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CHARACTERIZATION OF AGRICULTURAL LAND IN ORDER TO ESTABLISH A WALNUT PLANTATION IN VOITEG, TIMIŞ COUNTY

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Abstract. *The location and definition in the terrestrial space of each part of land defined morphologically, genetically, altitudinal, etc. plays an important role in defining the conditions for plant growth and fruiting. This study includes an interpretation of the results of the analyses on the entire arable area (534.81 ha) data contained in the agrochemical sheets in the form of arithmetic mean values of the analyses of samples harvested in the field and respectively weighted means at the level of bodies as well as the division of the areas by interpretation limits. In general, the agrochemical plots overlap the cadastral ones. There are two cases when, due to essential differences between some agrochemical elements (fertilizer supply data), the division of two plots into two agrochemical plots was required. The lands on which the areas under study are located, respectively the two bodies, are located on soils that belong to the category of chernozems, phaeozems, preluvosoils and gleiosoils. As it results from the agrochemical sheets from the analyses of pH values encountered in the perimeter but also from the specialized literature, it is specified that the need for calcareous amendments on weakly acidic soils appears only in conditions in which the soils contain exchangeable forms of aluminum and manganese at toxic levels as well as in those in which the exchangeable forms of these elements can appear during the vegetation period of the crops. In the studied perimeters such environments are not encountered, consequently the application of calcareous amendments is not necessary.*

Keywords*: suitability, fertile soils, specific characteristics of the soil type*

INTRODUCTION

The high plain, is presented as a relatively uniform surface interrupted only here and there by narrow valleys. Also on this relatively uniform surface there are frequent ridges lacking natural drainage, where the water coming from precipitation pools during rainy periods (considering the clayey-clay texture prevalent in the area). The high plain was formed by the accumulative action of the Pogăniș which, when entering the plain, brought immense sediments which it deposited when flowing. The entire high plain can be classified as terrace formations. The lithological constitution of the plain is specific to the glacis. The deposits are crossed with an indefinite orientation.

The low plain is represented by the Timiș Plain, Jebel – Ciacova compartment. The entire area is drained by the tributaries of the Timiș River and represents one of the most recent lands removed from the influence of waters. Its juvenile character is given by the depressional areas of subsidence and the intense meandering of the valleys. The meandering of the rivers can be observed in the field through the numerous abandoned beds, meanders, and reluctances of the wandering of the Timiș River (Dead Timiș) or of other streams (RUSU ET AL., 2002).

The average altitude of the low plain is about 90 m. The different types and groups of genetic types of soils existing within the researched perimeter are the result of the actions in

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time and space of the complex of pedogenetic factors (underlying rock, relief, climate, vegetation, hydrography, hydrology, vegetation) to which are added the influences determined by human actions starting with the works of drainage and desiccation up to today's intensive agriculture (MIHUȚ ET AL., 2024; BĂLTEANU & BADEA, 2007; BLAGA ET AL., 1996).

Thus, in the low plain area in a climate with an average annual rainfall of 600 – 700 mm and an average annual temperature of 10 – 11ºC, a great diversity of soil types and subtypes was formed as a result of the differentiated action of the groundwater level on the profile of the microrelief and the parent rocks (MIRCOV ET AL., 2025; MHUT & NIȚĂ, 2014).

On the gravelly or flat forms on rocks rich in $CaCO_3$ with relatively good drainage, soils from the molisol class were formed.

On the depressional forms, under conditions of a strong excess of moisture of a phreatic nature, soils specific to the hydromorphic soil class were formed, and in the case of excess stagnant moisture, usually on fine parent rocks (clays), soils from the molisol class were formed, having a certain degree of pseudogleyization depending on the duration of water stagnation (ȚĂRĂU D., 2003; DRĂGAN I., 1990; IANOȘ, 1997, 1997, 1999).

In the high plain area, the diversity of soil types and subtypes is lower and the determining factor in this regard is the parent rock (ROGOBETE, 1993).

Thus, on loess or loessoid deposits, soils of the molisol class were formed, and on clays or clays, soils of the argillusol class (soils with an alluvial clay horizon) were usually formed. In this area, the groundwater being at greater depths (3–10) influences pedogenetic processes less or not at all.

MATERIAL AND METHODS

This paper has been prepared on the agricultural fields of Voiteg and aims to obtain a fund of agrochemical and pedological information on soil properties (morphological, physico-mechanical, hydrophysical and chemical) that to substantiate the most appropriate technological and scientific measures, specific to each part of the territory, ecologically distinct as well as data on the nature and intensity of possible limiting factors and degradation phenomena (FLOREA & MUNTEANU, 2012; MUNTEANU ET AL., 2014).

