THE SOIL SUITABILITY FOR ORCHARDS FROM CARANI LOCALITY, TIMIȘ COUNTY, ROMANIA

O. EREMI[2], F. MARIAN[2], A. NOZIM[1], A. OKROS[2]
[1]Tajik Agrarian University named after Sh. Shotemur, Republic of Tajikistan
[2]University of Agricultural Sciences and Veterinary Medicine"King Michel I of Romania" of Banat from Timisoara
Corresponding author: nnozim@gmail.ru

Abstract: *Agriculture has been a vital area of human activity since ancient times, a thing that can be observed even today, representing both the only source of food and an important supplier of raw materials for different industries. The importance of agriculture differs from country to country, but it continues to be the main economic branch in all nations, including the highly developed ones. In this paper we want to present the suitability level of the soils in Carani, for the establishment of a tree plantation in this area (Marin 2013, Astrid 2017). The suitability of the soils is checked for the following varieties of trees: apple (MR), pear (PR), plum (PR), plum (PR), cherry-cherry (CV), apricot (CS), peach (PC).((In order to determine this suitability, a series of soil types and subtypes were chosen, namely: typical endocalcaric preluvosoil (7.50 ha), typical preluvosoil (29.13 ha), stagnant preluvosoil (4.15 ha) and molic preluvosoil (6, 30 ha). Following the analysis performed on the characteristics of the soil they are distributed within one of the four classes of suitability (Florescu 2014). The bonitary marks offered to the soils being the main indicator for classifying them. The total area considered for this study is 47.08 ha. A number of recommendations will also be made regarding possible improving the suitability of the if that is possible (Mihut, 2018).*

Keywords*: tree plantation, soil, suitability, improvements*

INTRODUCTION

Agriculture is a specific human activity which aims to obtain food and raw materials needed in human diet and certain sectors of the economy. Following man's control over food production, agriculture is a fundamental social activity on which it depends to satisfy human vital requirements.

With the progressive passage in the last 10-15 millennia to agricultural practice (plant culture, animal domestication and livestock rearing), one of the deepest revolutions of humanity has been achieved.

The importance of agriculture is different from one country to another but, no matter the degree of importance granted, agriculture is and remains an important brick placed at the basis of human development and well-being of a society, which can be seen today (OKROS, 2016; OANCEA, 2012).

Orchards are one of the agricultural branches and one of the main sectors of horticultural production. The main rationale of tree culture is the use, under different forms, of fruit as essential components to ensure the balanced metabolic functions of the human body (DRAGOESCU, 2019).

The locality of Carani is part of the TAU Sânandrei. The Sânandrei TAU studied comprises two types of plains in the Western Plain, namely the high Piedmont plain of the sub hill glacis, namely the Vinga Plain, the low plain of subsidence and divagation, respectively the Beregsău Plain. Both plains are subdivisions of the Nordic Banat Plain located on the interfluve Mureș – Bega and fully belong to the hydrographic basin of Beregsău River and its tributaries (MIHUT, 2014; BERBECEAN, 2014).

The Vinga Plain is in the form of a 120-140 m altitude terraces, fragmented by a secondary erosion network, which gives the current aspect of this plain. The main forms of relief are represented by interfluves, slopes, and meadows generated by erosion valleys.

The Beregsău Plain is in the form of an alluvial plain which together with the Beregsăului meadow, fuse at its exit from the Piedmont Vinga Plain, forms an altitude of 110-120 m, with a general slope of 1-3%.

The two plains, Vinga and Beregsău, as a whole territory studied, is located in the Beregsău basin, which in its lower part, in the low plain, is located in a draining area with managed, diked watercourses.

From the point of view of vegetation, the studied territory is part of the silvo-steppe area, where, however, the grassy vegetation predominates in the wake of woody vegetation (DRAGOSLAV, 2016; NITA, 2018).

The soil cover in the studied territory is the result of the conjugated action in time and space of soil genesis factors, respectively, relief, hydrography, hydrology, climate, mother rock, vegetation, groundwater, and last but not least anthropogenic intervention through the hydro-ameliorative works, mechanisation, chemical treatment of parental material.

In this paper, the suitability characteristics for the establishment of a fruit plantation on four soles with varied surfaces is presented (NITA, 2007; BORCEAN, 2009).

The first sole has 7.80 ha, the second sole as 29.13 ha, the third one stretches over an area of 4.15 ha and the fourth comprises an area of 6.30 ha. All these plots total 47.08 ha on which this soil study is carried out. Soil suitability was studied for a number of seven species of trees, namely apple, pear, plum, cherry, sour cherry, apricot and peach (MARIN, 2017)

Following the analyses of each plot, a score was awarded to distinguish the degree of soil suitability. Following the scores obtained, soils will be introduced into one of the four classes of suitability. A number of soil processing recommendations have also been made to improve soul suitability (DICU, 2016; DUMA, 2014).

