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RESEARCH ON THE EVALUATION OF SOIL RESOURCES SPECIFIC TO THE TERRACE AND FLOODPLAIN AREAS OF ROSEȚI COMMUNE, CĂLĂRAȘI COUNTY

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Abstract

The main objective of the research was to evaluate the morphological, agrophysical, and agrochemical characteristics of the soils in the terrace and floodplain areas of Roseți, Calarasi County. Environmental and geographical conditions influencing soil quality and its agricultural potential were also analyzed. The research also aimed to identify the characteristics that determine the adaptability/suitability of the land for various types of agricultural use.The studied area is characterized by a diversity of soils that support a variety of agricultural and ecological uses. In the terrace area, Chernozems and Phaeozems provide a suitable environment for cereal or leguminous crops, with a slightly alkaline pH (7.2-7.6), good to very good phosphorus (61-64 ppm) and potassium (160-400 ppm) supply, and a medium to good humus content (2.6-4.30%). In the floodplain area, the dominant soils are Alluvial soils, with a slightly alkaline pH (7.3-7.6) and a humus content of 2.69-3.5%, indicating a medium supply. These alluvial soils are in different stages of development but are relatively young, still evolving, and formed from alluvial deposits.

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

INTRODUCTION

Land evaluation is a fundamental field of natural resource management, playing a crucial role in ensuring the sustainable and efficient use of agricultural, forestry, and urban land. The importance of this activity has significantly increased in the context of globalization, climate change, and the growing demand for land for various economic uses.

According to the Food and Agriculture Organization of the United Nations (FAO, 1976), land evaluation is defined as "the process of estimating land performance in relation to specific uses, involving the analysis of environmental, social, and economic factors". This definition was later expanded by experts in the field, such as Rossiter (1996), who emphasized that "land evaluation is a systematic process of analyzing land potential based on soil, climate, and topographical characteristics to determine its most suitable use".

Land evaluation is not limited to the physical aspects of the soil but also includes socio-economic considerations. According to Dent and Young (1981), "land use decisions should not be based solely on the physical characteristics of the soil but also on economic, political, and social factors that influence the feasibility of implementing certain types of land use".

In the Romanian context, the land evaluation process is known as "bonitation" and plays an essential role in determining the productive capacity of agricultural soils. According to the methodology developed by ICPA Bucharest (1987), land is classified based on its pedological, agrochemical, and climatic characteristics to determine its suitability for various agricultural crops.

Another key concept in land evaluation is favorability, which, according to Țărău (2006), represents "the extent to which agricultural land meets the growth and development requirements of crops under normal climatic conditions and with the application of standard technologies". This definition is similar to that proposed by Klingebiel and Montgomery

(1961), who suggested using the term "favorability" to describe the overall performance of land in relation to specific uses. Therefore, land evaluation is not merely a technical process of soil analysis but a complex, interdisciplinary activity that contributes to the sustainable development of agriculture and land-use planning.

MATERIALS AND METHODS

Field Phase

This stage includes all activities carried out directly in the field, including:

- A general evaluation of the studied area;
- Soil profile analysis, correlated with natural factors and production conditions (the actual mapping process);
- Identification and description of soil morphological characteristics;
- Soil sampling for laboratory analysis.

To determine the qualitative properties of the soils, the following analyses were conducted:

- Determination of soil reaction (pH) in aqueous suspension (pH H_2O), using the potentiometric method at a soil-to-water ratio of 1:2.5;
- Analysis of mobile phosphorus content using the Egner-Riehm-Domingo method, based on ammonium acetate-lactate extract;
- Determination of mobile potassium content using the same method mentioned above;
- Analysis of humus content using the modified Walkley-Black oxidation method (Gogoasă modification);
- Calculation of the base saturation degree (V), by determining hydrolytic acidity and the sum of exchangeable base cations;
- Determination of granulometric fractions using the Kacinsky method.

Office Phase

During this stage, the following operations were performed:

- Identification and delimitation of soil territorial units (US);
- Classification of soils according to the Romanian Soil Taxonomy System (SRTS, 2012), at both higher levels (type, subtype) and lower levels (variety, granulometric species, family, and variant);
- Characterization of soil territorial units based on field observations and laboratory analysis results, in terms of morphological and physico-chemical properties;
- Evaluation of agricultural land quality using the methodology established by the Research Institute for Pedology and Agrochemistry (ICPA), for assigning soil fertility ratings and classifying land according to its suitability for different agricultural crops, as well as into specific quality classes for each type of agricultural use.

