

## RESEARCH ON THE CHARACTERIZATION OF SOIL RESOURCES SPECIFIC TO THE TERRACE AREA IN ROȘEȚI COMMUNE, CĂLĂRAȘI COUNTY

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### **Abstract**

*The purpose of the paper was to study and evaluate the morphological, agrophysical and agrochemical characteristics of the soil, the environment and geographical conditions as well as the evaluation of the land suitability potential, from the terrace area of Roșeți locality, Călărași County. The objective of these evaluations is to estimate the possibilities of maintaining the optimal natural potential of the soil in the process of a certain way of use in a long period of time. The studied area is located in the Southern part of Bărăganului Plain. Most of the lands located on this relief form are included in the agricultural circuit, and a large part of them have arable use. Land, especially arable land, must be protected against natural and/or anthropogenic degradation factors, ensuring the maintenance of production potential, as well as the sustainable use of soil resources. In the flat areas of the plain, there are roofs and wide depression areas, where the water from precipitation in rainy periods accumulates and stagnates for a long time, producing stagnoleization of the soil. This added moisture caused the soil to evolve from Chernozems to Cambic Phaeozems with a pH from weakly alkaline (8.2) to weakly acidic (6.5). Ground water is found at different depths, below 5 m and above 10 m. From a climatic point of view, the studied territory is characterized by average annual temperatures of 11.5°C and average annual precipitation of approx. 475 mm. In the studied area, carbonate and Typical chernozems predominate, and in roofs cambic, well and medium humiferous Phaeozems of medium thickness (25-50 cm), formed on loamy and clayey rocks, with humus content values between 2.64 and 3.84%. The texture varies depending on the soil type and the pedogenesis process, from medium loam, clay loam to dusty loam in the roof areas. The soil supply of phosphorus is good to very good, with values ranging from 45 ppm to 62 ppm, and the supply of potassium is medium to very good, with values ranging from 180 ppm to 296 ppm.*

**Key words:** soil fertility, soil assessment, limiting factors.

### **INTRODUCTION**

Land evaluation is the essential, central activity of land management, a field of major importance growing recently in the world, but also in our country, especially in the relatively new conditions of the market economy and efforts to integrate into the European Union. Land evaluation refers to "the process of corroborating and interpreting the study of soil, vegetation, climate, and other aspects of the land to identify and make a first comparison of promising land use alternatives in socioeconomic terms" (Brinkman, 1972). As a result this definition was supplemented and republished in A Framework for Land Evaluation (1<sup>st</sup> edition) as follows "the process

of evaluating the performance of land when used for a specific purpose, this process involves taking measurements and studying the climate, soils, vegetation and other aspects of the land, in order to identify the requirements of alternative uses of the land. To be useful, the range of land uses considered must be limited to those that are relevant to the physical, economic and social context of the area under study, and comparisons must take economic considerations into account" (FAO, 1976). Vlad et al. (2000) in the article "An outline of the systematization of the field of land evaluation (2000)", the author states that "land evaluation deals with the assessment of land performance for uses for specific purposes, involving the comparison between land for a

given use and /or comparing the use options for a given land and including or not socioeconomic and sustainability considerations". The land evaluation process in Romania is known as the "creditworthiness process" of agricultural land. The definition of the concept of Soil, from a pedological point of view, we consider to be the one recently published in Geoderma (Bockheim et al., 2004), evolving from the definition elaborated by Dokuchaev, in 1879, and calling the soil "a natural, independent and evolutionary organism which can be subdivided into sub-compartments and formed under the influence of five soil-forming factors - climate, organisms, parent material, relief and time" (Bockheim et al., 2004). Land suitability refers to the grouping or classification of land into classes, subclasses, and subdivisions for a specific purpose. The grouping of lands into suitability classes for different uses and arrangements is done according to the "Methodology for Elaboration of Pedological Studies" part two published by I.C.P.A. Bucharest in 1987. The grouping represents a gathering of lands and an ordering according to their aptitudes for different uses and arrangements, specifying the deficiencies that limit their intensive use or arrangement for different purposes.