The soils identified within the perimeter are researched in relation to the natural or anthropogenic environmental factors that condition their existence together forming units of homogeneous ecological territory (E.O.T.) with specific pre-tabilities and favorable for different agricultural uses (a land may be favorable for certain crops but unfavorable for others), with different technological requirements.

The research was directed as follows: in the first phase, the data regarding the soil cover and the natural framework existing in the OSPA Timisoara archive were processed, namely:

-Pedological study for the grant of agricultural land scale 1:10000 Voiteg commune, Timis county, 1993

-Pedological study for qualitative cadastre of the Jebel communal territory, Timis county, scale 1:10000, 1982.

From a number of 4 (four) soil profiles, a number of 31 samples were collected in modified condition and a number of 56 (14 x 4) in natural settlement.

Within the OSPA Timisoara laboratory, all the analyzes were executed (ȚĂRĂU D., 2003).

The interpretation of the data, the characterization of the natural framework, the analysis of the limiting factors of agricultural production as well as the financing of agricultural

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lands, were carried out according to „Methodology of Development of Pedological Studies" (vol. I, II, III) and „The Romanian Soil Classification System" developed by I.C.P.A. Bucharest under the aegis of A.S.A.S. Bucharest in 1987 and 1980 respectively.

RESULTS AND DISCUSSIONS

Geomorphologically, the investigated perimeter is part of the great physical-geographical unit „Banato-Christian Plain" (BERINDEI & NEDELCU, 1983).

The plain of Banat, generally uniform in origin, was subdivided later, when, after the retreat of the waters of Lake Pannonic, the post-valachic orogenetic movements at the beginning of the Holocene determined a last local immersion in the area of the lower basin Bega – Timis.

It is represented within the perimeter in the form of two relief units:

- high plain – where the perimeter of Jebel commune is located
- low field – perimeter of Voiteg commune

The geology of the investigated perimeter is part of the great Pannonian Depression its eastern extremity, which was formed by the gradual clogging of the lake in the pleistocene – quaternary.

The basis of this depression is formed by a Carpathian foundation, made up of crystalline formations and sediments of paleozoic, mesozoic and paleogenic age over which were deposited tortonian, sarmatian and pliocene deposits (ȚĂRĂU D., 2003).

The studied perimeter belongs to the hydrographic basin of Timis. In the investigated territory, there were no permanent water courses.

In the high plain area there are frequent narrower or wider valleys that harbor non-permanent streams of water during rainy periods and snow melting. Also in the low plain area there are many abandoned meanders and depression areas that along with the high plain crotch play the role of collecting rainwater from the surrounding positive landforms.

Situated in the south-west of the country, the investigated territory is characterized by a moderate continental temperate climate, with shorter and milder winters, being frequently under the influence of cyclones and air masses in the seas: Mediterranean and Adriatic.

Multiannual average rainfall at the Timisoara station in the period 1783 – 1975 is 631 mm. In the period 1927 – 1999 the values of the annual averages have the following oscillations 407,2 mm (1983) and 908,1 mm (1970).

The relative humidity of the average monthly and annual air (%) after the Timisoara station (2010-2025) (MIHUȚ ET AL., 2024; MIRCOV ET AL., 2025).

The different types and groups of genetic types of soils existing within the investigated perimeter are the result of actions in time and space of the complex of pedogenetic factors (subicent rock, relief, climate, vegetation, hydrography, hydrology, vegetation) to which are added the influences determined by human actions starting with the draining and drainage works until today intensive agriculture.

The soils formed under these conditions are at a relatively recent stage of solidification due to the fact that they have been coming out of the waters for a short time. The process of solification is relatively recent and their direction of evolution is dictated to the greatest extent by the forms of microrelief they occupy and implicitly the level of groundwater on the profile, as well as the nature of parental rocks.

On the hail or flat forms on rocks rich in $CaCO_3$ with relatively good drainage were formed soils of the molisole class.

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On the depressive forms under the conditions of a strong humidity excess of a phreatic nature, soils specific to the hydromorphic soil class were formed, and in the case of stagnant humidity excess, usually on fine parental rocks (clays), soils of the molisole class were formed, having a certain degree of pseudoglization depending on the duration of water stagnation.

In the high plain area the diversity of soil types and subtypes is lower and the determining factor in this respect is the parental rock.