MATERIAL AND METHODS

Determination of physical properties.

Soil texture- through the Cernikova method (the principle underlying the pipetting method is the sedimentation of particles into a liquid at different rates, depending on their size, according to Stokes' law).

The determination of the granulometric fractions in weight percentages was done using the following formulas:

Coarse sand (2 - 0.2 mm in diameter) % = $\frac{m_1 \ x100}{m_0 xF}$

Fine sand (0.2-0.02 mm in diameter) % = $\frac{100xm_2}{m'}$

Dust (0.02 - 0.002 mm in diameter) % = $\frac{(m_2 - m_3)xVx100}{(Vxm_0)xF}$

Clay (diameter less than 0.002 mm) % = $\frac{m_3 xVx100}{Vxm_0 - dxF}$

Soil Density (cm3**)** - using a pycnometer, using distilled water;
Soil density is calculated using the following formula:

$$D = \frac{M_2 - M}{M_1 + M_2 - M - M_3} \text{ x } d$$

Apparent Density (Cm3) -the formula by which we calculated the bulk density is as follows:

$$DA = \frac{M_1 - M_2}{V}$$

Total Porosity Pt (%) -was calculated using the following formula: $PT = \left(1 - \frac{DA}{D}\right) x100$

Aerosis Porosity Pa (%). In order to determine it by calculation we used the values of some hydrophysical and physical indices: *PA = PT - CC x DA*
Setting And Soil Compaction (Gt)

$$GT = \frac{PMN - PT}{PMN} x100$$

PMN = 45 + 0,163 x A

Determination of chemical properties.

Soil Humus Content (%) - by titrimetric methods, respectively Tiurin method;
The principle of the method is to oxidize the carbon in the humus with a solution of chromium anhydride or potassium dichromate in the presence of sulfuric acid.

The humus content of a soil sample was calculated using the following formula:

$$\text{Humus\%} = \frac{(\text{V1 V2}) \text{ x f x } 0{,}0005181 \text{ x } 100}{\text{m}} \text{ x K}$$

pH of the soil solution - according to the potentiometric method, in aqueous extract 1: 2.5;
Total Nitrogen Dosage - was done by Kjeldahl method (soil mineralization is done by boiling with concentrated sulfuric acid in the presence of catalyst);
Mobile Phosphorus - determined by Egner-Rhiem-Domingo on a UV-VIS spectrophotometer;
Assimilable Potassium - extracted into ammonium lactate acetate and determined with atomic absorption spectrophotometer;
Total Cationic Exchange Capacity (T) - determined by the Bower method;
Degree Of Saturation In Bases (V%) - was calculated by the formula:

$$V = \frac{S_B}{S_B + S_H} X100(\%)$$

RESULTS AND DISCUSSION

The soil analized within the studied territory is the result of the combined action, in time and space of the pedogenetic factor, respectively, terrain, hydrography, hydrology, climare, bedrock, vegetation, groundwater and last but not least the anthropic intervention, through the hydro-ameliorative works, mechanization, chemicalization, on the parental material.

Table 1.

