONCLUSIONS

Beyond the designated land use categories by analyzing existing cartographic parameters compared to those of previous land record plans, there were a number of changes regarding these categories, as a result of economic activities and changing legal framework of land, as fishing design, deforestation of areas with vineyards, clearing orchard's surfaces, degradation by binding works of land for the construction of communication pathways.

The main forms of deep erosion within the Horia Hilișeu village are channels, ruts and ravines, but with a very poor representation in territory. Among areolar erosion and linear erosion, field trips complete the range of current

geomorphological processes prevailing in the region. On the studied area, the characteristic landforms with large widespread are landslides, quite often, due predominantly clay-marl lithological constitution.

The emergence and development of gravitational processes are conditioned by a whole of factors, including: clay formations, free aquifer layers captive that appear to date on the slopes, especially in the cornices, large enough slopes in some sectors (over 15) and relatively high relief energy. Thus, landslides can be found on 678 acres.

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