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FORMS AND PROCESSES OF SOIL DEGRADATION AND IMPACTS ON AGRICULTURE IN LAKE BASIN IZVORUL MUNTELUI

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Abstract: The basin of Lake Izvorul Muntelui has soils with a reduced but constantly increasing erosion coefficient. Due to the practice of agriculture and some inadequate methods of cultivation, there is a tendency of passage of soils from moderate erosion to strong erosion. The most affected areas, of degradation processes, are the massive slopes around the lake, where the effects of gravitational processes and of mechanical denudational processes can be observed. The plowing works for corn and potato crops, as well as overburdening, are a permanent threat, causing soil erosion processes, their destruction, crustification, the loss of nutrients and organic matter in the soil. The use of pesticides and chemical fertilizers increases soil productivity but affects the entire edaphic ecosystem and causes once ingested by the human body, disorders of several systems and devices or even chronic diseases. In order to combat these phenomena and reduce soil degradation in the area, it is recommended to maintain vegetation on the slopes and to introduce organic farming practices.

Key words: soil erosion, landslides, degradation, geomorphological process, anthropogenic impact

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INTRODUCTION

In order to correctly identify the soil degradation forms in the Izvorul Muntelui Lake area, the soil types were first surveyed in the studied area and a map of their spatial distribution was made. The lake Izvorul Muntelui is covered by the slopes that belong to Ceahlău, Bistriţa and Stănisoarei mountains, and soil degradation is determined both by natural conditions (biopedo-climatic natural setting and geological composition) and by anthropic activities, especially due to agricultural practices and land exploitation. The soil is the most important productive factor of agriculture and must therefore be protected and exploite in accordance with its physical and chemical properties and fertility. From the desire to have larger and safer agricultural productions, people have practiced agricultural techniques with numerous negative effects on the environment, starting with the plowing works that have been done along the slope and until the chemicalization of the agriculture (Herman, 2009, 2010). The repeated passage of agricultural machinery over certain types of soils contributes to their destruction by compaction of the soil both on the surface and in the depth, the modification of the soil structure, the reduction of the organic matter content and the biotic activity which determines the reduction of

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the humus quantity and natural fertility of the soil. Under the current conditions for the development of a sustainable agriculture it is necessary to rationalize the soils and preserve their natural fertility. The geomorphological processes in the Lake Izvorul Muntelui area can be analyzed both from the perspective of the paleogeographic evolution of the region as well as from the historical perspective, including transformations, forms and processes determined by the appearance of the lake. Until the occurrence of the reservoir lake, in the area around it, dominates the river basin, represented by: the Bistriţa stream beds and their tributaries and terraces, as well as a fluvio-denudational relief seen on the slopes of the Ceahlău Mountains, visibly shaped by landslides and pseudo-fluxions as well as torrential organisms. After the construction of Lake Izvorul Muntelui, the deposits acquire a deltic structure; there are specific phenomena of submarine creep abrasion, underwater slides and drifts, phenomena due, the emery and submersion alerts and the conditions specific to the lake. For the slopes around the lake, following their construction, the type of deposits on the slope and the anthropic intervention, frequent landslides, crashes that can determine in the future, the clogging of the lake and the unbalance of the slopes can be observed. Other frequent processes are: solifluxion and pluviodenudation, affecting all deforested slopes, which is manifested by the appearance of some gullies and furrows of the torrents, at whose shed were formed the dejection cones.

RESEARCH METHODOLOGY

In order to analyze the soil properties in the Izvorul Muntelui lake basin and the impact of agriculture on them, in the basin of the Izvorul Muntelui lake, we made a cartographic inventory of the soil types in the studied area, establishing the correlation between them, the land use and the degree of soil erosion. We have analyzed the influence of the classical system of soil works on both the production of fodder, potatoes and maize and on the direct and indirect effects of these practices on soil properties. In order to determine the influence of agricultural works on the physical properties of soil, we carried out field and laboratory tests, taking the samples and interpreting the results, as well as monitoring the evolution of crops throughout the vegetation period in order to ascertain as accurately their perspective (Choy et al., 2005). The identification of the degraded land and the monitoring of its evolution has been differentiated according to the intensity of the erosion phenomenon and the natural or anthropogenic causative factors, aiming at establishing an optimal strategy for reducing or eliminating the negative effects on the habitats or the preservation of the lands in danger. The analysis of agricultural techniques and practices was carried out from the perspective of time evolutions, together with the identification of soil types and subtypes, the analysis of the geomorphological processes in the studied area, and their role in the pedogenesis or in erosion process.

