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IDENTIFICATION AND CHARACTERIZATION OF SOIL RESOURCES SPECIFIC TO THE FLOODPLAIN AREA OF ROSEȚI COMMUNE, CĂLĂRAȘI COUNTY

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Abstract

The primary objective of this research is to evaluate the possibilities of maintaining the optimal natural potential of soils within a sustainable land use framework. This involves assessing the land's capacity to support various agricultural activities without compromising natural resources while ensuring long-term soil fertility. In the studied area, the floodplain of Roseți Commune, Călărași County, four main soil types were identified: Alluvisols, Gleysols, Psamosols and Anthrosols. These soils reflect ecological diversity and pedological conditions specific to floodplain areas, exhibiting a slightly alkaline pH (7.2-7.6). Alluvisols are fertile soils formed through alluvial deposits and have a moderate humus content (3.92%). In contrast, Gleysols are characterized by poor drainage and intense gleying processes due to high moisture excess, with a low humus content (1.68%). Psamosols, with a high sand content, have a reduced water retention capacity and a moderate humus supply (2.56%), whereas Anthrosols are soils modified by human activity. The identified soils are well supplied with phosphorus (65-71 ppm) and potassium (160-360 ppm), ensuring the agricultural and ecological potential of the region.

Key words*: soil, evaluation marks, quality class.*

INTRODUCTION

Land evaluation is a crucial aspect of natural resource management, playing a fundamental role in the efficient and sustainable use of agricultural, forestry, and urban land. In a context marked by climate change and increasingly diverse economic demands, the importance of this activity has grown significantly.

According to the Food and Agriculture Organization of the United Nations (FAO, 1976), land evaluation is defined as "a process by which the performance of a given land area is assessed in relation to specific uses, through the analysis of environmental, social, and economic factors." This definition was later refined by experts such as Sys et al. (1991), who emphasized that land evaluation involves "a detailed analysis of soil, climate, and topographical characteristics to determine the most suitable use of the land."

The land evaluation process considers not only physical aspects but also socio-economic elements. According to Bouma (2002), "decisions regarding land use must incorporate both the natural characteristics of the soil and the economic and social factors that influence its viability." In Romania, this process is known as "bonitation" and is used to determine the productive potential of agricultural land. Based on the methodology developed by ICPA Bucharest (1987), land is classified according to pedological, agrochemical, and climatic characteristics to establish its suitability for various crops.

Another key concept in land evaluation is the suitability of land for specific agricultural crops. As Dudal (1976) states, "land is considered suitable for a crop if it meets the crop's requirements under normal climatic conditions and with the application of standard technologies". This approach aligns with that of Klingebiel and Montgomery (1961), who defined suitability as "the extent to which land can support specific uses without requiring excessive technological interventions."

Thus, land evaluation is not merely a technical analysis of soil but a complex and interdisciplinary process, essential for the

sustainable development of agriculture and effective territorial planning.

MATERIALS AND METHODS

The soil study was conducted in two distinct phases: the field phase and the office phase, each involving specific activities for the analysis and evaluation of soil properties.

Field Phase

This stage involved activities carried out directly in the analyzed area, aimed at collecting data and samples necessary for soil evaluation. The main operations performed included:

- General examination of the land and its natural context;
- Investigation of soil profiles, correlating data with pedogenetic factors and existing agricultural conditions;
- Detailed description of soil morphological characteristics;
- Sampling for laboratory analysis.

To determine the main soil properties, the following analytical methods were applied:

- pH determination using the potentiometric method, with a soil-to-water ratio of 1:2.5;
- Mobile phosphorus analysis using the Egner-Riehm-Domingo method, based on ammonium acetate-lactate extraction;
- Mobile potassium determination using the same technique as for phosphorus;
- Humus content evaluation through the modified Walkley-Black method (Gogoasă modification);
- Base saturation degree calculation (V, %) by determining hydrolytic acidity and the sum of exchangeable base cations;
- Granulometric analysis using the Kacinsky method to establish soil fraction proportions.