The evaluation of agricultural lands both from a parametric-quantitative point of view and from an economic perspective becomes extremely important when it is desired to identify the favorability of a certain territory for different uses and agricultural crops, depending on the related soil resources. Practice has demonstrated that the economic development of a region starts from the primary premise of knowing all the environmental characteristics that can really support productive activities based on effective management. The soil, being analyzed as a means of production under the direct influence of environment factors (relief, climate, hydrogeology, etc.), having a series of characteristics that offer certain productive and technological characteristics that will dictate the nature and intensity of the favorability or restrictiveness of certain crops whose knowledge becomes a necessity. Favorability refers to "the extent to which an agricultural land satisfies the requirements for growth and

crop formation for different agricultural plants or cultivated species, under normal climatic conditions and within an average agricultural technique" (Țărău, 2006). Klingebiel (1961), is in favor of the proposal that the "term of favorability" be "used for the global measure of land performances in relation to specific uses", because the two terms (pretability, favorability) do not have a direct correspondent in international terminology standardized field of land evaluation. Pedological studies for the general evaluation of soil resources are done to characterize the agricultural potential of a more or less extensive territory or for the pedogeographical characterization of a natural region. These studies are carried out either as a result of pedological reconnaissance studies on a small to medium scale or as a result of a synthesis or assembly and generalization of existing pedological data on areas, natural or administrative units (the site being able to take the form of pedological zoning or regionalization), either as a result of both pathways.

## MATERIALS AND METHODS

The field phase represents all the operations that are carried out in the field and consists of:

- research of soil profiles in close connection with natural and production conditions (mapping itself);
- morphological delimitation and characterization;
- collection of soil samples for laboratory analyses; In order to establish the quality indices of the soils, the laboratory performed the following analyzes according to the methods:
  - soil reaction (pH) in aqueous suspension (pH H<sub>2</sub>O) determined at a potentiometric soil-water ratio of 1: 2.5;
  - the mobile phosphorus content determined by the Egner-Riehm-Domingo method in ammonium lactate acetate extract;
  - mobile potassium content determined by the same method;
  - humus content, according to the oximetric method in the Walkley-Black version, after the Gogoasă modification;
  - to calculate the degree of saturation in bases (V), the hydrolytic acidity and the sum of the base exchange cations were determined;

- Kacinsky method was used to determine the particle size fractions.

For the office phase:

- Identification and delimitation of territorial soil units;

- Classification of soils according to the Romanian Soil Taxonomy System (SRTS, 2012), at the upper level (type, subtype);

- Characterization of soil territorial units (US) regarding morphological and physico-chemical properties based on field observations and laboratory analyses.

## RESULTS AND DISCUSSIONS

The studied territory is located in the sector of the Eastern Romanian Plain (subdivision of Călărași Plain), which in its northern part is characterized by a clear unbroken relief of deep valleys and waters, individualized from a morphological point of view into terrace and plain formations and in the Southern part from the Danube meadow. In the South of the inner city, over a distance of approximately 6 km, the terrace stands out. The transition from the terrace to the plain is made through a 200-300 m wide slope with an inclination of 2-30. At a distance of 6 km North of the inner city, the plain stands out, characterized by a flat relief unbroken by valleys. The dominant rock that characterizes the terrace is loess. As we advance in the N-W direction in the plain, in addition to the loessoid deposits, we encounter as underlying rocks the Mostiștea sands interspersed with marble complexes and Frațești strata (a complex of alluvial deposits made up of gravels and sands to which clay intercalations are sometimes added). The relatively recent formation process of the Danube meadow includes two phases:

- the first phase represented by an erosive cycle of Quaternary waters (the diluvial period) is followed by,

- the second phase characterized by the withdrawal of waters in the current bed (halogen) which is an accumulative process determined by overflow waters.

This meadow remained a region of intense fluvial accumulation until it was dammed.

The presence of marshy areas (puddles, rivulets, gypses) proves that this meadow is an alluvial plain in formation.

Gypses and rivulets have the lowest elevations of 9-10 m.

The "high" relief in the Danube meadow includes the nurseries and beams. The nurseries have average heights of up to 16 m with a lenticular shape and longitudinal orientation S-W, N-E. The river bank generally follows the location of the current seawall. It is accompanied by other beams that do not exceed 12 m in height.

### Hydrology and hydrography

Due to Frațești layers that develop in the southern part of the Romanian Plain, the geological formations described above have a higher permeable character.

Similarly, in the Danube area and the Getic Plain, gravels predominate (permeable porous rocks, porosity reaches values of 25-35%) and in the central and eastern area of the plain, sandy fractions predominate.

The highly permeable nature of the geological formations offers the possibility of storing important amounts of underground water.