Thus loessuri or loessoid deposits were formed soils of the molisole class, and clay or clay soils were usually formed from clayuvisol class (soils with argilloyluvial horizon). In this area the groundwater being at higher depths (3 – 10) influences less or no pedogenetic processes.

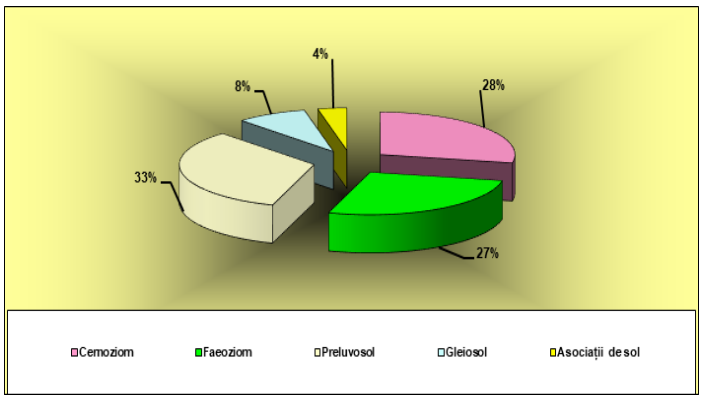

Figure 1. The dominant soil types in the investigated area

This study includes an interpretation of the analysis results over the entire arable area (534.81 ha) data included in the agrochemical records in the form of arithmetic average values of the field samples analysis and weighted average at body level and the division of the surfaces on interpretation limits.

Evolution of the reaction state of soils with the main fertilizing elements

The reaction of the soils on which these lands are located is weakly acidic in both bodies.

We notice a weak diversity of the values encountered in the agrochemical samples in all the plots taken in the study, but the arithmetic averages put them in the category of weak acid pH land between 5.81 – 6.80.

There is a relatively small difference between the two bodies in the sense that in the body from Jebel the soils appear somewhat more acidic.

The supply of phosphorus is somewhat more uneven on the whole can be considered as a mean about 70 ppm broken down by the two bodies the supply of P_2O_5 of the land falls into the middle category supplied the values being on the body Jebel 86,3 ppm, and on the body Voiteni 53,9 ppm.

Although there are higher values on Voiteni body diversity in the P_2O_5 supply state is higher, respectively medium values on 44.34 ha (16.85%), good supply on 19.57 ha (7.29%) and very good on about 199.56 ha (ie 75.86%) while Voiteni body only signals good supply on 252.74 ha (93.01%) and very good on 19.00 ha (6.99%).

From the analyses it follows that on an overwhelming surface (75.86% at least) were applied high doses of phosphorus fertilizers.

Potassium supply is very good and good in both bodies the average value per association is 262 ppm with relatively large differences between the two bodies, respectively 201 ppm (Jebel) and 321 ppm (Voiteni). The distribution by supply categories at Voiteni the entire area is very well supplied, and at Jebel about 219.38 ha (83.37%) are well supplied, respectively 43.74 ha (16.63%) very well supplied.

At Voiteni there are applications of mineral potassium fertilizers on some plots (see agrochemical indices).

As regards the supply of humus land, it is somewhat more diversified from weak to good to Voiteni with the predominance of well and medium-sized supplied areas.

In Jebel, 177.46 ha (85.41%) of the middle-stock areas predominate, while the well-stocked areas occupy about one third of the perimeter.

Nitrogen insurance calculated by the humus content and the saturation degree in the bases have the same alura as humus.

Recommendations on the application of fertilisers and amendments

As it results from the agrochemical records from the analyses of the pH values encountered in the perimeter, but also from the specialized literature, it is specified the need for calcareous amendments on the weak acid soils appears only in the conditions in which the soils contain changeable forms of aluminum and manganese at toxic levels, as well as in those in which the changeable forms of these elements may appear during the vegetation period of the crops.

In the studied perimeters do not meet such averages accordingly the application of calcareous amendments is not necessary.

Avoid the application of acidifying fertilizers (ammonium nitrate, preferring periodically nitrocalcar or urea, usually).

If ammonium nitrate is applied in the following year, it is recommended to apply nitrocalcar to buffer the eventual acidification. The use of urea is very effective if administered during vegetation, instead it may be toxic (for some species) if its administration was done in less than two weeks before sowing.

Supply by additional supply of P_2O_5 is particularly necessary on parcels: A 1037, A 1040, A 1967/1, A 2020.

As regards the potassium supply, it is good and very good and the K fertilisers will be used on a case-by-case basis depending on the expected yields and requirements of the plants. Prefer their management by scattering to the surface of the land.

