ECOPEDOLOGICAL PARAMATERS USED IN THE QUALITATIVE EVALUATION OF THE LANDS OF REMETEA MARE

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Abstract *The importance of the approached topic derives from the fact that the land properties are extremely differentiated in the territory, due to the variation of pedogenesis factors and conditions, as well as from the fact that in production system of plants, the productive potential of the soil and the judiciously applied humar labour are harmoniously combined. The aim of the research finds its origin in the current scientific and practical concerns of the accumulation of knowledge on pedological and agrochemical characteristics regarding the inventory, grading and classification of soil resources according to the ecological requirements of the main cultivated plants, in order to identify and develops an agronomically, ecologically and conservatively integrated management for the soil and the environment. The presented results are part of the program of doctoral studies and researches (28.09.2015-27.09.2018) having as theme "Research on the ecopedological bases of land productivity in the Lipova Hills and possible pressures on their quality". The approached issue refers to the lands of the territorial administrative unit (ATU) Remetea Mare with an area of 10125 ha, of which 8691 ha represents the agricultural land. The paper offers, through the presented material, basic knowledge and methodological elements for the evaluation and characterization of natural and anthropically induced resources, in the hope that the information obtained will arouse the interest of the decision maker so that in the near future agricultural research and practice, together with environmental protection, to make efforts for the development of interdisciplinary studies, not being able to talk about a healthy environment without a healthy soil.*

Keywords*: relief, hydrography and hydrology, climate, edaphic*

INTRODUCTION

The properties of the land are extremely differentiated in the territory, due to the variation of factors and conditions of pedogenesis, as well as the fact that in the production system of plants, both the productive potential of the soil as well as the judiciously applied human labor are harmoniously combined, thus having a *culturally and economically conditioned cultural productivity*, result of the contributions of the soil, of the cosmic-atmospheric factors, of the human activity through its investments in water and fertilizers, vitally integrated, by the plants, in the biomass production.

In this context, the purpose of the inquiry is to research the main geographical features of the area, soil resources, data on the nature and intensity of the limiting factors, and qualitative assessment of land.

The object of study is the lands of the territorial administrative unit (ATU) Remetea Mare.

In order to achieve the proposed goal, the following objective was established: identification and characterization from an ecopedological point of view of the soil and land units within the considered space: relief, hydrography and hydrology, climate, edaphic resources (pedodiversity), objectives that fall into current concerns of agricultural research and practice at international and national level aimed at studying the relationship between ecopedological conditions and agricultural land productivity.

MATERIALS and METHODS

The issue addreessed refers to an area of 9 468 ha, of which 8 691 ha are agricultural land (tab.1)

Table 1

The situation of the land fund in ATU **Remetea Mare**

Arable	Pasture	Meadows	Orchards	Total agr.	Forest	Water	Other categ.	Total
7.256,08	1.221,99	198,63	14,38	8691,08	906,51	203,45	323,70	10.124,74

***** pedological and agrochemical study elaborated in order to realize / update the national and county soil-land monitoring system for agriculture on the territory of Remetea Mare commune, 2005

The object of study is the agricultural lands with an area of 9691 ha, respectively the qualitative assessment of soil and land resources in terms of natural environmental factors, changes, nature and intensity of manifestation of natural and anthropogenic risk factors, together forming units of homogeneous ecological territory (TEO), with a specific vocation and different technological requirements.

The research of the ecopedological conditions, the ordering and the data processing is based on the "Methodology of elaboration of pedological studies" (vol I, II, III), elaborated by I.C.P.A Bucharest in 1987 and the Romanian Soil Taxonomy System (SRTS-2003, respectively 2012).

Results

Located in the center of Timiş County, on DN 6, Remetea Mare locality, the residence of the commune of the same name, is at a distance of 12.3 km from Timişoara municipality and 47.7 km from Lugoj municipality. Remetea Mare commune covers an area of 9468 ha, of which 8691 ha represents agricultural land.

From a geomorphological point of view, the researched perimeter is part of the great physical-geographical unit "Banato-Crişană" (Geography of Romania, vol. I, chapter 10, I. BERINDEI, E. NEDELCU, 1983).

This is one of the three pericarp units being located on the western side of the Western Carpathians and comprises distinct subunits, but closely related to each other by the genesis, evolution and use of the territory:

- Banato-Crişene hills
- Banato-Crişana Plain:

The Banato-Crişene Hills or the western Piedmont hills (Romanian Hills and Plains chap. III, Vintilă Mihăilescu, 1966) run on the outer side of the Western Carpathians as an intermediate and almost continuous relief step between them and the neighboring plain. The geographical differentiations from north to south allow the individualization of several subunits, of which in this paper the Lipova Hills are of interest.