The flows and depth of the underground layers depend on the granulometric material encountered and the morphological aspect of the existing formations. Thus, within the terrace, the groundwater level is between 3-10 m and higher than 10 m.

Due to the general tectonics of the Romanian Plain, the waters from the Frațești strata flow in the W-E direction and flow towards the Danube with local influences due to the drainage action of the rivers.

The flow of these rivers is around 6-10 l/sec decreasing towards the interior of the plain to 3 l/sec, and the mineralization is variable between 0.7-1.7 g/l which indicates a weak mineralization. Ground water belongs to the category of bicarbonate waters, poorly mineralized, which explains the fact that the studied soils do not show a pronounced character of salinization.

### Climate

The data about the climate of the studied area were collected from Călărași weather station.

The main climate characteristics are:

- the annual average temperature calculated for the two period studied is 11.2°C;

- the highest temperature was reached in the period July-August (+22.8°C), and the lowest temperature is considered in January -22°C.

According to the values of the decadal averages, it is found that at the end of March and the beginning of April the temperatures recorded allow the execution of spring agricultural works. The earliest frosts are recorded in the second half of September, and the latest until the beginning of May.

#### Rainfall regime

The average annual precipitation indicates a value of 497.9 mm. It should be noted that lately a decrease in the total average annual precipitation has been observed in this area.

The maximum rainfall in 24 hours was recorded in June, such a quantity fell in the form of a torrential downpour, often causing the dormancy of crops, especially that of wheat. In the summer season, a moisture deficit is frequently recorded, which is largely due to the torrential nature of these rains, in which the momentary surplus of water drains into the micro depressions that fragment especially the plain.

Thus, the water not gradually infiltrating into the depth of the soil, only at a small depth it evaporates very quickly during periods of maximum temperature.

#### Aeolian regime

The dominant wind is Crivățul which blows from the NE and accentuates freezing conditions in winter and spring. The second is the Austral which comes from the SW and accentuates the drought conditions during the summer. The third one, Băltărețul wind, blows from the South and although it has a lower frequency and intensity, most of the time it brings rain, being often loaded with water vapor that condenses under the conditions of our area in the form of quiet rains.

#### Vegetation

Within the researched territory, apart from the steppe vegetation developed especially in the northern part, in the meadow between the Danube and Borcea branch, the vegetation has a specific character:

- On the higher areas, a spontaneous woody vegetation was established in which the following species dominate: *Poculus alba*, *Poculus nigra*, *Salix alba*, *Salix fragilis*, *Tamarix ramosissima*, on the interval between these high areas and marshes, meadows with associations of mesophilic plants and hydrophilic: *Convulvulus arvensis*, *Seturia viridis*, *Centaurea cyanus*, *Cynadon dactylon*,

*Papaver rhoias*, *Plantago lanceolata*.

#### Profil 1 - Proxi-calcareous Chernozems

Latitude: N: 44°13'33"

Longitude: E: 27°27'02"

Major relief unit: Romanian Plain

Unit: Bărăganului Plain

Parental material: carbonate loessoid deposits

Groundwater: 5-8 m

Current use: pasture

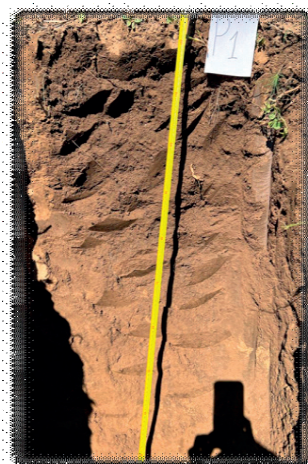


Figure 1. Proxi-calcareous Chernozems

#### Morphological characterization

Ap (0-19 cm): medium clay, very dark brown (10 YR 3/2) wet, dark greyish brown (10 YR 4/2) dry, small gritty structure, reventant, friable, weakly cohesive, weak plastic, weak adhesive, weak compact, loose, rare medium macropores, frequent thin grassy roots, medium effervescence, clear transition.

Am (19-33 cm): medium clay, very dark brown (10 YR 3/2.5) wet, dark brown (10 YR 4/2) dry, small-medium grained, loose, friable, moderate cohesive, moderately plastic, moderately adhesive, weak compact, loose, frequent medium macropores, frequent thin grassy roots, weak to medium effervescence, gradual transition.

A/C (33-91 cm): medium loam, very dark grayish brown (10 YR 3/3) wet, dark grayish brown (10 YR 5/3) dry, small grain structure medium developed, friable, moderately cohesive, moderately plastic, moderately adhesive, loose, frequent medium macropores, frequent grassy roots, medium effervescence, gradual transition.