Office Phase

In this stage, the data collected in the field were processed and interpreted to obtain a clear understanding of soil characteristics. The main activities conducted were:

- Delimiting soil territorial units (STUs) and classifying them according to the Romanian Soil Taxonomy System (SRTS, 2012) at both higher (type, subtype) and lower levels (variety, granulometric species, family, variant);
- Analyzing and describing soil territorial units based on field observations and laboratory results, including physico-chemical and morphological properties;
- Evaluating agricultural land using the methodology of the Research Institute for Soil Science and Agrochemistry (ICPA), with the aim of assigning bonitation scores and classifying land according to its suitability for various agricultural crops;
- Establishing land quality classes in accordance with specific agricultural uses.

Through this methodological approach, a detailed characterization of the soil was obtained, essential for sustainable land use and the optimization of agricultural practices.

RESULTS AND DISCUSSIONS

The floodplain area of Roseți Commune is located within the Danube Floodplain and is characterized by low-lying relief, dominated by marshy lands, fluvial ridges, and depressions. The predominant soils are Alluvisols, which can be weakly developed, incompletely developed, or well-developed but relatively young, formed through the deposition of alluvial sediments transported by the Danube. These soils are fertile and favorable for agriculture; however, they were historically subject to frequent flooding.

Climate and Aeolian Regime

The region has a temperate-continental climate, with hot, dry summers and cold winters. The average annual temperatures range between 10-11°C, while in July, the Danube's water temperatures can reach 25-28°C. During winter, the probability of ice formation is 83%, and ice bridges can lead to rising water levels and flooding.

The aeolian regime is influenced by local characteristics such as micro-relief and soil texture. The alluvial sands on ridges and flat surfaces warm up more rapidly in summer, leading to increased evaporation and a soil moisture deficit between June and October.

Precipitation

The average annual precipitation ranges between 450 and 550 mm, but its distribution is uneven. The moisture deficit is more

pronounced in sandy soils, where water infiltrates rapidly, whereas medium-textured soils retain moisture more effectively.

Hydrology

The hydrological regime of the area is determined by the Danube and its branches, Borcea and Rău. Hydrological studies indicate that the average slope gradient of the Danube and Borcea is 45 mm/km, while the Rău Branch has a steeper gradient.

The water flow velocity varies as follows:

- Borcea Branch: minimum 0.37 m/s, average 0.80 m/s, maximum 1.03 m/s;
- Danube: minimum 0.88 m/s, average 1.05 m/s, maximum 1.30 m/s;
- Rău Branch: minimum 1.19 m/s, average 1.28 m/s, maximum 1.36 m/s.
- The water discharge (in cm^3/s) follows this order:
- Borcea Branch: minimum 200, average 700, maximum 3,250;
- Rău Branch: minimum 1,700, average 3,100, maximum 6,750;
- Danube: minimum 2,650, average 6,150, maximum 15,800.

The average amplitude of the Danube's water level reaches 5-6 m but can exceed 8.8 m during floods. The annual sediment transport is estimated at approximately 70-80 million tons.

Following hydrotechnical works for embankment and drainage, flooding has been controlled, and excess water from precipitation and river overflow is discharged through an open-channel drainage network. In addition to drainage, irrigation is essential for maintaining agricultural productivity by ensuring a controlled water supply tailored to soil characteristics and existing crops.

Vegetation and Land Use

Embankment and drainage have significantly transformed the floodplain, allowing the expansion of agricultural land. Natural vegetation has largely been replaced by cultivated crops; however, wetland areas still support specific species such as common reed (*Phragmites australis*), cattail (*Typha* spp.), sedge (*Carex* spp.), as well as trees like willows (*Salix* spp.) and poplars (*Populus* spp.).

Currently, maize (*Zea mays*) is the dominant crop due to the soil's natural fertility, irrigation, and the beneficial influence of the groundwater table. Additionally, wheat (*Triticum aestivum*), sunflower (*Helianthus annuus*), sugar beet (*Beta vulgaris*), and soybean (*Glycine max*) are cultivated, taking advantage of the floodplain's favorable conditions.

Profile 1 - Mollic Gleyic Alluviosols
Latitude - N: 44°09'44"
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: 27

Morphological characterization (Figure 1)

Apk (0-18 cm): sandy clay, grayish-brown (10 YR 5/2) when moist, light grayish-brown (10 YR 6/2) when dry, slightly moist, structure disturbed by agricultural activities, friable, weakly cohesive, slightly plastic, weakly adhesive, rare small macropores, frequent thin herbaceous roots, strong effervescence, clear and sharp transition.