SCIENTIFIC CONTENT

Geographical position

The lake dam Izvorul Muntelui formed in 1960, is located in the middle basin of the Bicaz River being crossed by the parallel of 47 degrees north latitude and the meridian of the 26 degrees east longitude. At its maximum, it has a length of 31 km in a northwest-south-east direction with numerous lateral extension areas, with the Bistricioara River (3 km). There is a difference of 82 m between the maximum elevation at 516 m altitude and minimum at 434 m altitude (the level varies depending on the operating regime). From the east, the long slope of the Stânișoarei Mountains, slightly fragmented, dominates by 400-500 m of the surface of the lake, while to the west the high silhouette of Ceahlăul, although not integrated into the slope in the immediate vicinity, rises to over 1400 m relative altitude, above lake level, with a particular importance in the evolution of this lake, especially in climatic and geomorphologic terms.

Geographic features of the lake

The Lake Izvorul Muntelui is surrounded by the peaks belonging to Ceahlău, Bistriţa and Stânişoarei Mountains. The Ceahlău Mountains have the highest altitude of 1,800 m, the Stânşoarei Mountains are 1500 m altitude and the Bistriţa Mountains have an altitude of 1100 m and only two peaks over 1500 m. Climatically, the average annual temperature is 7-7.5 degrees C, the average temperature in January of -4 degrees C and the average temperature in July of 17 degrees C. Average annual rainfall is 650-670 mm. Lake water has a high transparency of 2-10 m, a neutral pH towards low alkaline, and water temperatures of 22-24 degrees C in the warm season. From a biological point of view, the high water transparency indicates an oligotrophic environment, with a fish fauna composed of: clean, marsh, specific to medium sized Bistrita valley, but also prussian carp and common bream, lacustral basin species.

FORMS AND PROCESSES OF GROUND DEGRADING IN THE STUDY AREA

The cryonival modeling system

At altitudes above 1700 m, in the Ceahlău Mountains is the subalpine floor of bushes, characterized by the average annual temperature between 0 and 2 °C, annual precipitation of 1000-1200 mm per year, conditions in which due to the cliffs and their cover with vegetation on the largest surfaces, the most frequent geomorphological processes are the crionival ones, due to which the eluvio-deluvial layer continuously transforms, thickens, being frequent mass movements such as: creep and solifluxions (Domuta, 2011) whose effects can be observation on Vf. Ocolaşul Mic in the form of waves, terraces or grasshoppers (Albota, 1994). On slopes whose cliffs exceed 10 degrees sliding blocks are visible whereas on slopes with lower inclines and on flat surfaces can be identified depressions of nivalis compulsion. Due to frost and thaw, gelling or soliflux processes are generated. Gelivation occurs as a result of the frost and thaw that penetrates into the cracks of the rocks, but also because of the diurnal and seasonal thermal differences. Under the conditions of a humid and cold climate, detritic rocks are continuously fractured, and then suffer chemical alteration processes, thus creating soil conditions. Through this process, rocks are transformed by mechanical, physical and chemical agents into the atmosphere called the meteorization process. On surfaces belonging to the steep slopes without vegetation and the soil blanket are conditions of triggering of the gravitational and nival processes, as a result of which the slope profile changes due to accumulations of detritic rocks at their base. In pleistocene, such processes occupied larger areas in the Ceahlău Mountains and the Bistriţa Mountains, which were located in the periglacial area, as evidenced by the thick deposits of stumps, dating from the beginning of the Quaternary, deposited at the base of the mountains, some of which were covered by a soil cover and vegetation. The intensity of today's gelifraction processes is much lower, appearing disaggregation forms, which belong to a residual relief, with a ruinous appearance, represented by: pyramidal peaks, toothed sprocket grooves, but also by accumulation forms of the type of grooves that can be separated into: eluvial grooves arranged on interfluvials and slope grooves. Along the torrent valleys, there are also the storms of stones or grooves cones deposited at the base of the slopes. In the Ceahlău Mountains, due to the disintegration processes, an eluvio-deluvial layer, with a thickness of 0.5-5 m, with a coarse granulometric structure (sandy, rocky, permeable grain structure allowing the accumulation of groundwater, which can be in peak Ocolaşu Mare, Bâtca lui Ghedeon and Lespezi. The alteration blanket or ergolite can be seen on the high bridges of the peaks. Its apparition is due to the geological processes specific to the transition period from the glacial climate to the present one. The solifluxion processes are specific to thawing when the soil is soaked with water, coming from both the melting of snow and the abundant spring precipitations. The soil soaked blanket slides the frozen substrate from the surface of the slopes with small inclinations, and because the phenomenon is repeated in each year, can be considered a mixed process, bothfrost-riven as well as gravitational, and the resulting relief forms are gelisoflixion sliding and terracing stones.