Cca (91-125 cm): Medium clay, dark yellowish brown (10 YR 6/4) wet, yellowish brown (10 YR 6/6) dry, slightly eroded, hard, hard, weakly plastic, weak adhesive, moderately compact, weakly cemented, rare small macropores, strong mass effervescence.

The pH increases in the depth of the profile from 7.6 to 8.1, the reaction being weakly alkaline (Table 1). The supply of humus is average with values of 2.88-1.44% in the first 33 cm. Mobile phosphorus at the depth of 0-19cm has a value of 47 ppm, which means that the soil is very well supplied.

And mobile potassium having a value of 196 ppm, supplied medium. The texture is medium clay from the first horizon to the last. The depth of the hydrostatic level of the phreatic water is located at a great depth, within the code 0.70 (> 5 m), contributing to the reduction of the

credit score by a coefficient of 0.8 for all cultures. The humus reserve is 160 t/ha, medium, having the code 140, from where it penalizes all crops by 0.9, lowering the credit score (Table 2).

The credit ratings were calculated for the eight crops: wheat, barley, sunflower, peas and beans, 65 points were obtained, falling into the 2nd quality class and the 4th favorability class. Maize and soybean fall into the 3rd class of quality and the 5th class of favorability. The potato crop is the most penalized with 40 points, being in the 4th quality class and the 7th favorability class, as well as the sugar beet crop, which is ranked with 45 credit rating points, in the 3rd class quality and 6th class of favorability. The credit score for the eight crops is 58 points and falls into the 3rd class of quality and 5th of favorability.

Table 1. The main physical and chemical properties

Horizon	Depth (cm)	Physical properties				Texture class	Chemical properties				
		Coarse sand (2-0.2 mm)	Fine sand (0.2-0.02 mm)	Dust (0.02-0.002 mm)	Colloidal clay (<0.002 mm)		pH (H <sub>2</sub> O)	CaCO <sub>3</sub> (%)	Humus (%)	P <sub>AL</sub> (ppm)	K <sub>AL</sub> (ppm)
Ap	0-19	0.68	44.32	28.35	26.65	LL	7.6	4.4	2.88	47	196
Am	19-33	0.41	44.47	27.30	2.82	LL	7.6	8.6	2.73	-	-
A/C1	33-56	0.32	37.58	33.89	28.21	LL	7.8	9.4	1.44	-	-
A/C2	56-91	0.18	46.48	25.74	27.60	LL	7.9	10	-	-	-
Cca	91-125	0.19	59.88	22.72	27.30	LL	8.1	18	-	-	-

Table 2. Land Suitability for the main crops

Crop	Tem 3C	Pre 4C	Gl 14	Stg 15	Sal/Alc 16/17	Text 23	Pol 29	Slo 33	Ls 38	HL 39	Flo 40	TP 44	CaCO <sub>3</sub> 61	pH 63	EV 133	HR 144	EM 181	CS	
Wheat	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	0.9	1	65
Barley	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	0.9	1	65
Maize	1	0.8	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	0.9	1	58
Sunflower	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	0.9	1	65
Potato	0.8	0.7	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	0.9	1	40
Sugar beet	0.9	0.7	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	0.9	1	45
Soybean	0.9	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	0.9	1	58
Peas/Beans	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	0.9	1	65

Note: average annual temperature-3C, average annual precipitation-4C, gleization-14, stagnogleization-15, salinization or alkalinization-16/17, texture-23, pollution-29, slope-33, landslides-38, hydrostatic level-39, floodability-40, total porosity-44, total CaCO<sub>3</sub> content-61, soil pH-63, edaphic volume-133, humus reserve-144, surface soil moisture excess -181.

## Profile 2 - Proxi-calcareous Chernozems

Latitude: N: 44°13'28"

Longitude: E: 27°26'16"

Major relief unit: Romanian Plain

Unit: Bărăganului Plain

Parental material: carbonate loessoid deposits

Groundwater: 5-8 m

Current use: Arable

### Morphological characterization

Ap (0-18 cm): medium clay, very dark grayish brown (10 YR 3/2) wet, dark grayish brown (10 YR 4/2) dry, structure destroyed by

agricultural work, hard, dry, hard, weak plastic, weak adhesive, weak compact, rare small pores, thick and dense grassy roots (alfalfa), weak effervescence, clear transition.