Walnut in our country owns 3.1% of the total number of trees. The main crop area starts in the vineyards region and climbs up to the upper limit of beech forests. In northern Oltenia (Horezu, Tismana, Baia de Arama, Turnu Severin, Varciorova) the walnut tree finds exceptional conditions for culture.

As a crop plant, walnut is quite demanding of heat. Does not support large frosts and late frosts, walnut requesting sheltered exhibitions.

Large damage is recorded in walnut due to late spring frosts and broths (in May). Temperatures below $-1^{o}C$ destroy young fruits, leaves and shoots.

Walnut culture gives very good results in regions with 700 – 800 mm rainfall annually and with relative air humidity of 60 – 80% in the vegetation period.

Are favorable for walnut and areas with 600 – 700 mm during the period of vegation (western part of Transylvania). Walnut of fairly good results and in areas of silvostepa (500 – 600 mm) and satisfactory in steppe area (400 – 450 mm) when in the first 5-6 weeks after flowering fall heavy rains.

Walnut succeeds (but not as well) on a not too wide range of soils. It gives the best results on deep soils with a medium fertility, with good water retention capacity, neutral reaction (6.9 – 7.2), slightly acidic (pH 5.9 – 6.8) or weakly alkaline (pH 7.3 – 8.4), permeable basement well supplied in calcium and pedogenetic canvas under 3 – 3.5 m. When the water is closer to the surface (1.5 – 2.0), the walnuts develop well until they enter the fruit, after which the tops and branches of the skeleton dry. When the soil has an acid reaction the peel of the fruit remains soft, and at the alkaline reaction the walnut is exposed to chlorosis.

Compact, wet and cold soils, as well as those with a stony substrate (gross and marl) are not suitable for walnut culture.

Due to the climate, relief and soil conditions from Voiteg, walnut does not find very good vegetation conditions, thus not being recommended on these lands.

CONCLUSIONS

In the agrochemical study with elements of pedological characterization from Voiteg were approached two distinct components of agricultural research and production:

-agrochemical characterization of soils, including an analysis of the evolution of reaction and supply state with the main fertilizing elements

-assessment of the production capacity of land based on the credit notes, including the parameterization of agricultural land according to their agro-productive characteristics and the way in which man in his agricultural research and production can influence them.

The detailed knowledge of the productive and technological qualities of the favorable and restrictive or limiting factors of agricultural production, of each part of the territory, both in terms of their current manifestation aspect and in terms of the real possibilities of changing for the better of them, can be a valuable tool for the decision-maker for achieving the most appropriate practical measures in a rigorous dynamic correlated with the ecological demands of the environment.

In this respect, after a detailed presentation of the physical conditions – geographic (relief, lithology, hydrography, hydrology, climate, vegetation, anthropogenic influences) in order to explain the phenomena that take place in the soil and how they can be influenced by man, which can thus become a wise partner of nature, were approached the two components mentioned above.

Thus, the operation of boning and that of framing the land in favorability classes for the main species cultivated in the investigated space have highlighted a number of limiting factors that act on the productive capacity of the land such as: low porosity (respectively the degree of accentuated settlement), and sometimes excess moisture (phreatic and pluvial), etc.

Excess moisture (phreatic and pluvial) as a result of the water regime of the soil serves to separate the soil varieties, determining at the same time different favourites for certain cultivated and spontaneous plants, affecting about 51 ha, respectively 9.53% of the investigated perimeter and in close interdependence with the total porosity showing low values on 199.11 ha (37.24%) and very low on 335.70 ha (62.76%) are limiting factors of agricultural production.

Following the laboratory analyses, namely: soil reaction (pH), nitrogen, phosphorus and potassium content, it appears that the application of the amendments is not necessary, aiming only to eliminate excess moisture and reduce the degree of compaction through preventive works and combating them: channels, ditches, gutters, drains (vertical, horizontal), etc.

The application of this information and recommendations in their entirety can be expressed by saving material means and labor invested through greater production safety avoiding the degradation of agricultural land, and finally achieving an enlarged reproduction of soil fertility.

However, practical experience shows us that when the measures taken are not applied rigorously in their entirety, based on the recommendations stated on the basis of complex measures to dimension correctly and the negative consequences of human activity, the results can be costly.

The means of action of the specialist can therefore be of the most diverse: from simple or current cultural works to pedohydroammeliorative works or the use of superior biological materials, actions applied in the complex can lead to the increase of the production capacity of the land and to the improvement of the production quality.

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