Am (18-32 cm): clayey loam, brown (10 YR 5/3) when moist, pale brown (10 YR 6/3) when dry, slightly moist, small granular structure, friable, weakly cohesive, slightly plastic, weakly adhesive, weakly compact, rare small macropores, frequent thin herbaceous roots, strong effervescence, gradual transition.

Go (32-68 cm): clayey loam, yellowish-brown (10 YR 3/4) when moist, yellowish-brown (10 YR 5/4) when dry, massive, dry, weakly compact, weakly cohesive, slightly plastic, rare thin herbaceous roots, strong effervescence, gradual transition.

Gr (68-118 cm): sandy clay loam, yellowish-brown (10 YR 5/4) with olive spots (2.5 Y 4/4) when moist, light yellowish-brown (10 YR 6/4) with light olive-brown spots (2.5 Y 5/4) when dry, massive, weakly compact, weakly cohesive, slightly plastic, strong effervescence throughout, gradual transition.

CkGr (118-150 cm): fine sandy loam, brownish-yellow (10 YR 6/6) with light olive-brown spots (2.5 Y 5/4) when moist, brownish-yellow (10 YR 6/8) with light olive spots (2.5 Y 5/6) when dry, slightly moist, massive, weakly compact, weakly cohesive, slightly plastic, strong effervescence throughout.

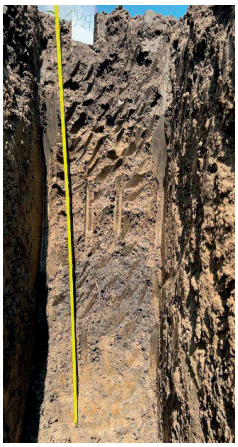

Figure 1. Mollic Gleyic Alluviosols

The soil reaction is slightly alkaline, with pH increasing from 7.2 at the surface to 7.7 at deeper layers. The humus supply is moderate, ranging from 3.92% to 2.16% in the upper layers of the profile. The mobile phosphorus content at 0-18 cm is 71 ppm, indicating a well-supplied soil, while mobile potassium is 160 ppm, also demonstrating sufficient potassium levels (Table 1).

The soil profile consists of varying textures, including sandy clay, clayey loam, and sandy loam. The shallow groundwater table (2-3 m) has a slight impact on evaluation scores. The humus reserve is high, at 210 t/ha, which positively influences the soil's evaluation.

Evaluation scores for several crops are as follows:

Wheat, barley, sunflower, peas, and beans: 81 points, placing them in the 1st quality class and the 2nd favorability class.

Corn: 80 points, placing it in the 2nd quality class and the 3rd favorability class.

Soybean: 73 points, placing it in the 2nd quality class and the 3rd favorability class (Table 2).

The potato crop scores the lowest, with 45 points, placing it in the 3rd quality class and the 6th favorability class. Sugar beet scores 57 points, placing it in the 3rd quality class and the 5th favorability class.

The average evaluation for all eight crops is 72 points, classifying the land in the 2nd quality class and the 3rd favorability class.

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	0-18	0.43	48.23	13.04	38.30	TN	7.2	-	3.92	71	160
Am	18-32	0.34	46.42	18.94	34.30	TT	7.3	9	3.88	-	-
Go	32-68	0.57	42.73	22.00	34.70	SF	7.4	14	2.16	-	-
Gr	68-118	0.59	60.24	19.57	19.60	SF	7.6	9.8	-	-	-
CGr	118-150	1.17	62.58	17.85	18.40	SF	7.7	16.4	-	-	-

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	0.9	1	1	1	1	1	1	1	81
Barley	1	0.9	1	1	1	1	1	1	1	0.9	1	1	1	1	1	1	1	81
Maize	1	0.8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	80
Sunflower	1	0.9	1	1	1	1	1	1	1	0.9	1	1	1	1	1	1	1	81
Potato	0.8	0.7	1	1	1	0.9	1	1	1	0.9	1	1	1	1	1	1	1	45
Sugar beet	0.9	0.7	1	1	1	0.9	1	1	1	1	1	1	1	1	1	1	1	57
Soybean	0.9	0.9	1	1	1	1	1	1	1	0.9	1	1	1	1	1	1	1	73
Peas/Beans	1	0.9	1	1	1	1	1	1	1	0.9	1	1	1	1	1	1	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 2 - Calcaric Gleysols
Latitude - N: 44°09'25"
Longitude - E: 27°29'17"
Major relief unit: Romanian Plain
Unit: Bărăganului Plain