Am (18-34 cm): medium clay, very dark gray (10 YR 3/2) wet, dark gray (10 YR 4/2) dry, loose, loose, fine-grained, medium, well defined, friable, loose, moderately plastic, moderately adhesive, moderately cohesive, frequent medium macropores, frequent grassy roots, medium effervescence, gradual transition.

A/C1 (34-55 cm): medium clay, dark gray

brown (10 YR 3/3) wet, dark gray brown - dark brown (10 YR 5/3) dry, medium - large subangular polyhedral, friable, moderately plastic, moderately sticky, medium frequent macropores, moderate effervescence, rare thin grassy roots, gradual transition.

A/C2 (55-93 cm): medium clay, dark gray brown (10 YR 4/3) wet, dark gray brown - dark brown (10 YR 5/3) dry, medium - large subangular polyhedral, friable, moderately plastic, moderately adhesive, medium frequent macropores, gradual transition.

Cca (93-125 cm): medium clay, dark yellowish brown (10 YR 5/4) wet, yellowish brown (10 YR 6/3) dry, massive, hard, hard, weak compact, weak plastic, weak adhesive, rare small macropores, vinous and friable concretions of CaCO<sub>3</sub>, strong effervescence in the mass.



Figure 2. Proxi-calcareous Chernozems

The pH increases in the depth of the profile from 7.7 to 8.0, the reaction being weakly alkaline (Table 3). The supply of humus is average with values of 3.46% in the first 18 cm. Mobile phosphorus has a value of 41 ppm and is very well supplied to the soil. And mobile potassium having the value of 296 ppm, very good supply. The texture is medium clay from the first horizon to the last. The depth of the hydrostatic level of the phreatic water is located at a great depth, within the code 0.70 (> 5 m), contributing to the reduction of the credit score by a coefficient of 0.8 for all crops. The humus reserve is 198 t/ha, large, so it does not penalize any crop (Table 4).

For the US2 profile, credit ratings were calculated for the eight crops: wheat, barley, sunflower, peas and beans, 72 points were obtained, falling into the 2nd and 3rd quality classes of favorability. Maize and soybeans with 64 and 65 credit points and fall into the 2nd house of quality and the 4th class of favorability. The potato crop obtained 45 points and is in the 3rd quality class and 6th favorability, and the beet crop obtained 50 points and is in the 3rd quality and 6th class of favorability.

The credit score for the eight crops is 64 points and falls into the 2nd quality class and the 4th favorability class.

Table 3. The main physical and chemical properties

Horizon	Depth (cm)	Physical properties				Texture class	Chemical properties				
		Coarse sand (2-0.2 mm)	Fine sand (0.2-0.02 mm)	Dust (0.02-0.002 mm)	Colloidal clay (<0.002 mm)		pH (H <sub>2</sub> O)	CaCO <sub>3</sub> (%)	Humus (%)	P <sub>AL</sub> (ppm)	K <sub>AL</sub> (ppm)
Ap	0-18	0.56	45.31	27.93	26.20	LL	7.7	4.2	3.46	41	296
Am	19-34	0.15	49.10	23.43	27.32	LL	7.7	7.4	3.31	-	-
A/C1	34-55	0.35	50.35	21.00	28.30	LL	7.8	8.6	2.11	-	-
A/C2	55-93	0.13	47.06	25.36	27.45	LL	7.9	16.8	-	-	-
Cca	93-125	0.61	46.93	25.36	27.10	LL	8.0	17.2	-	-	-

Table 4. Land Suitability for the main crops

Crop	Tem 3C	Pre 4C	Gl 14	Stg 15	Sal/Alc 16/17	Text 23	Pol 29	Slo 33	Ls 38	HL 39	Flo 40	TP 44	CaCO <sub>3</sub> 61	pH 63	EV 133	HR 144	EM 181	CS
Wheat	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	72
Barley	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	72
Maize	1	0.8	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	64
Sunflower	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	72
Potato	0.8	0.7	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	45
Sugar beet	0.9	0.7	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	50
Soybean	0.9	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	65
Peas/Beans	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	72

Note: average annual temperature-3C, average annual precipitation-4C, gleization-14, stagnogleization-15, salinization or alkalization-16/17, texture-23, pollution-29, slope-33, landslides-38, hydrostatic level-39, floodability-40, total porosity-44, total CaCO<sub>3</sub> content-61, soil pH-63, edaphic volume-133, humus reserve-144, surface soil moisture -181.