Modeling processes and periglacial relief

The mountains around the Bistriţa valley and the Izvorul Muntelui reservoir lake had no continuous permafrost, a fact that showed lack of polygonal soil, and striated, but also the lack of ice feather structures that had formed lately pleistocene, a period when most of the Periglacian structures in the area date. Instead, in the region the modeling action was accomplished by polysonal and azonal processes. The polysonal processes acted upon the relief, being conditioned by freeze-thaw, temperature drops and by the existence of pergelsol, in a seasonal or multi-annual regime. The gelifraction process has been differentiated according to the lithological properties of rocks, in macrogelifration and microgelifration, the first having more pronounced effects on rocks, such as diaclase, cracking, or stratification, due to both freeze-thaw or gelivation as well as prolonged frost, causes that determined the disintegration of the rocks. The structural shortcomings of a periglacial nature are the main forms of relief due to gelifraction, representing at the same time geological structures favoring the separation of the grooves. The ruiniform relief is the residual witness of gelifraction, being well represented in the Ceahlău Mountains. The gelifraction, along with other transport and accumulation processes such as rolling, rocking, rock creep, talus - creep, have resulted in the formation of some forms of accumulation such as: thick grooves on the slopes or grooves cones at the base of the abrupts that can be found in the pools the Galu, Fagul, Suha Mare rivers. The nivation is part of the polisonal periglacial process, defining the action of snow in the evolution of the relief, manifested by mechanical erosion, dissolution, protection, evacuation and accumulation (Hamelin and Cook, 1967). Although the nivation is analyzed more closely in the study of the modeling of the higher areas of the Carpathian Mountains, the perimeter studied can be reconstituted with the effects of pleistocene nivation, represented by nivation niches, peak pressures, and pleistocene pergelisol existence. The nivation niche, of 80-100 m wide, was identified at altitudes of 1150 m on Mount Tiflea, while the depressions of peaks separated by a narrow threshold have depths of up to 16 m and are present on the interfluve of Cracău-Negru-Cuejdiu. Periglacial conditions, as well as the action of running waters and wind, are associated and are present in the mountains of Bistriţa Valley. The slopes had a leveling evolution that was demonstrated by the rhythmic stratification of the rocks on the slope, indicating that diffuse leakage predominated in slope modeling, generating erosion and accumulation forms, such as glacises. An important feature of the evolution of the slopes in periglacial conditions is due to the accumulation processes generated by the precipitation, being represented by the rise of the bases of the slopes, up to 10-15 m. The formation of the dejection cones in the shedding areas of the rivers represents the contribution of the running waters to this process. Sometimes the length of the dejection cones can represent ¼ of the length of the valley seen in the Fărcaşa, Sabasa and Suha Mare rivers. Some smaller valleys were blocked altogether due to the pleistocene climatic conditions which did not allow for the permanent release of the slopes of the material deposited here, as a result of the transport. Due to this tendency, many valleys in the region present thalweg format in adobe deposits without being submerged up to the base rock.