The soil analyses for the four plots

NR1	NR2
Name: Typical preluvosoil **Formula**: ELtikj 52/53 131/60 **Area**: 7.50 ha **Reprezentativ profile**: R1 **County**: Timiș; **Common**: Carani; **Prevalence**: High plain, slope. **Soil characteristics** Ap; 0-7 cm- clay lomay Atp; 7-17 cm-clay loamy Ao; 17-35 cm- loamy clay Bti; 35-53-clay loamy, yellowish brown, polyhedral sub-angular structure; Bt2; 53-72- loamy clay, pale yellowish brown, subangular polyhedral structure; Ck; 72-110 cm- loamy clay, yellowish. Limitations regarding the sutability of th soil for the tree plantation: • moderated limitations due to the soil reaction. • reduced limitation due to uneven terrain. **Quality class for the tree plantation:** MR (apple)-73 class points II PR (pear)-73 class points II PN (plum)-81 class points I CV (cherries)-66 class points II CS (apricot)-66 class points II PC (peach)-66 class points II **Tree plantation average: 71 class I**	**Name**: Typical preluvosoil. **Formula**: ELti 1<453/61 131/50 **Area**: 29.13ha **Reprezentativ profile**: R4 **County**: Timiș; **Common**: Carani **Soil characteristics** Ap; 0-20 cm-clay loamy; Atp; 20-30 cm-clay loamy; Ao; 30-50 cm- clay loamy; AB; 50-62 cm-clay loamy; Bt; 62-75 cm- loamy clay; BC; 75-100 cm-clay loamy; Ck; 100-120 cm- clay loamy. Limitations regarding the sutability of the soil for the tree plantation: • moderated limitations de excess surface water. • reduced limitation due to uneven terrain. **Quality class for the tree plantation:** MR (apple)-50 class points III PR (pear)-58 class points III PN (plum)-65 class points II CV (cherries)-52 class points III CS (apricot)-52 class points III PC (peach)-52 class points III **Tree plantation average: 55 class III**
NR3	**NR4**
Name: Stagnic preluvosoil. **Formula**: EL st $W_2$53/61 122/60 Area: 4.15 ha **Reprezentativ profile**: R2 **County**: Timiș; **Common**: Carani **Natural conditions**: The surface is of plains with unevenness of 10-20 cm. **Soil characteristics** Ap; 0-20 cm-clay loamy, broen; Atpw; 20-31 cm-clay loamy, light brown, slightly rusty, polyhedral structure; Aow; 31-52 cm-loamy clay, rusty brown, medium polyhedral structure; BtW3; 52-73 cm-loamy clay, rusty brown, medium polyhedral structure; Bt; 76-95 cm- loamy clay, pale yellowish brown, polyhedral structure; C; 95-120 cm-loamy clay, yellowish. **Quality class for the tree plantation:** MR (apple)-43 class points III PR (pear)-50 class points III PN (plum)-57 class points III CV (cherries)-39 class points IV CS (apricot)-39 class points IV PC (peach)-39 class points IV **Tree plantation average: 45 class III** Improvment requirements and recomandation: • surface drainage; • deep loosening; • limestone amendment.	**Name**: Molic preluvosoil. **Formula**: EL mo-st W2 53/61 122/50 Area: 6.30 ha **Reprezentativ profile**: R3 **County**: Timiș; **Common**: Carani **Soil characteristics** Ap; 0-20 cm-clay loamy, brown, black, structure destroyed by plowing; Amw; 20-32 cm-loamy clay, brown, black, slightly rusty, polyhedral structure; ABW2; 32-53 cm-loamy clay, rusty brown, medium polyhedral structure; BtW3; 53-71 cm-loamy clay, light brown to yellowish rusty, polyhedral structure; Bt; 71-100 cm-loamy clay, slightly yellowish brown, polyhedral structure; C; 100-120 cm-mediul clay loamy, yellowish. **Quality class for the tree plantation:** MR (apple)-43 class points III PR (pear)-50 class points III PN (plum)-57 class points III CV (cherries)-39 class points IV CS (apricot)-39 class points IV PC (peach)-39 class points IV **Tree plantation average: 45 class III** Limitations regarding the sutability of the soil for the tree plantation: • severe limitations due to exess surface water; • reduced limitation due to the degree of unevenness.

Based on the accumulated data drom the soils in the studied area, the bonitary marks are as follows:

Table 2

Bonitary marks for the studied soils

TEO	MR, (apple)	PR, (pear)	PN, (plum)	CV, (cherries)	CS, (apricot)	PC, (peach)	Media
	Evaluation marks						
1	73	73	81	66	66	66	**71**
2	50	58	65	52	52	52	**55**
3	43	50	57	39	39	39	**45**
4	43	50	57	39	39	39	**45**

The surface of 27.08 ha for the orchard use category is as follows:

- TEO 1 (7.50 ha), note71 II class;
- TEO 2 (29.13 ha), note 55 III class;
- TEO 3 (4.15 ha), note 45, II calss;
- TEO 4 (6.30 ha), note 45, III class.

CONCLUSIONS

This pedology study was carried out in order to set up a orchard in the territorial administrative unit (UAT) of Sânandrei, Timiș county, with a total area of 47.08 ha.

The study is carried out in accordance with the previsions of Order 278/2011 of the Ministry of Agriculture and Rural Development, following the methodology of elaboration of a pedological studie, with subsequent additions, we inform you of the following:

The sutability classes for trees, for each soil:

- TEO 1, typical preluvosoil, orchard suitability class-III;
- TEO 2, typical preluvosoil, the sutability for a orchard is class-III;
- TEO 3, stagnic preluvosoil, orchard sutability class-IV;
- TEO 4, molic preluvosoil, orchard suitability-IV.

Within the studied perimeter, improvement measures are required:

- TEO 1- Surface drainage, radical fertilization and limestone amendaments;
- TEO 2- Surface drainage, deep loosening;
- TEO 3- Surface drainage, limestone amendaments and deep loosening;
- TEO 4- Surface drainage, deep loosening.

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