### Profile 3 - Epi-calcareous Chernozems

Latitude: N: 44°18'58"

Longitude: E: 27°27'04"

Major relief unit: Romanian Plain

Unit: Bărăganului Plain

Parental material: carbonate loessoid deposits

Fractal water depth: >10 m

Current use: Arable



Figure 3. Epi-calcareous Chernozems

### Morphological characterization

Ap (0-21 cm): medium clay, very dark brown (10 YR 3/1) wet, dark grayish brown (10 YR 3/3) dry, small gritty structure, friable, weakly cohesive, weak plastic, weak adhesive, weak compact, loose, rare medium macropores, frequent thin grassy roots, medium effervescence, clear transition.

Am (21-40 cm): medium clay, very dark brown (10 YR 3/1) wet, dark brown (10 YR 3/3) dry, small-medium grained, loose, friable, moderately cohesive, moderately plastic, moderately sticky, weakly compact, loose, frequent medium macropores, frequent thin grassy roots, low to medium effervescence, gradual transition.

A/C (40-102 cm): medium clay, very dark grayish brown (10 YR 3/3) wet, dark grayish brown (10 YR 4/2) dry, small grain structure medium developed, friable, moderate cohesive, moderately plastic, moderately adhesive, loose, frequent medium macropores, frequent grassy roots, medium effervescence, gradual transition.

Cca (102-125 cm): clay loam, dark yellowish brown (10 YR 5/4) wet, yellowish brown (10 YR 6/2) dry, slightly eroded, hard, hard, weakly plastic, weak adhesive, moderately compact, weakly cemented, rare small macropores, strong mass effervescence.

The pH in Ap is 6.5 - the reaction of the soil is weakly acidic and down the profile the reaction is weakly alkaline (Table 5). Mobile phosphorus has a value of 35 ppm and is medium supplied to the soil. And mobile potassium having the value of 180 ppm, very good supply. The humus is medium and the humus reserve is 146 t/ha, medium, penalizing the credit score. The soil texture is medium, medium clay throughout the profile.

The credits were calculated for the crops: wheat, barley, sunflower, peas and beans, 65 points were obtained, falling into the 2nd quality class and the 4th favorability class. Maize and soy fall into the 3rd house of quality and the 5th class of favorability. The potato crop is the most penalized with 40 points, being in the 4th quality class and the 7th favorability class, as well as the beet crop, which is ranked with 45 credit rating points, in the 3rd class quality and VI favorability. The depth of the hydrostatic level of the phreatic water is located at a very deep depth, within the code 15.0 (> 10 m), contributing to the reduction of the credit score with a coefficient of 0.8 for all crops. The credit score for the eight crops is 58 points and falls into the 3rd class of quality and 5th of favorability (Table 6).

Table 5. The main physical and chemical properties

Horizon	Depth (cm)	Physical properties				Texture class	Chemical features				
		Coarse sand (2-0.2 mm)	Fine sand (0.2-0.02 mm)	Dust (0.02-0.002 mm)	Colloidal clay (<0.002 mm)		pH (H <sub>2</sub> O)	CaCO <sub>3</sub> (%)	Humus (%)	P <sub>AL</sub> (ppm)	K <sub>AL</sub> (ppm)
Ap	0-21	2.19	42.33	25.56	26.92	LL	6.5	-	2.64	35	180
Am	21-40	1.85	44.73	26.12	27.30	LL	7.6	3.4	2.50	-	-
A/C1	40-80	1.86	41.85	27.97	28.32	LL	7.7	12.0	2.02	-	-
A/C2	80-102	1.83	40.13	30.19	27.85	LL	7.8	17.2	-	-	-
Cca	102-125	1.84	41.93	29.56	26.67	LL	7.9	14.8	-	-	-

Table 6. Land suitability for the main crops

Crop	Tem 3C	Pre 4C	Gl 14	Stg 15	Sal/Alc 16/17	Text 23	Pol 29	Slo 33	Ls 38	HL 39	Flo 40	TP 44	CaCO <sub>3</sub> 61	pH 63	EV 133	HR 144	EM 181	CS
Wheat	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	0.9	1	65
Barley	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	0.9	1	65
Maize	1	0.8	1	1	1	1	1	1	1	0.8	1	1	1	1	1	0.9	1	58
Sunflower	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	0.9	1	65
Potato	0.8	0.7	1	1	1	1	1	1	1	0.8	1	1	1	1	1	0.9	1	40
Sugar beet	0.9	0.7	1	1	1	1	1	1	1	0.8	1	1	1	1	1	0.9	1	45
Soybean	0.9	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	0.9	1	58
Peas/Beans	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	0.9	1	65