RESULTS AND DISCUSSIONS

The commune of Roseți is located in southeastern Romania, in Călărași County, and is characterized by a lowland plain relief consisting of floodplain areas and terrace surfaces (Rîpă et al., 2024).

Relief and Land Use

The floodplain area is situated near the Danube River, featuring low-lying terrain with nutrient-rich alluvial soils, but it is susceptible to periodic flooding. These lands are primarily used for agriculture, favoring crops such as rice, corn, and vegetables. To improve agricultural productivity, drainage works and hydrotechnical arrangements have been implemented.

The terrace area is located at a slightly higher altitude and features proxicalcaric chernozem and cambic phaeozem soils, known for their moderate to high fertility. This region is mainly dedicated to cereal crops such as wheat and barley, as well as viticulture and orchards. Due to its higher elevation, this land is less exposed to flooding risks, providing more stable conditions for agricultural exploitation.

Thus, the geomorphological diversity of the Roseți commune shapes a complex agricultural landscape, where the efficient use of land must be adapted to the characteristics of each area, ensuring the sustainable exploitation of resources.

Hydrology and Hydrography

The Frățești layers, present in the southern part of the Romanian Plain, give the area high permeability. In the Danube region and the Getic Plain, gravel deposits predominate, known for their highwater absorption capacity

(porosity between 25-35%), while sandy formations dominate the central and eastern parts of the plain.

Due to this increased permeability, the area benefits from significant groundwater reserves. The groundwater level varies between 3 and 10 meters in the terrace area, and in some places, it exceeds 10 meters. The groundwater in the Frățești layers moves from west to east, with the Danube River as the primary drainage direction, also influenced by the local hydrographic network.

The flow rate of the aquifers ranges between 6 and 10 liters per second, but as they move further into the plain, it decreases to approximately 3 liters per second. The groundwater has low mineralization (between 0.7 and 1.7 g/L) and falls into the category of bicarbonate waters, which explains the absence of strong soil salinization phenomena in the area.

Climate

Climatic data collected from the Călărași meteorological station indicate a temperate-continental climate with the following characteristics:

- The average annual temperature is 11.2°C.
- The highest temperatures are recorded in July–August, reaching 22.8°C, while the lowest temperatures, down to -22°C, occur in January.
- At the end of March and the beginning of April, temperatures allow for the initiation of spring agricultural work.
- The first frosts appear in late September, while the last ones can be observed until early May.

Precipitation

The average annual precipitation is 497.9 mm, but in recent years, a downward trend has been observed.

- The highest amount of precipitation recorded within 24 hours occurred in June, when torrential rains sometimes caused the lodging of crops, especially wheat.
- During summer, moisture deficits frequently occur due to the torrential nature of rainfall. Rainwater tends to accumulate in microdepressions in the plain instead of gradually infiltrating the soil, leading to its rapid evaporation during heatwaves.

Predominant Winds

- *Crivăț* (from the Northeast) is the dominant wind, intensifying low temperatures in winter and early spring.
- *Austral* (from the Southwest) contributes to severe drought conditions in summer.
- *Băltăreț* (from the South), though less intense, brings precipitation, carrying moisture that condenses and generates moderate rainfall.

Vegetation

In the territory of Roseți, besides the steppe vegetation in the north, a specific type of vegetation develops in the area between the Danube and the Borcea Branch:

- Higher areas are covered by spontaneous forests, dominated by species such as: *Populus alba*, *Populus nigra*, *Salix alba*, *Salix fragilis* and *Tamarix ramosissima*.
- Between the high lands and the marshy areas, meadows with mesophilic and hydrophilic plants have formed, including: *Convolvulus arvensis*, *Setaria viridis*, *Centaurea cyanus*, *Cynodon dactylon*, *Papaver rhoeas* and *Plantago lanceolata*.

Profile 1 - Cambic Phaeozem
Latitude: N: 44°19'16"
Longitude: E: 27°27'56"
Major relief unit: Romanian Plain
Unit: Bărăganului Plain
Parental material: carbonate loessoid deposits
Groundwater: >10 m
Current use: Arable
Representative profile: 12

Morphological characterization (Figure 1)

Ap (0-19 cm): dusty clay, very dark gray brown (10 YR 3/1) wet, dark gray brown (10 YR 4/2) dry, small grain structure, good plastic, good adhesive, good compact, rare medium macropores, frequent thin grassy roots.