Parental material: carbonate loessoid deposits
Groundwater: 1-2 m
Current use: Arable
Representative profile: 43

Figure 2. Calcaric Gleysols

Morphological characterization (Figure 2)
Apk (0-20 cm): clay loam, grayish-brown (10 YR 5/2) when moist, light grayish-brown (10 YR 6/2) when dry, structure partially disturbed by agricultural activities, moist, friable, slightly plastic, slightly adhesive, weakly compact, few medium macropores, thin herbaceous roots, moderate effervescence, clear and sharp transition.
Aok Go (20-46 cm): clay loam, brown (10 YR 4/3) with olive-brown mottles (2.5 Y 4/4) when moist, pale brown (10 YR 6/3) with light olive-brown mottles (2.5 Y 5/4) when dry, moist, structureless, friable, moderately plastic, moderately adhesive, compact, frequent thin herbaceous roots, frequent medium macropores, strong effervescence, gradual transition.
Grk1 (46-58 cm): clay loam, dark yellowish-brown (10 YR 5/4) with frequent olive mottles (5 Y 4/3) when moist, yellowish-brown (10 YR 5/4) with frequent olive mottles (5 Y 4/4) when dry, polyhedral structure, moist, moderately plastic, moderately adhesive, weakly compact, rare thin herbaceous roots, strong effervescence, gradual transition.
Gr2 (58-125 cm): clay loam, yellowish-brown (10 YR 5/6) with frequent olive mottles (5 Y 5/3) when moist, pale yellowish-brown (10 YR 6/4) with frequent pale olive mottles (5 Y 6/3) when dry, massive structure, moist, hard, moderately plastic, moderately cohesive, moderately compact, rare thin herbaceous roots, few medium macropores, strong effervescence throughout the matrix, gradual transition.
CkGr (125-150 cm): clay loam, yellowish-brown (10 YR 5/8) with frequent olive mottles (5 Y 5/6) when moist, brownish-yellow (10 YR 6/8) with frequent pale olive mottles (5 Y 6/4) when dry, massive structure, wet, hard, moderately plastic, moderately adhesive, weakly compact, few medium macropores, strong effervescence throughout the matrix.
Soil Properties and Evaluation. The pH increases along the soil profile, from 7.2 at the surface to 7.6 at deeper layers, indicating a slightly alkaline reaction. The humus content is low, ranging from 1.92% to 0.52% in the first 95 cm of the profile (Table 3). Mobile phosphorus at a depth of 0-20 cm is 66 ppm, showing the soil is well-supplied with this nutrient, while mobile potassium is 180 ppm, also indicating sufficient potassium availability.
Soil Suitability for Agriculture. The soil profile consists entirely of clay loam. The shallow groundwater table (1-2 m) negatively affects the evaluation marks for this area. The humus reserve is low at 92 t/ha, which also impacts the soil's agricultural potential.
Evaluation scores for various crops are as follows:
Wheat and barley: 43 points, placing them in the 3rd quality class and 6th favorability class.
Corn: 45 points, also in the 3rd quality class and 6th favorability class.
Soybeans: 39 points, placing them in the 4th quality class and 7th favorability class.
Potatoes: 21 points, placing them in the 4th quality class and 8th favorability class.
Sugar beet: 28 points, also in the 4th quality class and 8th favorability class.
Sunflower, peas, and beans: 50 points, placing them in the 3rd quality class and 6th favorability class (Table 4).
The overall evaluation for all eight crops is 40 points, classifying the land in the 4th quality class and 7th 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	0.54	44.26	17.00	38.20	TT	7.2	-	1.92	66	180
Ao	20-46	0.45	46.05	16.20	37.30	TT	7.2	-	1.68	-	-
Gr1	46-95	0.22	34.00	30.58	35.20	TT	7.2	-	0.52	-	-
Gr2	95-121	0.13	38.55	26.62	34.70	TT	7.4	7.0	-	-	-
CGr	121-150	17.48	72.82	9.70	10.60	TT	7.6	16.2	-	-	-

