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Studinet catchment (Tutova Hills). Pedo-geomorphological study

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Summary

Keywords: pedogenesis processes, geomorphological processes, GIS, land use

Studies in physical geography, particularly in the field of geomorphology and soil science, undertaken both within undergraduate studies and postgraduate of master, justifies the motivation to substantiate the knowledge in this field and to continue the research by carrying out a PhD entitled *"Bazinul Studineţului (Colinele Tutovei). Studiu pedo-geomorfologic". (Studinet catchment (Tutova Hills). Pedo-geomorphological study).*

Studineț catchment, although it lies in an area of hills, monotonous morphostructural point of view, represents a complex study area, with typical morphographic and morphogenetic features for Tutovei hills. This entails the need for knowledge of Genesis and soil evolution closely, as well as the types and forms of relief from this basin.

This study follows a classical structure, according to an outline approach aiming the following: pedogenetic and morphogenetic factors; sheath current soil and genetic types of relief; pedo-geomorphological processes; the current mode of land use in relation to the potential and the restrictions imposed by the pedogeomorfologic background.

The water catchment area of the Studineț catchment is located in the central-eastern part of Tutovei hills, integrated in the Tutova river basin system catchment. The upper reach of the river is oriented in the direction of NNW-SSE, and the middle and lower course in the N-S direction. From the administrative point of view, the territory of Studineț catchment belongs to the Vaslui County, being contained within the territories of 5 municipalities, Ghergheşti village, respectively, and, in part, on the territories of Iana municipality (48,10% of the total area of the village), Puieşti (4,46%), Voineşti (3,63%) and Poineşti with only 3,18% of the total area of the village.

Statistical processing of numerical data, assumed both a proper statistical processing and a spatial adjustment of statistical results. In the present study were used almost exclusively

specialized software like TNTmips and SAGA. These programs offer an integrated environment for analyzing the greeds and the vectors, image processing, creating maps and geostatistics interpretation. To capture the dynamics of the way it was used, it has proceeded to: tracing the ortophoto plannes (2005, 2009 editions; resolution 0, 5 m x 0, 5 m), at the plot level, which enabled the catching of the way the fragmentation of agricultural plots happend, plot configuration etc.

Geological background of the basin under study is dominated by Khersonian deposits (50,55%), with a relatively higher ranking in the upper sector. Meotian appears evenly uniformily through the entire basin, in the form of a continue strips, especially in the upper half of the slopes, represented by the cinerites of Nuțasca-Ruseni landmark horizon (26,28) belonging to lower meoțian and upper meoțian deposits (17,17%), loamy-sandy on top (Jeanrenaud 1966, 1971). Quaternary alluvial deposits have the lowest share of basin (5,17%), in addition to the main river.

The water resources of the Studinet catchment area are in deficit, both quantitatively and qualitatively, influenced largely by the morphoclimatic and hydrogeology characteristics of this area. The basin has an order number of IV and a confluence of 2,27, confluence ratio value decreases with increase in the serial (order) number. Most prominence have the lower rates of order, respectively 37,21 % of order I and 41,74 % of the second order.

From the geographic point of view, the Studineț catchment is a complete rural area, in which are located 14 villages with a population not exceeding a total of 5000 inhabitants, being in an advanced stage of aging, which practice subsistence agriculture, without respect for the most elementary principles of environmental, economic or technical.

The climate shows a particular interest in the relief-ground-vegetation synergism, being considered a first order factor, given the fact that, with the climate change that occurred in the course of time, there have been felt major repercussions in specific areas and distribution of vegetation, the progress way and the intensity of the morphogenetic processes, denudational and solification processes. *Soil surface temperature* is of particular interest, from the pedogenetic and morphoogenetic point of view, particularly by the freezing phenomenon and especially, frost-defrost cycles. The cold season has the most important role in the initiation and activation of slope processes, by preparing the material to be ejected through gully erosion or through the creation of a growing humidity under floods.

From the pedogenetic point of view, temperature (air and soil), alongside precipitation, presents a major interest, bearing in mind that the cumulative influence of them in the soil formation process is still from the early stages, especially in the disintegration and weathering of rocks, subsequently influencing the processes of decomposition, organic matter formation, bioaccumulation, and nutrient substances cycle.

The precipitations are the main agent of soil erosion, in particular of downpour precipitation fallen during the months of May and June. Distribution of annual rainfalls highlights in particular

the intensity with which they act in the process of erosion, according to the time interval in which shall be recorded. It appears, therefore, that the largest part of rainfalls (56,8%) are between 15-20 May and 15-20 June, range corresponding to the critical erosion season from the Moldavian Plateau (Ioniță, 2007).

Hydric component represents a factor of major importance in the processes of solidification, water intervening in eluvial-alluvial processes of various mineral or organic compounds, bioaccumulation, organic matter transformation, alteration, leaching of various compounds in soil. Depth of groundwater is an important parameter, influencing the depth of occurrence and intensity of gleyzation processes. Soils affected by soil groundwater have a rich organic matter content, have a deeper humiferous horizon and eluvial-alluvial processes are reduced.