Am (19-40 cm): dusty loam, very dark grayish brown (10 YR 3/1) in wet state, dark brownish gray (10 YR 4/2) in dry state, small-medium grained well developed, friable, moderately plastic, moderately cohesive, moderately adhesive, medium-frequency macropores.

A/B (40-62 cm): dusty clay, dark gray brown (10 YR 3/2.5) wet, gray brown (10 YR 4/3) dry, well-developed subangular polyhedral, friable, moderately plastic, moderately

cohesive, loose, frequent medium macropores, frequent thin grassy roots, gradual transition.
Bv (62-113 cm): clay loam, dark brown (10 YR 3/3) wet, brown (10 YR 5/3) dry, medium-high polyhedral moderately developed, moderately cohesive, loose, medium frequent macropores.
B/C (113-156 cm): clay loam, dark yellowish brown (10 YR 4/3) wet, brown (10 YR 5/4) dry, large subangular polyhedral, poorly developed, friable, weak plastic, weak adhesive, weak compact, rare medium macropores.
Ck (156-180 cm): medium clay, dark yellowish brown (10 YR 4/4) wet, yellowish brown (10 YR 6/3) dry, loose, friable, moderately plastic, moderately adhesive, loose, macroporous medium rare, medium to strong effervescence.

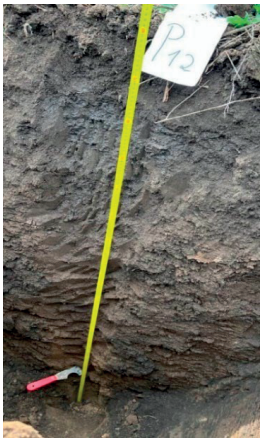

Figure 1. Cambic Phaeozem

n profile 1, from the Ap horizon to the B/C horizon, the soil reaction is neutral and down the profile up to 180 cm, the reaction is weakly alkaline. Mobile phosphorus has a value of 64 ppm and is well supplied to the soil. Mobile potassium having the value of 160 ppm, good supply (Table 1). The humus has a good supply and humus reserve is 251 t/ha, very high, and does not penalize the credit score. The soil texture is medium, dusty clay up to the A/B horizon, fine texture with a clay percentage greater than 32% in the Bv and B/C horizon, and medium texture in the Ck horizon. It is a profile with carbonates at 156 cm.
For the US 1 profile, evaluation marks 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 points and fall into the 2nd quality class 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 depth of the hydrostatic level of the phreatic water is located at a very deep depth (> 10 m), contributing to the reduction of the evaluation marks with a coefficient of 0.8 for all crops. The evaluation marks for the eight crops is 64 points and falls into the 2nd quality class and the 4th favorability class (Table 2).

Table 1. The maine 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_2O)	$CaCO_3$ (%)	Humus (%)	P_{AL} (ppm)	K_{AL} (ppm)
Ap	0-19	1.23	29.30	37.80	31.67	LP	7.2	-	4.50	64	160
Am	19-40	1.23	30.80	37.24	31.73	LP	7.0	-	4.22	-	-
A/B	40-62	0.99	31.48	31.20	36.33	LP	6.9	-	3.74	-	-
Bv	62-113	1.26	30.86	31.22	36.66	LA	6.9	-	-	-	-
B/C	113-156	0.92	36.68	30.82	31.58	LA	6.9	-	-	-	-
Ck	156-180	1.23	29.30	37.80	31.67	LM	7.7	9.4	-	-	-

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	$CaCO_3$ 61	pH 63	EV 133	HR 144	EM 181	EM
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 $CaCO_3$ content-61, soil pH-63, edaphic volume-133, humus reserve-144, surface soil moisture excess -181

Profile 2 - Proxicalcaric Chernozem
Latitude: N: 44°16'02"
Longitude: E: 27°28'07"
Major relief unit: Romanian Plain
Unit: Bărăganului Plain
Parental material: carbonate loessoid deposits
Groundwater: 4-5 m
Current use: Arable
Representative profile: 17