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	$CaCO_3$ 61	pH 63	EV 133	HR 144	EM 181	EM
Wheat	1	0.9	1	1	1	1	1	1	1	0.6	1	1	1	1	0.8	1	1	43
Barley	1	0.9	1	1	1	1	1	1	1	0.6	1	1	1	1	0.8	1	1	43
Maize	1	0.8	1	1	1	1	1	1	1	0.7	1	1	1	1	0.8	1	1	45
Sunflower	1	0.9	1	1	1	1	1	1	1	0.7	1	1	1	1	0.8	1	1	50
Potato	0.8	0.,7	1	1	1	0.9	1	1	1	0.6	1	1	1	1	0.7	1	1	21
Sugar beet	0.9	0.7	1	1	1	0.9	1	1	1	0.7	1	1	1	1	0.7	1	1	28
Soybean	0.9	0.9	1	1	1	1	1	1	1	0.6	1	1	1	1	0.8	1	1	39
Peas/Beans	1	0.9	1	1	1	1	1	1	1	0.7	1	1	1	1	0.8	1	1	50

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 - Anthrosols
Latitude - N: 44°09'52"
Longitude - E: 27°28'41"
Major relief unit: Romanian Plain
Unit: Bărăganului Plain
Parental material: carbonate loessoid deposits
Groundwater: 1-2 m
Current use: Arable
Representative profile: 42
Morphological characterization (Figure 3)

Figure 3. Anthrosols

Ap (0-15 cm): Clay loam, dark grayish-brown (10 YR 5/2) when moist, light grayish-brown (10 YR 6/2) when dry; composed of transported material, slightly plastic, slightly adhesive, weakly compacted; few medium-sized macropores; numerous fine herbaceous roots; moderate effervescence; distinct and abrupt boundary.
Ao1 (15-28 cm): Clay loam, brown (10 YR 4/3) when moist, pale brown (10 YR 6/3) when dry; moist, polyhedral structure, friable, moderately plastic, moderately adhesive, compacted; numerous fine herbaceous roots; frequent medium-sized macropores; transitional boundary.
Ao2 (28-54 cm): Clay loam, dark yellowish-brown (10 YR 5/4) when moist, yellowish-brown (10 YR 5/4) when dry; moist, polyhedral structure, moderately plastic, moderately adhesive, weakly compacted; few fine herbaceous roots; slight effervescence; gradual boundary.
Go (54-117 cm): Fine sandy clay loam, yellowish-brown (10 YR 5/6) when moist, pale yellowish-brown (10 YR 6/4) when dry; massive structure, moist, hard, moderately plastic, moderately cohesive, moderately compacted; sparse fine herbaceous roots; infrequent medium-sized macropores;

moderate effervescence; gradual boundary. CGo (117-150 cm): Fine sandy clay loam, yellowish-brown (10 YR 5/8) with prominent olive mottles (5 Y 5/6) when moist, yellowish-brown (10 YR 6/8) with noticeable pale olive mottles (5 Y 6/4) when dry; massive structure, wet, hard, moderately plastic, moderately adhesive, weakly compacted; few medium-sized macropores; strong effervescence throughout.

The pH increases with depth, ranging from 7.2 to 7.6, indicating a slightly alkaline reaction. The humus content is relatively low, varying from 1.80% to 0.62% in the upper 54 cm of the soil profile. The available phosphorus concentration (0-15 cm depth) is 69 ppm, categorizing the soil as well-supplied, while the available potassium level (180 ppm) also classifies it as adequately supplied (Table 5). The soil texture changes throughout the profile, transitioning from clay loam and silty clay loam to fine sand. The presence of a shallow groundwater table (1-2 meters) negatively impacts soil assessment scores. The humus reserve is limited (103 t/ha), contributing to a reduction in evaluation marks. Crop suitability assessments indicate that wheat and barley received a score of 43 points, placing them in the third quality category and sixth favorability class. Maize also falls within the third quality category, scoring 45 points, and the sixth favorability class. Soybean is ranked in the fourth quality category with 39 points and the seventh favorability class. Potato cultivation received 24 points, placing it in the fourth quality class and eighth favorability class, whereas sugar beet scored 31 points, situating it in the fourth quality category and seventh favorability class (Table 6). Sunflower, peas, and beans achieved a score of 50 points, classifying them in the third quality category and the sixth favorability class. The overall evaluation score across the eight crops is 41 points, positioning the land in the third quality category and the sixth favorability class.