Note: average annual temperature-3C, average annual precipitation-4C, gleization-14, stagnogleization-15, salinization or alkalization-16/17, texture-23, pollution-29, slope-33, landslides-38, hydrostatic level-39, floodability-40, total porosity-44, total CaCO<sub>3</sub> content-61, soil pH-63, edaphic volume-133, humus reserve-144, surface soil moisture excess -181.

### Profile 4 - Cambic Phaeozems

*Latitude:* N: 44°18'46"

*Longitude:* E: 27°27'60"

*Major relief unit:* Romanian Plain

*Unit:* Bărăganului Plain

*Parental material:* carbonate loessoid deposits

*Fractal water depth:* 5-10 m

*Current use:* Arable



Figure 4. Cambic Phaeozems

### Morphological characterization

Ap (0-20 cm): dusty clay, blackish brown (10 YR 3/1) wet, greyish brown-dark grayish brown (10 YR 3/3) dry, structure destroyed by agricultural works, reeds, grassy roots frequent, friable, weakly cohesive, medium plastic, medium rare macropores, clear passage.

Am (20-42 cm): dusty loam, very dark gray brown (10 YR 3/1) wet, dark gray brown (10 YR 3/3) dry, small-medium grained, well

developed, roots frequent grassy, friable, moderately cohesive, moderately adhesive, loose, frequent medium macropores, gradual transition.

A/B (42-61 cm): dusty clay, dark brown (10 YR 3/2) wet, brown (10 YR 4/2) dry, subangular polyhedral, medium well developed, frequent herbaceous roots, friable, moderately cohesive, moderately plastic, medium adhesive, small-medium frequent macropores, gradual transition.

Bv (61-91 cm): dusty clay, dark brown (10 YR 3/3) in wet condition, brown (10 YR 4/3) in dry condition, medium-large subangular polyhedral, reed, grassy roots rarer, friable, moderately cohesive, moderately plastic, weak adhesive, frequent small macropores, gradual transition.

B/C (91-150 cm): dusty clay, brown (10 YR 4/3) wet, pale brown (10 YR 5/4) dry, poorly defined columnoid, silt, friable, weakly cohesive, medium plastic, moderately adhesive, weakly compact, frequent small macropores, gradual transition.

Cn (150-200 cm): dusty clay, dark yellowish brown (10 YR 4/4) wet, yellowish brown (10 YR 6/4) dry, unstructured, hard, hard dry, firm wet, weakly compact, good plastic and adhesive.

In profile 4, on 0-61 cm the reaction of the soil (pH=6.5-6.7), being weakly acidic and down the profile up to 200 cm, the reaction is neutral (Table 7). Mobile phosphorus has a value of 62 ppm and is well supplied to the soil. Mobile potassium having the value of 280 ppm, very good supply. The humus is medium and the humus reserve is 195 t/ha, high, and does not penalize the credit score. The soil texture is medium, dusty clay throughout the profile. It is a carbonate-free profile with a Cn horizon up to 200 cm.



For the US 4 profile, credit scores were calculated for: wheat, barley, sunflower, peas and beans, 72 points were obtained, falling into the 2nd quality class and the 3rd favorability class. Maize and soybeans with 64 and 65 credit points and fall into the 2nd house of quality and the 4th class of favorability. The

potato crop obtained 45 points and is in the 3rd quality class and 6th favorability, and the beet crop obtained 50 points and is in the 3rd quality and 6th class of favorability.

The credit score for the eight crops is 64 points and falls into the 2nd quality class and the 4th favorability class (Table 8).