Morphological characterization (Figure 2)
Ap (0-15 cm): medium clay, very dark brown (10 YR 3/2) wet, dark grayish brown (10 YR 4/2) dry, small polyhedral structure, friable, weakly cohesive, weak plastic, weak adhesive, weak compact, loose, rare medium pores, rare thin grass roots, weak effervescence, coprolites, clear passage.
Am (15-45 cm): medium clay, very dark brown (10 YR 3/2) in wet condition, dark brown (10 YR 4/2) in dry condition, fine-grained medium-developed, friable, moderately cohesive, moderately plastic, moderately sticky, weak compact, loose, frequent medium pores, rare thin grassy roots, weak to medium effervescence, gradual transition.
A/C (45-125 cm): dusty clay, very dark grayish brown (10 YR 3/3) when wet, dark grayish brown (10 YR 4/3) when dry, polyhedral structure not developed, friable, moderately cohesive, good plastic, good adhesive, loose, frequent medium pores, rare grassy roots, medium effervescence, gradual transition.
Ck (125-150 cm): dusty clay, dark yellowish brown (10 YR 5/4) in wet state, yellowish brown (10 YR 7/3) in dry state, weakly eroded, weak, weakly plastic, weakly adhesive, moderately compact, poorly cemented, rare small pores, strong mass effervescence.
The pH increases in the depth of the profile from 7.6 to 8.0, the reaction being weakly alkaline. The supply of humus is average with values of 2.6%-1.82% in the first 55 cm (Table 3). Mobile phosphorus at the depth of 0-20 cm has a value of 61 ppm, which means that the soil is well supplied. And mobile potassium having a value of 400 ppm, very well supplied. The texture is medium, medium clay between 0-33 cm and from 33-125 cm it is medium texture, dusty clay.
The humus reserve is 155 t/ha, medium, from where it penalizes all crops by 0.9, lowering the evaluation marks.

Figure 2. Proxicalcaric Chernozems

Following the calculation of evaluation marks, 81 points were obtained for: wheat, barley, sunflower, peas and beans, falling into the 1st quality class and the 2nd favorability class. Maize and soybeans fall into the 2nd quality class and the 3rd class of favorability. The potato crop has 50 evaluation marks, being in the 3rd quality class and the 6th favorability class, as well as the beet crop, which ranks with 57 credit rating points, in the 3rd class of qualities and the 5th of favorability (Table 4).
The depth of the hydrostatic level of the phreatic water is located at medium depth (3-5 m), does not penalize the rating.
The evaluation marks for the eight crops is 72 points and falls into the 2nd quality class and the 3rd favorability class.

Table 3. The maine 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_2O)	$CaCO_3$ (%)	Humus (%)	P_{AL} (ppm)	K_{AL} (ppm)
Ap	0-20	0.55	37.33	30.92	31.20	LL	7.6	1.8	2.6	61	400
Am	20-33	0.59	38.57	29.80	31.04	LL	7.8	9.4	2.2	-	-
A/C1	33-55	0.66	33.24	36.29	29.81	LP	7.8	8.0	1.82	-	-
A/C2	55-88	0.44	33.60	35.20	30.76	LP	8.0	14.6	-	-	-
Cca	88-125	0.58	35.00	34.80	29.62	LP	8.0	14.8	-	-	-

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	$CaCO_3$ 61	pH 63	EV 133	HR 144	EM 181	EM
Wheat	1	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	81
Barley	1	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	81
Maize	1	0.8	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	72
Sunflower	1	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	81
Potato	0.8	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	50
Sugar beet	0.9	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	57
Soybean	0.9	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	73
Peas/Beans	1	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	81

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 $CaCO_3$ content-61, soil pH-63, edaphic volume-133, humus reserve-144, surface soil moisture excess -181

Profile 3 - Mollic Gleyic Alluviosol
Latitude: N: 44°11'38"
Longitude: E: 27°25'54"
Major relief unit: Romanian Plain
Unit: Bărăganului Plain
Parental material: carbonate loessoid deposits
Groundwater: 2-3 m
Current use: Arable
Representative profile: 22