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	0-15	1.16	52.34	20.20	26.30	LL	7.2	-	1.80	69	180
Ao1	15-28	1.80	50.78	19.82	27.60	LL	7.1	-	1.29	-	-
Ao2	28-54	0.22	49.11	16.17	34.50	TT	7.3	7.6	0.62	-	-
Go	54-117	0.90	58.93	21.67	18.50	NF	7.6	21	-	-	-
CGo	117-150	1.25	57.96	23.39	17.40	NF	7.6	25.0	-	-	-

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	0.6	1	1	1	1	1	0.8	1	43
Barley	1	0.9	1	1	1	1	1	1	1	0.6	1	1	1	1	1	0.8	1	43
Maize	1	0.8	1	1	1	1	1	1	1	0.7	1	1	1	1	1	0.8	1	45
Sunflower	1	0.9	1	1	1	1	1	1	1	0.7	1	1	1	1	1	0.8	1	50
Potato	0.8	0.7	1	1	1	1	1	1	1	0.6	1	1	1	1	1	0.7	1	24
Sugar beet	0.9	0.7	1	1	1	1	1	1	1	0.7	1	1	1	1	1	0.7	1	31
Soybean	0.9	0.9	1	1	1	1	1	1	1	0.6	1	1	1	1	1	0.8	1	39
Peas/Beans	1	0.9	1	1	1	1	1	1	1	0.7	1	1	1	1	1	0.8	1	50

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 - Psamosols
Latitude - N: 44°12'26"
Longitude - E: 27°28'34"
Major relief unit: Romanian Plain
Unit: Bărăganului Plain

Parental material: carbonate loessoid deposits
Groundwater: 2-3 m
Current use: Arable
Representative profile: 36

Figure 4. Psamosols

Morphological characterization (Figure 4)
Aț (0-7 cm): loamy sand, dark grayish brown (10 YR 3/2) when moist, light grayish brown (10 YR 3/2.5) when dry, transported material, slightly plastic, slightly adhesive, weakly compacted, with a few medium-sized macropores, thin herbaceous roots, moderate effervescence, clear and abrupt transition.
Ao (7-36 cm): coarse sand, brown (10 YR 3/3) when moist, pale brown (10 YR 3/3) when dry, compact, with 10% oxidation spots, polyhedral structure, friable, moderately plastic, moderately adhesive, compact, frequent thin herbaceous roots, frequent medium-sized macropores, moderate effervescence, gradual transition.
Go (36-63 cm): coarse sand, dark yellowish brown (10 YR 5/4) when moist, yellowish brown (10 YR 5/4) when dry, polyhedral structure, moist, slightly plastic, slightly adhesive, weakly compacted, rare thin herbaceous roots, weak effervescence, gradual transition.
Gr (63-113 cm): fine sandy clay, yellowish brown (10 YR 5/6) when moist, pale yellowish brown (10 YR 6/4) when dry, massive, moist, hard, moderately plastic, moderately cohesive, moderately compact, moderate effervescence, gradual transition.
CGo (113-150 cm): sandy clay, yellowish brown (10 YR 5/8) with frequent olive spots (5 Y 5/6) when moist, brownish yellow (10 YR 6/8) with frequent pale olive spots (5 Y 6/4) when dry, massive, wet, hard, moderately plastic, moderately adhesive, weakly compacted, few medium-sized macropores, strong effervescence.
The soil reaction is slightly alkaline, with pH ranging from 7.3 to 7.7 as the depth increases. Humus content is low, with values between 2.56% and 1.48% in the first 63 cm of the profile.
Phosphorus availability at 0-7 cm depth is 65 ppm, indicating well-supplied soil, while potassium availability is 360 ppm, classifying the soil as very well-supplied in potassium (Table 7).
The texture varies across the profile, transitioning from loamy sand to coarse sand and sandy clay, which negatively affects evaluation marks for different crops. The shallow groundwater table (2-3 m depth) also contributes to lower evaluation scores. The humus reserve is low, with a value of 120 t/ha, further impacting the evaluation results.
For wheat, peas, and beans, the evaluation score is 32 points, placing them in the 4th quality class and 7th favorability class.
Corn and sunflower are ranked in the 3rd quality class with 45 evaluation points, classified in the 6th favorability class. Soybeans are in the 4th quality class with 29 evaluation points and placed in the 8th favorability class.
Potatoes scored 28 evaluation points, placing them in the 4th quality class and 8th favorability class. Sugar beet received 31 evaluation points, placing it in the 4th quality class and 7th favorability class.
Barley scored 39 points, placing it in the 4th quality class and 6th favorability class (Table 8).
The overall evaluation score for the eight crops is 35 points, classifying the land in the 4th quality class and 7th favorability class.