Nival processes

On the high peaks of Bistriței, Ceahlău and Stânișoara Mountains, an important role from a morphogenetic point of view, has snow, which stagnates for a long time, between 150-180 days a year, the snowfall being produced for 10 months from September to June. On the high plateaus of the Ceahlău Mountains the snow layer maintains an average of 165 days per year, especially on the shaded slopes exposed to the north. The snow is responsible for mechanical processes, erosion, or avalanches as well as chemical processes influenced by water from snow melting, dissolution or oxidation. To the north of Bâtca lui Ghedeon, through the nival compression, two micro-depressions were formed, whereby the accumulation of water resulted in lakes, which dried up about 500 years ago. The nivation is manifested both by slow and slow-moving compaction and erosion processes, such as the aforementioned, as well as by rapid avalanche rapid erosines. They play an important role in shaping the steep slopes around the

Izvorul Muntelui Lake because it trains the detritic rocks on the slopes and activates simultaneously, and other external agents that shape unspoiled areas such as gelivation or torrentiality. The annual avalanche production determines the widening and deepening of torrential valleys through the appearance of avalanche corridors.

Torrential processes

In the basin of the Izvorul Munteului Lake, processes of linear erosion, such as ravens, breezes, torrents, and surges, can be observed. The factors contributing to the emergence and evolution of these processes are of climatic, lithological, geomorphological, biogeographic, and anthropic kind, of which the most important external agent that accentuates the evolution of this type is the precipitation. For the studied area, precipitation is considered to be of a torrential nature, if it exceeds 50 mm in 24 hours (Rădoane, 1980). Such values were recorded at the Ceahlău-Toaca meteorological station in July 2007 (52.9 mm in 24 hours, in July 2011 (99.9 mm in 24 hours, in June 2016 – 56 mm in 24 hours), which reveals that there are few such events recorded in the Ceahlău Mountains. A stronger impact it has the antropic intervention through forestry because it favors the phenomenon of draining and concentrated water leakage both on the trails of wood, as well as along the forest roads, where the furrows are frequent. A reduced distribution has the ravines because the lineat erosion forms can not be deepened to the specific dimensions of a ravine due to the reduced thickness of the formed debris and the hardness of the rocks in the substrate. The torrential processes are manifested on steep slopes, and lacking in vegetation. The torrential formation is favored by abundant precipitation, from the spring months, especially from May to June, which, together with the melting of snow causes the accumulation of water in the receiving basins, the erosion of soils and the eluvio-diluvial deposits, their transportation, and the deposition in the form of dejection cones (Demeter, 2006). This way, the torrent reception basins are regressing towards the interfluves, and they also affect the grassy surfaces so that they are produced, and the detachment of the material from the bunch of grooves, already fixed. On the sloping cliffs, made up of poorly erosion-friendly slopes, water is formed on the slopes, gullies, ravines and dunes that swiftly reach, touch to the mother rock and then spread through linear erosion processes. The erosion and torrential accumulation processes are of a temporary nature with maximum intensity when maximum leakage is due to snow melting and torrential rains.

Processes of pluvial erosion

The precipitation falls in large quantities and therefore acts on the relief, by surface scrubbing, flow, and soil erosion. The result of this form of erosion is observed by non-irrigated terrain, eluvial and adobe soil deposits and affected by gelivation. These processes precede the torrential erosion and can also be triggered by intensive grazing, sheep circulation or the removal of juniper trees for the extension of pastures and meadows (Berca, 2008).

Denudational processes

In the rainy periods conditions is observed that lands most exposed to degradations through mass movement processes are found in the area of roads builded on diluavial slopes. The breaking of natural balance of the cliff of those slopes in conditions of some thick diluvial coverlet (areas along the Poiana Teiului-Bicaz, Poiana Teiului-Pipirig, Borca-Mălini roads; some forestry road: on the upper valley of Hangu river, area of Bucșoaia village) created the most favorable places of slides reactivations. It is necessary to consider that one of the slopes feature is the big thickness and big discontinuity of their spreading on the slopes (Buloiu, 1953; Buloiu and Ionescu, 1986; Grimm and Montanerlla, 2002; Luca and Oncia, 2000, Montgomery, 2007; Moțoc et al., 1975). The old diluavial mass, even when we can not talk about the slides reactivation, is into a "hidden" dynamics, in the creep phenomen: stable slides are potential areas of some ample processes. The flow varied during the time both in intensity as well as erosion regime and accumulation. Up to historic times, which also mark the beginning of the