Morphological characterization (Figure 3)
Ap (0-17 cm): medium clay, dark brown (10 YR 3/2) when wet, brown (10 YR 4/3) when dry, moderately developed granular structure, moist, slightly cohesive, slightly plastic, slightly adhesive, slightly compact, rare medium-sized macropores, dense thick grass roots, moderate effervescence, clear straight transition.
Am (17-30 cm): medium clay, brown (10 YR 3/2) when wet, pale brown (10 YR 4/3) when dry, small weakly developed angular polyhedral structure, moist, slightly plastic, slightly adhesive, slightly compact, frequent medium-sized macropores, moderate effervescence, gradual transition.
A/CGo (30-46 cm): medium clay, dark yellowish-brown (10 YR 3/4) with olive brown spots (2.5 Y 4/4) when wet, yellowish-brown (10 YR 5/4) with light olive brown spots (2.5 Y 5/4) when dry, moist, slightly compacted, slightly plastic, slightly adhesive, slightly compact, rare medium-sized macropores, strong effervescence, gradual transition.
CGo (46-106 cm): medium clay, yellowish-brown (10 YR 5/6) with frequent olive spots (5 Y 4/3) when wet, yellowish-brown (10 YR 5/8) with frequent olive spots (5 Y 5/3) when dry, weakly developed polyhedral structure, moist, medium plasticity, medium adhesiveness, medium compactness, 10% oxidation spots, strong effervescence throughout, gradual transition.
CGo (106-125 cm): medium clay, yellowish-brown (10 YR 5/8) with frequent olive spots (5 Y 5/6) when wet, brownish-yellow (10 YR 5/8) with frequent pale olive spots (5 Y 6/3) when dry, polyhedral structure, 6-10% oxidation spots, slightly plastic, slightly adhesive, medium compactness, strong effervescence throughout.

Figure 3. Mollic Gleyic Alluviosol

For the Mollic Gleyic Alluviosol with medium clay texture, the annual average temperature is very high - 11.5°C, while the annual average precipitation is low - 475 mm.
The pH values increase with depth, ranging from 7.6 to 8.0, indicating a slightly alkaline reaction. The humus supply is medium, with values between 3.50% and 1.92% in the first 46 cm (Table 5). Available phosphorus, at a depth of 0-17 cm, has a value of 63 ppm, meaning the soil is very well supplied. The potassium supply is good (196 ppm).

The texture is medium clay throughout the soil profile. The groundwater level is shallow (2-3 m), which contributes to a reduction in the evaluation marks. with a coefficient of 0.9 for crops such as wheat, barley, beans, potatoes, soybeans, peas, and other legumes.
The humus reserve is 170 t/ha, which is moderate, leading to a penalty for all crops, with a coefficient of 0.9, lowering the evaluation marks.
Evaluation marks were calculated for the eight crops: for wheat, barley, sunflower, peas and beans, 73 points were obtained, falling into the 2nd quality class and the 3rd favorability class. Maize is in the 2nd quality class with 72 credit rating points and in the 3rd favorability class. Soy falls in the 3rd quality class with 66 credit rating points and in the 4th favorability class. The potato crop is the most penalized, with 45 points falling into the 3rd quality class and the 6th favorability class, as well as the beet crop, which falls with 57 evaluation marks, into the 3rd quality class and the 5th favorability class.
The evaluation marks for the eight crops is 67 points and falls into the 2nd quality class and the 4th favorability class (Table 6).

Table 5. The maine 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_2O)	$CaCO_3$ (%)	Humus (%)	P_{AL} (ppm)	K_{AL} (ppm)
Ap	0-17	0,16	43,08	31,264	25,50	LL	7.6	5.4	3.50	63	196
Am	17-30	0,09	46,58	27,636	25,70	LL	7.6	10.2	2.44	-	-
A/Go	30-46	0,13	53,07	20,706	26,10	LL	7.6	12.4	1.90	-	-
Go	46-106	0,120	57,06	16,12	26,70	LL	7.9	14.0	-	-	-
CGo	106-125	0,821	56,23	16,04	26,90	LL	8.0	20.0	-	-	-

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	$CaCO_3$ 61	pH 63	EV 133	HR 144	EM 181	EM
Wheat	1	0.9	1	1	1	1	1	1	1	0.9	1	1	1	1	1	0.9	1	73
Barley	1	0.9	1	1	1	1	1	1	1	0.9	1	1	1	1	1	0.9	1	73
Maize	1	0.8	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	72
Sunflower	1	0.9	1	1	1	1	1	1	1	0.9	1	1	1	1	1	0.9	1	73
Potato	0.8	0.7	1	1	1	1	1	1	1	0.9	1	1	1	1	1	0.9	1	45
Sugar beet	0.9	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	57
Soybean	0.9	0.9	1	1	1	1	1	1	1	0.9	1	1	1	1	1	0.9	1	66
Peas/Beans	1	0.9	1	1	1	1	1	1	1	0.9	1	1	1	1	1	0.9	1	73

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 $CaCO_3$ content-61, soil pH-63, edaphic volume-133, humus reserve-144, surface soil moisture excess -181