Situated between the valleys of Mureş to the north, the valleys of Bega to the south and Beregsăului to the west, the Lipovei Hills are distinguished by the appearance of a well-preserved Piedmontese paradise, represented by a succession of slightly sloping steps around a central plateau (N. ROŞU, Physical Geography of Romania , 1973).

The hilly sector (southern extremity of the Lipova hills), occupies the part located NE of the village of Ianova, in the form of a succession of peaks and slopes that sometimes fall in steps to meadows and erosion valleys, which reach widths between 500-600 m.

The altitude of the hills is between 150-200 m;

The peaks are generally long, wavy, having the shape of slightly vaulted spines, with variable widths, from a few tens of meters to 300 - 400 m. They are slightly inclined towards the periphery, connecting in 2-3 levels with the pre-hilly area.

The slopes are presented with a great diversity of shapes and expositions depending on the orientation of the erosion valleys. Their length varies from a few tens of meters to a few hundred meters (in horizontal projection). The slope varies from 3-5% to 25% and quite often over 25%.

As forms of slopes, the most common are stepped (sliding pseudoterases, straight rectilinear slopes, concave or convex slopes, as well as those in sliding amphitheaters, especially in the valley formation basins.

The sliding profile is the result of landslides, today relatively stabilized (locally with reactivation zones).

Landslides have an important role in the modeling of the relief and in the creation of micro-relief forms. Erosion in the ravine surface also participates in this action, having various manifestations depending on the nature of the substrate, the precipitation regime and the diversity of the use of the slopes.

As forms of microrelief on the slopes we meet the micro-relief of deep erosion, streams, gorges and ravines. The most characteristic, however, is the micro-relief due to landslides in which there is no lack of soils with excess moisture due to coastal springs and mica lakes.

Intercollinarian valleys have widths ranging from a few tens of meters to 180-450 m (microluns).

The direction of flow is generally from north to south, except for Gherteamoş, which flows between Stanciova and Herneacova from east to west. These valleys have a torrential character and function as a water evacuation system during periods of heavy rainfall and melting snow.

The torrential character of the valleys and the frequency of the ravines (consolidated or unconsolidated) constitute together with the diversity of the rocks the increasing complexity of the chaotic microrelief landscape.

In the narrow sections of the valleys, the washed materials from the slopes are deposited at the bottom of the slope. The masses of earth that enter the hydrographic network constitute a very important source of alluvium which in a slightly lowered and less inclined relief unit are selectively deposited (meadows and micromeadows).

Within this step we meet the meadows of Băcin and Gherteamoş streams.

Gherteamoş meadow stretches on approx. 10 km, with different extensions from widths of 350-450 m to widths of approx. 1000 m, following that in the Remetea Mare area to be gradually lost in the subsidence and digression plain of Bega.

Banato-Crisana Plain

It is a continuation to the west of the Banato-Crişene Hills at the edge of the great Pannonian Depression and occupies most of the territory.

Within it two subunits are distinguished:

- the high plain
- the low plain

The high Plain occupies the most turbulent part of the sub-hilly plain as part of the eastern extremity of the Vinga Plain, with two altitudinal steps located, first, west of Ianova, between 120-150 m and the second, south of Ianova, between 105 -120 m being fragmented by a network of generally divergent valleys.

It penetrates inside the gulf depressions in the form of narrow terraces, in the northern part which gradually widen to the south, gaining maximum extension in the sector of the Banat Plain Hills (Vingăi Plain, VINTILĂ MIHĂILESCU, 1966).

Approximately 24.27% of the researched perimeter is located in this sector of the high plain, which makes the transition between the Piedmont hills and the low plain, being represented by the last branch of the Vinga Plain, its southern extremity which rests like a spur on the right bank of Bega and the Timiș - Bega interfluve plain.

The relief forms created here in the hydrographic network are represented by wide and generally flat interfluves, with microdepression forms in their central part or the source of some streams bordered by slopes with different slopes from 2.1 - 5% to 15 - 18% or even bigger.

The profile of the slopes is generally straight, with mixed forms rarely occurring.

The valleys that descend from the hills of Lipova, reached in this sector, orient their course to the southeast. Their course gradually widens and loses depth as it approaches the low plain (being frequently exposed to floods). Before leaving this sector, they reorient their course to the southwest.

The transition from the high plain to the low plain is made through slopes with slopes between 8-15%.