grubs, is more accentuated the chemical erosion, while, after man intervention through grub, the mecanichal erosnion became dominant. The landslides in the area of Lake Izvorul Muntelui are favored by the lithological composition, in particular by the presence of the Cretaceous greyish flysch and the Cretaceous argillaceous specific to Hangu strata. The landslides are manifested both by primary displacements of deluvial material as well as by the reactivation of some older landslides. The localities frequently affected by landslides are: Poiana Teiului, Hangu, Bicaz, where hundreds of landslides have been identified. Areas affected by landslides meet along the Bistrita Valley, but also on the slopes of the Stânisoarei Mountains, where the deluvials can reach up to 20 m thick, especially in the Vârlan, Huidumani, Grozăveşti and Rugineşti basin rivers. The landslides in the area can be grouped into two morphological types: simple and complex. Simple landslides have sculptural shapes but also sliding shapes such as cornices, steeples, diluvia, but also sloping slopes with a U-shaped profile with accumulation microrelief on the bottom of the valley and with drainage channels at the sides of the contact with the base of the slopes. In the hydrographic basin of Lake Izvorul Muntelui there are processes of land degradation: gravitational (landslides, collapses, solifluxions) but also denudational (ravens, gullies, torrents). The landslides have the highest frequency due to the petrographic composition of theflysch from clays, marches, marno-clay shale, advanced plasticity rock in contact with water (Stănescu et al., 1980). Gravitational processes are still present upstream of Poiana Teiului and continue up to Izvorul Muntelui, being easily visible on the left slope of the Bistrita valley. Torrents also present on the steep slopes are activated by torrential rains or the sudden melting of snow and develop a specific erosion due to the reduced hardness of the rocks and the lack of forest vegetation (Barbu et al., 1981). Slopes with lower inclinations are affected by processes of solifluxion and pluviodenudation, processes that can be observed in the valleys: Bistricioarei, Schitului and Jgheabuluui. In Poiana Teiului, 975 landslides were identified, 160 of which affected the dwellings. Other localities currently affected by landslides are: Bicaz, Păstrăveni, Făuneni, Hangu and Cuejdel, situated on the slopes limiting DN 15. The commune of Hangu has an intensely affected area of denudational processes and landslides that affect both the road and the protective works of DN 15 as well as the civil and agricultural fields. In this area, the slides are activated and reactivated also due to the reception basins of the streams: Vârlam, Buba, Buti, Huidumani and Grozăveşti. In 2005 there was a landslide on an old deluvium, which led to a road squeeze on a length of 80 m, accompanied by a fracture of the carriageway. In the same year in the reception basin of the Grozăveşti brook a secondary runway was set in motion, causing the road to be dilated, due to the lack of measures to stabilize the talweg of the torrent as well as the absence of consolidation works of the slopes. The stability of the DN 15 road was affected by valley landslides in the area of Grozăveşti, where mounds and lenses belonging to some 3-8 m separations affected the stability of the road and was located on both sides of it. The Huidumani Brook has a hydrographic basin representative of denudational processes (Martelloni et al., 2012) in the area of different ages, predominantly in the mass of the Buti stream crossing the road to 12 m below the road surface through a concrete tunnel, thanks to which the phenomenon of the slope of the road is 50 m high with 0.7 m vertically. The traffic on DN 15 is blocked due to slippage and muddy flowing from the deluvium belonging to the Buba brook, which has developed a sliding valley below Bubei's edge. Since 2011, drainage, slope consolidation works have been carried out to stabilize and reduce the effects of geomorphological processes without being sufficient. The degradation of the lands in the hydrographic basin of Lake Izvorul Muntelui is manifested both on the slopes' litology, by the gravitational geomorphological processes, of which the landslides prevail, but also by denudational mechanical processes such as: gullies, ravens, torrents. The mechanical processes can also affect the soil in the studied area through deep-seated transport and deposition erosion, which can continue until the complete removal of the soil layer. In the studied area prevails the slopes, with average inclinations of 15-30 degrees, that is why the lands affected by landslides and drainages represent 12% of the surface of the basin. The lands

afforested with soils of the brown-ferluvial type, brown-acid type, podzolic representing 56% of the surface of the basin are not affected by erosion. The soils affected by erosion under the pastures and meadows are part of the category of brown-acid soils, brown eumezobasic and lithosols as well as brown-lucius soils, representing about 21% of the studied area. The smallest weights belong to the soils with moderate erosion, in the category of brown luvic and brown eumezobazic soils, which represent 6% of the studied area, while only 5% is the weight of soils with strong erosion of brown eumezobasic erodet soils and erodisols.