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)
Aţ	0-7	16.32	64.87	8.61	10.20	UM	7.3	8.8	2.56	65	360
Ao	7-36	9.96	78.63	6.51	4.90	UG	7.7	11.4	1.69	-	-
Go	36-63	11.96	76.57	6.67	4.80	UG	7.7	11.4	1.48	-	-
Gr	63-113	7.93	44.29	13.58	34.20	TN	7.6	13.0	-	-	-
CGr	113-150	2.15	48.61	13.62	35.10	TN	7.7	17.4	-	-	-

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	0.5	1	1	1	0.9	1	1	1	1	1	0.8	1	32
Barley	1	0.9	1	1	1	0.6	1	1	1	0.9	1	1	1	1	1	0.8	1	39
Maize	1	0.8	1	1	1	0.7	1	1	1	1	1	1	1	1	1	0.8	1	45
Sunflower	1	0.9	1	1	1	0.7	1	1	1	0.9	1	1	1	1	1	0.8	1	45
Potato	0.8	0.7	1	1	1	0.8	1	1	1	0.9	1	1	1	1	1	0.7	1	28
Sugar beet	0.9	0.7	1	1	1	0.7	1	1	1	1	1	1	1	1	1	0.7	1	31
Soybean	0.9	0.9	1	1	1	0.5	1	1	1	0.9	1	1	1	1	1	0.8	1	29
Peas/Beans	1	0.9	1	1	1	0.5	1	1	1	0.9	1	1	1	1	1	0.8	1	32

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.

CONCLUSIONS

The Roseți commune, situated in the Danube Floodplain, features a low-relief terrain with fertile alluvial soils, though historically prone to frequent flooding. Soil analysis of the area revealed four distinct soil units: Mollic Gleyic Alluviosols, Calcaric Gleysols, Anthrosols, and Psamosols, each exhibiting unique ecopedological properties that impact their suitability for agricultural use.

Of these four soil units, Mollic Gleyic Alluviosols stands out for its agricultural potential, scoring an average of 72 points, which places it in the 2nd quality class and 3rd favorability class. In contrast, Calcaric Gleysols, Anthrosols, and Psamosols scored lower, with evaluation marks between 35 and 41 points, due to factors such as lower humus content, less favorable soil texture, and a shallow groundwater table.

Alluvial soils in Roseți commune are the most fertile and agriculturally suitable, particularly those classified under Soil Unit 1 (Mollic Gleyic Alluviosols), which demonstrated the highest evaluation marks for major crops and a high humus reserve of 210 t/ha. Conversely, Calcaric Gleysols, Anthrosols, and Psamosols face ecopedological challenges such as lower humus levels (1.92%, 1.80%, and 2.56%, respectively), less ideal texture, and a shallow groundwater table (1-3 m), which makes them less productive.

Crops such as wheat, barley, sunflower, peas, and beans are highly suited to this region, achieving strong evaluation marks across alluvial soils. Potatoes and sugar beet, however, are less suitable and receive low evaluation marks across all soil units due to less favorable ecopedological conditions.

The region holds substantial agricultural potential, but effective soil management practices are necessary to improve soil quality, particularly by boosting humus content and managing moisture levels. To address the identified soil limitations, several improvement strategies are recommended, including:

- Organic fertilization to raise humus levels.
- Drainage systems to manage the groundwater table.
- Strategic crop selection and land use planning to maximize productivity.

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