The low plain extended inside the Piedmont plain occupies the stage of altitudes between 80 - 100 m, superimposed on the Bega-Timiș interfluve, having a meadow character, sprinkled with numerous abandoned meanders, with swampy depression forms and ridges.

The relief is characterized by a wide development of the meadows of the main rivers Bega and Gherteamoșul, but especially Bega - Timiș, as well as by a great non-uniformity, both of the relief with numerous influences, meanders and swamps as well as of the parental materials, fact for which the first works of regularization, sewerage, damming and drainage were started in the 18th century.

It knows the largest extension in the interfluve Bega (left bank) - Timiș (right bank), area where the general direction of the relief forms is almost parallel to the NE - SW direction with a slight inclination, on the line Bazoșu Nou and Bucovăț, towards S towards Timiș and towards N towards Bega.

The ridges, from place to place, have slightly more accentuated elevations in the form of mounds, mostly obvious anthropogenic influences.

Thus in this plain, for the most part a recent plain, although at first sight it appears as a fairly flat surface, if carefully researched, however, it is found that it has many unevenness represented mainly by deserted meanders, micro-depressions and ridges (consisting of coarser materials). This is largely due to the uneven deposits of alluvial materials during the great floods caused in turn by Timiș and Bega, before regularization, sewerage and damming, as well as subsequent settlements.

Due to the varied micro-relief, the surface of the plain is presented with numerous puddles in the spring after the snow melts or in the periods with heavy rains, puddles that disappear only by the evaporation of the water. Between the Bega canal (right bank) and the high plain, the terrain is more fragmented and the puddles more frequent.

Within the river basins of the rivers Timiș and Bega, the hydrographic network is represented by their courses, as well as of a secondary network, tributary exclusively to Bega, under the aspect of a series of valleys, with narrow micro-meadows and temporary watercourses. they originate in the Lipovei Hills or even in the pre-hilly Plain of Beregsău, the cadastral territory Remetea Mare being part of the group of south-western hydrographic systems, the Timiș-Bega river basin.

The Timiș River delimits in the southern part for about 2 km the perimeter investigated by the territory of Chevereșu Mare commune.

Timiș has a permanent course with large level variations but with a small drainage slope of 0.2 - 0.6%, which explains its rather meandering course which is currently dammed.

Through its action as a water table feeder, Timiş has a significant role in the evolution of soils in this area.

The Bega River divides the territory in two, to the south Bazoşu Nou and Bucovăţul, to the north Remetea Mare and Ianova.

Bega with an almost constant and adjustable flow, is channeled and dammed.

The Băcin brook collects the waters from the northwestern part of the researched perimeter.

Gherteamoş brook, crosses the researched perimeter from the northeast (it has its springs in Dealul Hatului) to the west until close to Ianova, after which it orients your course to the southwest. In its course it collects the waters of the erosion valleys and of the torrential elements from the piedmont area of the researched perimeter, arranged in front of it in the form of a fan and flows into Bega, on its course being made an accumulation lake, with a water gloss of 10 - 15 ha, which is an attractive area for recreational fishing enthusiasts.

The Iarcos brook (an old arm of Timiş) crosses the Bega - Timiş interfluve from east to west, currently regularized, but before that it had a regime specific to the subsidence area with frequent digressions and deletions.

The climate, moderate temperate-continental, can be characterized as a plain climate, at the limit of interference between the western subtype with oceanic nuances and the Banat subtype with sub-Mediterranean nuances. The average annual temperature is 10.6 ° C, and the average annual rainfall is 631.0 mm (Timisoara station), with the observation that if in the summer there is a deficit of rainfall, in the rest of the year there are surpluses of water both in the soil and on its surface, with negative influences on the balanced development of agricultural crops.

The area of which the commune area is part is characterized by a humid forest-steppe vegetation. The forests occupy small areas, among them the one from Bazoş, a dendrological scientific reservation, with an area of 60 ha, which preserves indigenous and exotic forest species from the North American and Asian flora, the collection comprising a number of 900 taxa. The main natural woody species are represented by Quercus pedunculiflora (dark oak) and Q. petarea (holm oak), Acer campestre (jugastra), Fraxinus excelsior (ash), Ulmus spp. (Elm), the sub-tree being mainly represented by Cornus sanguinea (blood), Crataegus monogyna (hawthorn), Prunus spinosa (pigeon) and Rosa canina (rosehip).

Along the rivers, species such as: Salix alba, S. fragilis (willow), Populus alba and P. nigra (black and white poplar) are dominant.

Usually cultivated trees are plum, apple, cherry, quince, hair, and along the roads, mulberry and acacia.