Impact of soil degradation on agriculture

In the basin of the Izvorul Munte Lake, the specific crop is that of the potato expanded on more than half of the arable land, followed by: corn and vegetable crops in the river meadows. In farming practices a significant share, however it has the animal husbandry based on natural pastures and meadows. Sheep are raised in transhumance mode, bovine and poultry, with the highest frequency of over 60 %. To increase agricultural yield over time, people have grazed lands in slopes and used poor farming practices. A consequence of these phenomena is the washing and transport of soil from sloping lands not covered with vegetation in the Bistriţa waters and its affluences, especially during the winter. The erosion of the soil is manifested in parallel with the phenomenon of clogging of the rivers and, implicitly, of the mountain spring and is characterized by: the emergence of differentiated ditches according to dimensions, in gullies and ravines, which determines the reduction of the soil productivity. When chemical fertilizers or pesticides have been used, water pollution on the slope leads to pollution of surface and underground waters, accompanied by the loss of nutrients and soil organic matter (Bechet and Neagu, 1975; Herman, 2009; Bully and Stănescu, 1998).

POLLUTION OF SOIL WITH PESTICIDES AND CHEMICAL FERTILIZERS

Pesticides are used to prevent and combat insects, rodents or other pests in agriculture and forestry. In the basin of Lake Izvorul Muntelui, these are used both in deciduous and coniferous forests, as well as on agricultural cultivated surfaces with corn and potato. Most commonly used are those in the orogan-chlorinated category with high persistence. Their use is necessary because they increase potato production by more than 50% and in the absence of pesticides that combat the Colorado and hand-beetle, production could drop by 70% in potatoes and by 50% in maize (Dumitrescu and Sarbu, 1979). Although necessary pesticides act on microorganisms in the soil, it influences biochemical processes in the soil and generally the whole edaphic system. The mode of pesticide accumulation in the soil is done in three ways: by treating the aerial parts of the plants, which are washed by rainfall, they then reach the soil by incorporating plant and animal residues containing pesticides into the soil or air transport (Florea, 2003; Quido, 1974; Surdeanu, 1998). Pesticides persist for many years in the soil, where they can be displaced by mass or solution transport, and chemical reactions that occur between pesticides and organic or mineral compounds can decompose. There are also types of pesticides resistant to degradation that have long-term effects, also called pesticide residues. After 1990 in the Basin of Izvorul Munteului lake began to be introduced pesticides that degrade faster, an example being organo-phosphorus insecticides. In the basin of Lake Izvorul Muntelui, phosphorus deficiency occurs in the colder and drier primes affecting the production of potato and corn. Phosphorus originates naturally from the parental soil on which the soil was formed, but on the slopes of Ceahlău, Bistriţa and Stănişoara, the soils under the meadows, and under the forest plantations, exhibit at a depth of 60-80 m a layer with a content low in phosphorus, while in the outlying areas of the localities, only 1% of the phosphorus-containing soil can be easily accessed to crop plants within a year. Potassium-based fertilizers are necessary for plants because the insufficiency of this element leads to the withering of plants, the decrease in their resistance or the appearance of humorous

necrotic spots on the leaves. In the area of Izvorul Muntelui Lake, a high potassium content of 4 grams, potassium k/100 grams of soil was found in clay soils and a much lower content of less than 1 gram / 100 grams of soil in more developed soils, affected by clay-altering processes. Due to contamination with fertilizers or pesticides, soils and vegetation cause a high degree of toxicity both on plant organisms and on animals, and especially on humans. Due to the cliff of the relief, fertilizers and pesticides can also reach the flowing waters in many localities as sources of drinking water (Neamţu, 1996).