Table 7. The main physical and chemical properties

Horizon	Depth (cm)	Physical properties				Texture class	Chemical features				
		Coarse sand (2-0.2 mm)	Fine sand (0.2-0.02 mm)	Dust (0.02-0.002 mm)	Colloidal clay (<0.002 mm)		pH (H <sub>2</sub> O)	CaCO <sub>3</sub> (%)	Humus (%)	P <sub>AL</sub> (ppm)	K <sub>AL</sub> (ppm)
Ap	0-20	1.06	30.94	36.32	31.68	LP	6.5	-	3.84	62	280
Am	20-42	0.59	32.39	35.82	31.20	LP	6.7	-	3.60	-	-
A/B	42-61	0.73	34.75	34.36	30.16	LP	6.7	-	2.73	-	-
Bv	61-91	0.87	34.64	33.82	30.67	LP	6.9	-	-	-	-
B/C	91-150	0.37	36.12	34.22	29.29	LP	7.1	-	-	-	-
Cn	150-200	0.52	35.66	34.06	29.76	LP	7.2	-	-	-	-

Table 8. Land suitability for the main crops

Crop	Tem 3C	Pre 4C	Gl 14	Stg 15	Sal/Alc 16/17	Text 23	Pol 29	Slo 33	Ls 38	HL 39	Flo 40	TP 44	CaCO <sub>3</sub> 61	pH 63	EV 133	HR 144	EM 181	CS
Wheat	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	72
Barley	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	72
Maize	1	0.8	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	64
Sunflower	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	72
Potato	0.8	0.7	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	45
Sugar beet	0.9	0.7	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	50
Soybean	0.9	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	65
Peas/Beans	1	0.9	1	1	1	1	1	1	1	0.8	1	1	1	1	1	1	1	72

Note: average annual temperature-3C, average annual precipitation-4C, gleization-14, stagnogleization-15, salinization or alkalinization-16/17, texture-23, pollution-29, slope-33, landslides-38, hydrostatic level-39, floodability-40, total porosity-44, total CaCO<sub>3</sub> content-61, soil pH-63, edaphic volume-133, humus reserve-144, surface soil moisture -181.

## CONCLUSIONS

The studied area represents the terrace area of Roseți administrative territory, which is located in the southern part of Bărăganu Plain. Most of the lands located on this relief form are included in the agricultural circuit, and a large part of them have arable use.

The soil units delimited in the studied perimeter belong to the Chernisols Class, which includes the Typical Chernozems and Phaeozems.

Typical Chernozems were formed under the influence of the main factors of soil formation including: rock, climate, relief and vegetation.

Solification processes are characterized by intense bioaccumulation and the accumulation of a large amount of humified organic matter. The large amount of organic matter left in the soil after the end of the vegetation cycle is transformed, under the predominant influence of bacteria, resulting in humus of the "calcic mull" type that accumulates at great depths (50-

65), giving the soil a dark color. The intense activity of the mesofauna is evidenced by the presence of biogenic neoformations represented by coprolites, cervotocins and crotovines. The downward current of water passing through the soil has determined a weak leaching of calcium carbonate that can be present even in the upper part of the A mollic horizon, causing Proxi-calcareous Chernozems, at its base or in the AC horizon, forming Epi-calcareous Chernozems. Soil units 1, 2, and 3 are Proxi-calcareous and Epi-calcareous Chernozems with a texture, medium, medium clay from the first horizon to the last. The depth of the hydrostatic water table in profile 1, 2, 3, is at great depth, 5-10 m and (>10 m contributing to the reduction of the credit score by a coefficient of 0.8 for all crops. The credit score on the eight crops for soil units 1 and 3 is 58 points and falls into the 3rd of quality class and 5th favorability, and for units 2, the credit score is 64, falling -it is in the 2nd class of quality and the 4th of favorability.

The Phaeozems were formed following the processes of solification, characterized by intense bioaccumulation and the formation of humus of the "mull calcic" type, the migration of humus and clay colloids from the "A" horizon and their deposition at the level of the "B" horizon in the form of organo-mineral films on the faces of structural elements, in cracks or on pore walls. The partial removal of humus colloids from the "A" horizon is the cause of the large color difference between the wet and dry state of the soil sample.

Soil units 4 are Cambic Phaeozems with a texture, medium, dusty clay from the first horizon to the last. The supply of humus is average and good with values of 3.84%.

Mobile phosphorus at the depth of 0-19 cm has a value of 62 ppm, which means that the soil is very well supplied. And mobile potassium having the value of 280 ppm, good supply - very good.

The depth of the hydrostatic level of the ground water is at great depth, within the code 0.70 (5-10m), contributing to the reduction of the credit score with a coefficient of 0.8 for all crops.

In profile 4, on 0-61 cm the soil reaction (6.5-6.7), being weakly acidic and down the profile up to 200 cm, the reaction is neutral.

The credit score for the eight crops is 64 points and falls into the 2nd quality class and the 4th favorability class.

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