Spontaneous grassy vegetation is generally represented by species such as Gypsophila muralis (squid), Setaria viridis (mohor), Cynodon dactylon (thick pear), Cirsium arvense (poplar), Papaver rhoeas (red poppy), Chenopodium album (white spinach). , Erigeron canadensis (butterweed), Centaurea cyanus (cornflower), Polygonum aviculare (knotgrass) and P. hidropiper (pond pepper), Convolvulus arvensis (field bindweed), Trifolium arvense, T. repens and T. hibrydum (clover), Equisetum arvense (field horsetail), Symphytum officinale (comfrey), Plantago lanceolata (plantain), Ranunculus spp. (rooster's foot), Mentha spp. (ism).

In areas with excess humidity there are hygrophilous species such as Carex spp. (Sedge), Juncus spp. (Rust), Rumex crispus (sorrel), Ranunculus spp.

Thus in close correlation with the variety of geomorphological factors that determine the existence of diversified relief units, of the geolithological ones that led to a great diversity of parental materials (even if it is a small area, only 10,125 ha.) and Climate or hydrological ones,

as well as various anthropogenic interventions, resulted in a large population of soils with specific characteristics (related or totally different from each other) in continuous evolution.
According to the Romanian Soil Taxonomy System (SRTS 2012) within the researched area were identified 6 soil classes, 9 types, 30 subtypes, over 100 varieties and numerous detailed units, which differ distinctly by their properties, productive capacity and measures to maintain and increase fertility, so the soil map includes the following types and subtypes of soil, with areas representing the area of 8691 ha, agricultural land, within the researched area:

1. *Aluviosoils*: 1-14, eutric (eu), entice (en), gleice (gc), psamice-gleice (ps-gc), 370,10 ha, 4,26%;

2. *Eutricambosoils*: 15-43, typical(ti), gleice (gc), stagnic (st), molice-vertice (mo-vs), pelic-gleice (pe-gc), vertic-gleice (vs-gc), 2406,79 ha, 27,69%;

3. *Preluvosoils*: 44-85, stagnic (st), molic-stagnic (mo-st), molic-vertice (mo-vs), red-vertice (rs-vs), vertic-stagnic (vs-st), 3089,90 ha, 35,55%;

4. *Luvosoils*: 86-89, stagnic (st), stagnic-molice (st-mo), 360,44 ha, 4,15%;

5. *Pelosoils*: 90-104, typical(ti), gleice (gc), stagnic (st), gleice-stagnic (gc-st), 1244,89 ha, 14,32%;

6. *Vertosoils*: 105-115, gleice (gc), brunice-alkalice (br-ac), gleice-stagnice (gc-st), gleice-sodice (gc-so), 454,27 ha, 5,22%;

7. *Gleiosoils*: 116-119, pelices (pe), 372,83 ha, 4,28%;

8. *Stagnosoils*: 120-126, vertice (vs), vertice-gleice (vs-gc), 346,42 ha, 3,98%;

9.*Antrosoils* : 127, erodic-argic (er-ar), 47,43 ha, 0,55%.

The vegetal production being realized in the most diverse conditions: natural ecosystems (without or with very few anthropic interventions), or agroecosystems, extensive or intensive (with the direct or indirect involvement of the state) imposes with an urgent necessity the deepest knowledge of all the determinants ecological, fact for which each of the identified field units (TEO) were characterized according to the current Methodology for Elaboration of Pedological Studies using as rating indicators, the indicator: 3C - average annual temperature - corrected values indicator; 4C - average annual precipitation - corrected values; indicator 14 - glaze, indicator 15 - pseudogleization (stagnation); indicator 16 or 17 - salinization or alkalization (sodization), indicator 23A - texture in Ap or the first 20 cm; indicator 29 - pollution; indicator 33 - slope; indicator 38 - landslides; indicator 39 - depth of groundwater; indicator 40 - floodability; indicator 44 - total porosity in the restrictive horizon; indicator 61 - total CaCO3 content per 0-50 cm; indicator 69 - degree of saturation in bases in Aβ or 0-20 cm; indicator 133 - useful edaphic volume; indicator 144 - humus reserve in the layer 0-50 cm; indicator 181 - excess of stagnant (surface) humidity; indicator 271 - land improvement arrangements.

Thus, from the multitude of environmental conditions that characterize each unit of homogeneous ecological territory (TEO), delimited within the pedological study, or chosen those considered more important, easier and more precisely measurable, which are usually found in pedological study works (performed by territorial OSPAs, starting with 1987 under the methodological guidance of ICPA Bucharest), called rating indicators.