Soil types heavily influenced by the high level of groundwater are obviously Gleysoils and Fluvisols.

Vegetation represents a value with a load factor very important, from the morphogenetic point of view, as well as from the pedogenetic point of view of. In the first case, it is about a protection layer between external and internal morphogenetic agents, the lack of a protective coating from the surface of the soil creating favorable conditions to the erosional processes. From the pedogenetic point of view, the biotic factor represents the element itself-qua-non, assuring the organic matter in the absence of which the soil may not exist even if the systemic relationship is interactive, the vegetation itself depends on the existence and development of the ground coating.

The relief takes the form of relative uniform heights, extended, in accordance with the general geological layer tilt (NNW-SSE), separated by a network of valleys with a consistent character. These valleys are asymmetrical (structural asymmetry of the order II), dependent on a secondary sideline tilt of the layers from the orogen to the Prut River area, with a cuesta forehead with the West exhibition and reverse with the East exhibition. Due to the high relief energy, with a maximum gap of over 350 meters, they were sectioned by a series of typical consequential valleys, with flow direction approximately perpendicular to the front of the main monoclinal (structural asymmetry of the order I). The whole relief is dominated by the sculptural shapes (interfluviale heights, slopes), but they bear the imprint of the monoclinal structure, which genarates anatomical asymmetries (slope and length of the slopes), dynamic (differentiation of geomorphological processes on the forehead and reverse) and land use.

Forms of accumulation are represented by harmonic formations (colluvial or colluvial proluvial) that accompany the slopes almost in the whole basin) and alluvial levels, alluvial colluvial, due to the fact that the network has no hydrographic ability to eject the material which coes by erosion from hillsides. This causes a premature aging of the basin network, with an obvious degradation of the floodplains.

In terms of geomorphologic processes, erosion at the surface is the dominant process, the mean soil losses are approximatively 13.7 tons/hectare, on 35% of the surface area, the amount

exceeding 15 tons/hectare, implying a productivity decrease in soil used as agricultural. The critical erosion season, specific to the entire Moldavian Plateu (15-20 May - 15-20 June) appears very clearly outlined through the correlation of climatic indicators with soil losses obtained in the plots of leakage from the Perieni, located further South.

Morphologically, the most impressive forms of erosion are the deep ones, into the basin, thus creating nearly 400 forms of rill erosion, because of vertical fragmentation and sandy mainly facies. They have a very accentuated dynamic, especially since a good partition of them are not forested or don't even have the reception basin forested.

The evolution of the most of these are linked to the agricultural use and traditional roads network operating on the hill-valley, in conditions of high gradients and aggressive systems. Landslides have an appreciable expansion in the country but it is primarily about of old landslides, which are stabilized. Currently, active landslides occupies an reduced area, of 129 ha (1% of the catchment area) and their growth is usually related to the gully erosion.

From the biopedologic point of view, the Studineț basin is in the transition between the forest and forestry (dominant), with temperatures of 8 to 9 ° C and rainfall of 650 mm. In these conditions, the zonal soils are represented by Mollisols (Chernozems and Phaeozems) and Luvisols (Tipic Luvisols). Pedogeografic assembly is heavily plated, by the eroded soils slopes presence (Regosols and Eroded Anthrosols), which creates the dominant landscape of farmland, plus other soils which are the subject to the accumulative processes of stream bed (Fluvisoils), properties of the parental material (Psamosoils), or humidity excess moisture (Hidrisoils). At the subtype level, the pedolandscape is even more heavily plated according to the association of the pedogenetice processes intensity.

In terms of land use, there is a series of defining elements: presence of the agricultural land under adverse morphologically and pedologic conditions and high degree of agricultural land fragmentation at the plot level. In natural conditions, has been able to ascertain that the study area was covered in more than 80-90% with forest vegetation included. The long human intervention has led to a drastic restriction of forests, their evolution in relation with the process of population being analyzed in detail between 1772-2010. The other categories of use, an evolution on such long interval it was impossible to follow, but the change of use/non-use of the land and how aggregation of plots before was observed, before and after 1989. Parcel-level analysis for 2005 and 2009, reveals an atomization of the land fund in very small plots. The arable land, there are about 13,000 plots with an average size of 0.24 hectares, many of which were oriented towards the hill-valley.

In these circumstances, the size, shape and orientation of the parcels, morphological conditions, erodibility and high soil erosion, and agricultural practices, largely dependent on the level of living of the population, all of which limit the agriculture productivity up to the subsistence limit and contribute to the reduction of production potential of soil, also to the geomorphological processes acceleration. Therefore, the general and local socio-economic

conditions, when the adoption and application of techniques for combating soil erosion is expensive, changing land use, with minimum costs seems to be the only viable option.