Profile 4 - Calcaric Alluviosol
Latitude: N: 44°08'21"
Longitude: E: 27°27'00"
Major relief unit: Romanian Plain
Unit: Bărăganului Plain
Parental material: carbonate loessoid deposits
Groundwater: 4-5 m
Current use: Arable
Representative profile: 31

Morphological characterization (Figure 4)
Ap (0-19 cm): fine sandy loam, light brown (10 YR 3/2) when moist, brown (10 YR 4/3) when dry, structure destroyed by agricultural work, loose, weakly cohesive, slightly plastic, weakly adhesive, weakly compact, small macropores, moderate effervescence, clear transition.
Ao (19-38 cm): fine sandy loam, brown (10 YR 3/2) when moist, brown (10 YR 5/3) when dry, fresh, with thin grass roots, structureless, slightly plastic, weakly compact, rare small macropores, gradual transition.
A/Go (38-59 cm): fine sandy loam, pale brown (10 YR 4/4) when moist, yellowish brown (10 YR 5/4) when dry, with grayish brown spots (2.5 Y 5/2) when moist, light grayish brown (2.5 Y 6/2) when dry, polyhedral structure, rare thin grass roots, friable, moderately cohesive, slightly plastic, moderately adhesive, rare medium macropores, moderate effervescence, gradual transition.
Go1 (59-75 cm): fine loamy sand, dark yellowish brown (10 YR 4/4) when moist, yellowish brown (10 YR 5/4) when dry, with

light gray spots (2.5 Y 6/4) when moist and olive yellow (2.5 Y 6/6) when dry, polyhedral structure, slightly plastic, weakly adhesive, moderately compact, weak effervescence.
Go2 (75-98 cm): sandy loam, dark brown (10 YR 3.5/3) when moist, brown (10 YR 4/3) when dry, medium-large subangular polyhedral structure, fresh, friable, moderately plastic, moderately adhesive, moderately compact, frequent medium macropores, 10% oxidation spots, moderate effervescence, rare thin grass roots.
CGo 1 (98-125 cm): coarse sand, yellowish brown (10 YR 6/5) when moist, yellowish (10 YR 6/6) when dry, slightly plastic, weakly adhesive, weakly compact, rare small macropores, moderate effervescence.
CGo 2 (125-150 cm): medium sandy loam, yellowish brown (10 YR 6/5) when moist, yellowish (10 YR 6/6) when dry, slightly plastic, weakly adhesive, weakly compact, rare small macropores, strong effervescence.

Figure 4. Calcaric Alluviosol

For the Calcaric Alluviosol with sandy loam texture, the average annual temperature is very high, reaching 11.5°C, while the average annual precipitation is low, at 475 mm.
The pH increases with soil depth, ranging from 7.3 to 7.8, indicating a slightly alkaline reaction. The humus supply is moderate, with values between 2.69% and 1.87% in the upper part of the profile. The mobile phosphorus content at a depth of 0-19 cm is 38 ppm, indicating a good phosphorus supply. The potassium supply is very good, reaching 360 ppm (Table 7).
The soil texture is sandy loam throughout the entire profile. The groundwater table is at a moderate depth (3-5 m), which does not affect the evaluation marks.
The humus reserve is 141 t/ha, classified as moderate, introducing penalties for all crops. The penalization coefficient is 0.9, reducing the evaluation marks.
Evaluation marks were calculated for the eight crops: in the case of wheat, barley, sunflower, peas and beans crops, 81 points were obtained, falling into the 1st quality class and the 2nd favorability class. Maize is in the 2nd quality class with 72 credit rating points and in the 3rd favorability class. Soya falls in the 2nd quality class with 73 credit rating points and in the 3rd favorability class. The highest penalties were recorded for the potato crop, with a score of 50 points, falling in the 3rd quality class and in the 4th class of favorability, as well as for the beet crop, which, with 57 credit points, falls into the 3rd class of quality and the 5th class of favorability. The evaluation marks, for the eight crops, is 72 points, the land falling into the 2nd quality class and the 3rd favorability class (Table 8).