Each of the above indicators, with the exception of indicator 69, which intervenes indirectly, participates in establishing the rating note by a coefficient that has values between 1 (one) and 0 (zero) depending on the intensity of the limiting factor (1 = very favorable, 0 = unfavorable).

For each indicator, for each use or culture there are tables containing the respective coefficients (both for natural and potentiated conditions, according to annexes 3-2 to 3-29, M.E.S.P., 1987).

For a good part of the indicators, there is only one table that includes the specific coefficients, and for the other part, two or more series of coefficients are provided depending on the interdependence links that are established between some factors.

Depending on the values of these indicators and the specific behavior, for each of the main categories of use (PS-pastures, FN-hayfields, MR-mar, PR -pair, PN-plum, CV cherry-sour cherry, PC-peach VV-vineyard wine , VM - live mass AR-Arable), as well as for the main cultivated species (GR-wheat, OR-barley, PB-corn, FS- sunflower, CT- potato, SF- sugar beet, SO-soybean, MF- peas / beans), IF-flax plant, TR - clover IU – flax oil, CN - hemp, LG - vegetables were obtained rating notes based on which the lands were classified in quality classes for the main categories of use, for ARABIL being those in table 2.

Table 2

Classification of lands in quality classes (fertility) for the category of use ARABLE

Class I		Class II		Clasa III		Clasa IV		Clasa V	
Ha	%	Ha	%	Ha	%	Ha	%	Ha	%
164,27	1,89	2881,95	33,16	3727,22	42,89	1249,94	14,38	667,70	7,68

Soil, as a basic component of terrestrial ecosystems has a series of defined and studied properties (according to the methodology) that have served and serve both to specify the entities of genetic and parametric classification and to study the influence it exerts on plant growth and fruiting. cultivated and spontaneous plants, the credit rating operation highlighting a number of limiting factors.

Among the fundamental properties of the soil that influence the growth and fruiting of plants in direct relation to the manifestation and have a relatively more determinable function on the quality of soils in this area are: soil reaction (with moderate limitations on 7.3% of the surface, reduced 35.9%), humus reserve (moderate 18.2%, low 36.9%), compactness (severe 79.5%, moderate 20.5%), fine texture (reduced 62.2%), soil slope (moderate 4.1%, reduced 9.7%), excess groundwater (very severe 10.3%, severe 8.8%, moderate 3.3%, low 9.2%) and excess surface moisture (severe 20.1%, moderate 13.2%, reduced 35.6%), excess moisture due to flooding (very severe limitations due to flooding 4.31%).

Compared to the mentioned restrictive elements, measures of periodic fine amendment with calcium, deep loosening, ameliorating fertilizations, plowing on the contour line (in the area of **Lipovei Hills**) and hydro-amelioration works of drainage and evacuation of excess water are required (groundwater and precipitation).

In order to maintain the ecological balance, in addition to the mentioned works, special attention will have to be paid to the restoration and modernization of the existing anti-erosion management works and their extension until ensuring the protection on the entire surface with risk of erosion.

Conclusions

The knowledge of the natural conditions and especially of the ecological potential of the lands (defined according to M.E.S.P.-ICPA Bucharest, 1987) for the main cultures presents a special importance in the zoning works, fact that justifies the necessity and actuality of the mapping, credit rating and land evaluation activity.

In this paper, after a detailed presentation of the natural environment (relief, hydrography-climate, vegetation, anthropogenic influences, soils), based on data extracted from the pedological and agrochemical study developed to achieve / update the national and county soil monitoring system - land for agriculture in the commune of Remetea Mare, 2005 (located in the OSPA archive in Timişoara), as well as the observations recently collected from the land, in order to explain the phenomena that take place in the soil to man in his activity of agricultural

producer were followed two distinct sides of the production activity, the credit rating and the analysis of the limiting and restrictive factors of the productive capacity of the agricultural lands.

In the conditions of a good natural ecological potential, the quality situation of the soils is below the expectations as most of them are affected by the existence of one or more limiting or restrictive factors, the area being subjected, from the first beginnings, to more intense anthropogenic interventions than in other territories. from the area of Timiş County.

The rating notes (presented and interpreted) indicate an average potential in the current state of soil exploitation and conservation, potential that can be improved given that some indicators such as reaction, humus reserve, porosity are relatively easily modifiable properties for the better, but no longer in the case of the application of some measures that widen their area of manifestation as well as of other properties of the environmental factors taken in the calculation of the rating notes.

Detailed knowledge of the factors that contribute to increasing or decreasing the production capacity of each part of the territory (according to MESP, 1987) can provide for the decision maker (Government, Local Public Administration) an effective tool for choosing working procedures that favor a use efficient use of land resources.

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