Following the ingestion of pesticides, their metabolic reaction in the human body consists in the functional disruption of several immune, nervous, endocrine, respiratory, cardiovascular, renal and reproductive systems. The exposure to pesticides and their ingestion may also cause chronic diseases such as Parkinsonism, cancer, alzheimer, diabetes, cardiovascular and renal diseases (Parichi, 2007).

REMEDIAL MEASURES

In order to reduce soil erosion, it is advisable to permanently cover the cultivated soils on slopes with large cliffs around the Izvorul Muntelui Lake, as well as the afforestation of slopes with long cliffs or the lands situated along valleys and drainage channels (Traci and Corbu, 1966). In protected areas where no afforestation can be achieved, may be used protected crops, consisting of: shrubs, grass or hedges (Dârja, 2000). The effects of pesticides and fertilizers can be diminished and combated by identifying areas affected by pollution, their effects on vegetation, fauna, soils and human health. If excess amounts of fertilizers and pesticides are identified in water or soil, it is advisable to interrupt their use and to decontaminate the entire contaminated area. Another method is to change the agricultural practices by using compost, an ecological element that replaces chemical fertilizers, and the use of trapping crops to attract pests to abandon pesticide use. By these measures, the agriculture in the Izvorul Muntelui lake area gets ecological valences, and the soil erosion forms are net-diminished.

RESULTS

The types of soils identified in the Lake Izvorul Muntelui area are: Differentiated in altitude, ranging from lakes to peaks, three complexes: the complex at the base of the slopes, includes crusty soils through landslides, raw and young soils, and brown-acid soils. The soils on the slopes at low altitudes are raw-brown, young-brown out of flysch, brown and yellowish-brown, brown-grained, brown and brown-polysolite, while the soils complex on the slopes at high altitudes include brown-acide grained soils, brown soils and yellowish-brown acide, brownish-humid frained soils, acidic-podzolic brown soils, grained podsols. The use of lands in the studied area is differentiated at altitude, so at low altitudes the potato and corn cultivation is practiced, there are also lands from the localities or under roads, railways, hydrotechnical constructions, along with other vegetables at medium altitudes on the slopes the land has a forest destination, but also natural pastures and meadows, and at higher altitudes there are areas of forests, conifers and areas declared as natural reserves (Secu, Ceahlău). The erosion of the soil in the studied area is due to mechanical geomorphological processes, affecting about 44% of the surface of the hydrographic basin. Poor erosion affects the acid soils, lithosols, and brown-luvic soils, located under grassland and meadows, representing about 21% of the studied area. Soils with moderate erosion in the brown-eumezobazic and brown-luvic category represent 6% of the analyzed area, and the rest is represented by soils with strong erosion of type of eroded brown eumezobazic and erodisols.

CONCLUSIONS

The soils in the lake basin of Izvorul Muntelui have various types of evolution, properties and a geographic distribution correlated with the specificity of the Carpathian Flysch. In the studied area there were identified 7 types of soils with different weights belonging to the classes:

cambisols (brown-acid soils, protisols (lithosol), histisols (histosol), chernisols (rendzine). The most common soil type is brown-eumezobazic soil, spread over 37% of the analized area. The texture of the soil is predominantly sandy-clayey and loam-clay. From the hypsometric analysis, 4 distinct steps of relief can be identified, corresponding to 4 steps of vegetation floors belonging to the beech forests, mixed beech and coniferous, coniferous and a subalpine floor. The erosion values in the studied area range from 0 to over 8 tons per hectare per year and from the correlation of erosion susceptibility data bases, there are no eroded lands or with very high vulnerability to erosion. Of the technical and editorial factors influencing the agricultural production capacity, soil is the most important component. The physical and chemical properties of the soil that directly affect the growth of plants are gleizing, alkalizing, texture, permeability and humus content. The main forms of soil degradation in the studied area are: determined by pluvio- denudational and gravitational processes. Some of them accelerated by anthropogenic intervention, manifested by deforestation, improper farming practices or chemisations. In order to practice a sustainable agriculture and to reduce soil erosion, remedial measures can be taken to modify agricultural practices and to permanently cover the cultivated soils with vegetation.

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