Table 7. The maine 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_2O)	$CaCO_3$ (%)	Humus (%)	P_{AL} (ppm)	K_{AL} (ppm)
Ap	0-19	1.81	64.43	15.16	18.60	LP	7.3	-	2.69	38	360
Ao	19-38	1.61	60.59	20.32	17.50	LP	7.4	1.8	2.16	-	-
A/Go	38-59	4.07	60.69	12.64	16.60	LP	7.5	9.4	1.97	-	-
Go1	59-75	1.46	76.62	13.52	10.40	LP	7.7	8.0	-	-	-
Go2	75-98	3.14	52.59	25.07	19.20	LP	7.6	14.6	-	-	-
CGo1	98-125	45.77	46.65	2.98	41.60	LP	7.8	14.8	-	-	-
CGo2	125-150	2.80	60.89	19.11	17.20	LP	7.8	-	-	-	-

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	$CaCO_3$ 61	pH 63	EV 133	HR 144	EM 181	EM
Wheat	1	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	81
Barley	1	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	81
Maize	1	0.8	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	72
Sunflower	1	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	81
Potato	0.8	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	50
Sugar beet	0.9	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	57
Soybean	0.9	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	73
Peas/Beans	1	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	81

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 $CaCO_3$ content-61, soil pH-63, edaphic volume-133, humus reserve-144, surface soil moisture excess -181

Soil Suitability and Recommendations for Agriculture in Roseți Commune

Based on the obtained evaluation marks, the most favorable soils for agriculture are the Proxicalcaric Chernozem and Calcaric Alluviosol. The Cambic Phaeozem and Mollic Gleyic Alluviosol are more vulnerable to the influence of groundwater, which affects their suitability for certain crops. This geomorphological diversity highlights the need to adapt agricultural practices based on the specific characteristics of each soil to ensure a sustainable and efficient use of natural resources (Figure 5).

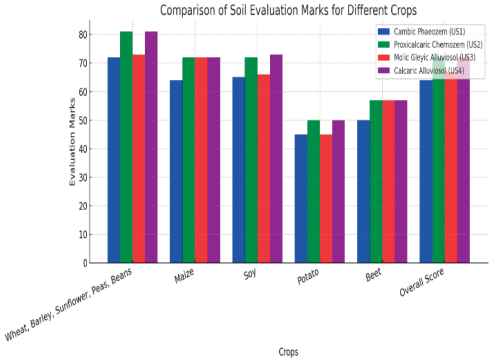

Figure 5. Comparison of soil evaluation marks for different crops

CONCLUSIONS

The studied area represents the terrace area of The Roseți commune is located in southeastern Romania, in Călărași County, benefiting from a lowland plain relief characterized by the presence of floodplain and terrace lands. The floodplain area is situated near the Danube River, containing fertile alluvial soils, which are prone to periodic flooding and are predominantly used for agriculture. The terrace area includes Cambic Phaeozem and Proxicalcaric Chernozem soils, which have moderate to high fertility, making them suitable for cereal crops, viticulture, and fruit growing.

Analyzing the four soil units in this area, significant differences can be observed regarding fertility, texture, and the influence of groundwater on agricultural land quality:

Cambic Phaeozem (US1) - The general evaluation marks is 64 points. This soil has good fertility, with a high humus reserve (251 t/ha). It is favorable for crops such as wheat, barley, and sunflower, but less suitable for potato and sugar beet, which score below 50 points. The groundwater level is over 10 meters, having a minimal impact on the soil.

Proxicalcaric Chernozem (US2) - This soil unit has the highest evaluation marks of 72 points due to its high fertility, providing optimal conditions for plant growth. It is suitable for most crops, with slight penalties for potato and sugar beet. The groundwater level is 3-5 meters, without negatively affecting the bonitation scores.

Mollic Gleyic Alluviosol (US3) - The general evaluation marks is 67 points, and the soil is well supplied with nutrients. However, the shallow groundwater depth (2-3 meters) penalizes evaluation marks for most crops. It is favorable for wheat, barley, and sunflower, but less suitable for potato and sugar beet.

Calcaric Alluviosol (US4) - The general evaluation marks is 72 points, and the soil has high natural fertility. However, the sandy texture negatively affects its water retention capacity, making it suitable for crops with moderate moisture requirements. Potato

cultivation records the lowest evaluation marks, and sugar beet also has reduced suitability.

Recommended measures for soil quality improvement and increased crop yields:

- applying sulfur or gypsum amendments to correct alkaline reactions;
- using organic fertilizers to increase the humus reserve, improving soil structure;
- performing soil loosening operations to enhance soil permeability;
- ensuring an adequate drainage system to mitigate the negative impact of shallow groundwater levels.

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