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Studies pedoameliorative in the Recaş area

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Abstract: This paper presents pedagogical studies carried out in the Recaş area, studies aimed: execution and field study of two soil profiles and determine the type of soil, sampling in profile and physical analyzes of the granulometric composition, density, apparent density, porosity, hydraulic conductivity, infiltration rate and chemical analyzes such as soil reaction (pH), total soluble salts and nutrient content. These analyzes were performed by the methods required by the methodology elaboration soil studies, Vol. I-III, and determining soil type was based on Romanian System of Soil Taxonomy.

Keywords: pedagogical studies, soil profiles, physical and chemical properties

1. INTRODUCTION

The study area is located in digression plain Timis - Bega, at an altitude of 99 m, an overall slope of 0.2-0.5%, in core lithology as substrate alluvial material deposited in layers with cross texture, powdery sand alternating of clay and dust on the thickness of 3-5 m.

Depending on the proximity to the River Bega pedofreatic level is at depths between 1.5 to 3.6 m, affecting soil cover and generating phenomena gleyzation lower intensity or higher.

Approaching the Bega River is the presence in the soil profile of textural stratifications due to deposition of coarse and fine materials, as well as some purple clay horizons - blackish at different depths in the area studied. Clayey horizon there follows a period of excess water stagnant swamp, hundreds of years ago.

Due to the presence of clay horizons, due to parent material and pedogenesis processes, the study area has a very diverse soil cover.

Although the climate is forest steppe, with an average rainfall of 592.6 mm and 28.6 aridity indexes appear stagnation of rain water in the soil profile due to poor soil permeability.

Development of drainage works in the west, since the last century, made the excess water and extreme gleyzation character of some horizons to occur relict.

2. MATERIAL AND METHOD

Studies provided the following aim:

a). execution and field study of two soil profiles and determining soil type;

b). Soil sampling in profile and physical analyzes of the granulometric composition, density, apparent density, porosity, hydraulic conductivity, infiltration rate.

c). Chemical analyzes, such as pH, content of soluble salts, the content of nutrients.

The analytical methods used to study soil profiles are those from the development methodology soil studies and Romanian system of Soil Taxonomy.

On the soil samples collected in natural and disturbed structure were determined in the laboratory following physical properties:

- Granulometric composition by analysis method with pipette Kubiena;
- Density by pycnometer;
- Apparent density on soil samples collected from natural structure in stainless steel cylinders;
- Total and aeration porosity, by calculation;
- Moisture by drying in a drying stove;
- The coefficient of wettability, the desiccator;
- Wilting coefficient by calculation;
- Field capacity for water in the ground;
- Hydraulic conductivity, by constant gradient permeameter method;
- The degree of compaction, the calculation;
- Infiltration rate was determined in field with infiltrometric cylinder.

Chemical properties which were determined are:

- Soil reaction (pH) was determined by electrometric methods;
- The total content of soluble salts was determined by calculation after determining the electrical conductivity with conductometer;
- Total nitrogen by the method Kindhal;
- Mobile phosphorus by photometric method (ammonium acetate-lactate);
- Mobile potassium by photometric method (ammonium acetate-lactate);

3. RESULTS AND DISCUTIONS

Description of the five soil profile is shown below:

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1. Soil profile no.1 is placed in irrigated corn crop and soil type is:

Fluvi-Gley-eutric Cambisol on fluvial and medium deposits.

Soil profile consists of the following horizons:

Ap - 0-24 cm, silty, polyhedral structure, loose;

Aog_2 - 24-44 cm, silty, medium polyhedral structure, light compact, light staining due to gleyzation;

$ABvg_2$ - 44-55 cm, silty, small prismatic compact;

Bvg - 55-114 cm, sandy-clayey, rich in iron oxides, compact;

Gr - 114-150 cm, with purple stains, loamy, gleyzation is relict.

The analytical data of the soil are given in Tables 1-8.

Table 1. Degree of compaction

Depth, cm	Degree of compaction, %	Need scarification
0-25	0	Absent
25-44	15	Urgency 2
44-55	24	Urgency 1
60-80	18	Urgency 1

It is found that the soil has a high degree of compaction of 25 to 100 cm, with high apparent densities between 1.44 and 1.60 g/cm^3 and aeration porosity, in particular between 25-55 cm extremely low (4.5 to 9.6%) (table 2).

Table 2. Physical properties

Depth cm	DA g/cm^3	D g/cm^3	PT %	PA %	Interpretation
0-25	1,18	2,50	52,8	23,8	High
25-44	1,44	2,50	42,4	4,5	Extremely low
44-55	1,57	2,50	37,2	9,6	Very low
60-80	1,60	2,60	38,5	11,6	Low
90-100	1,60	2,60	38,5	18,5	Middle
120-140	1,21	2,60	53,5	9,4	Very low

Calculating the degree of compaction, based on the required minimum porosity and total porosity, results the need of scarification for soil layer between 25-80 cm and 44-80 cm in depth, is urgently 1.

With regard to the hydrophysical indices shown in Table 3, it appears that the date of collection of soil samples there is a difference of instantaneous water content, in that the depth of 25-44 cm and 120-140 cm was a significantly higher amount of water other layers of 25.6% and 33.5% compared to 16-19% moisture in the other layers. This reflects the water storage capacity, expressed in terms of field capacity. Resulting values of 24-26% for the depth of 0-25 cm and 25-44 cm and 36.4% for the depth of 120-140 cm.

Values of hydrophysical indices are the result of granulometric composition (table 4) and the degree of compaction (table 1).

Table 3. Hydrophysical indexes

Depth cm	W %	CH %	CO %	CC %	CU %
0-25	19,1	7,39	11,09	24,6	13,51
25-44	25,6	7,90	11,90	26,3	14,40
44-55	16,6	6,81	10,21	17,6	7,40
60-80	19,3	5,61	8,42	16,8	8,40
90-100	17,9	4,56	6,84	12,5	5,66
120-140	33,5	10,94	16,41	36,4	20,00

Table 4. Granulometric composition

Depth cm	Ng %	Nf %	PI %	PII %	A %	Inter-pre-tation
0-25	9,17	16,03	4,30	34,40	36,10	PA
25-44	6,70	19,70	8,10	35,80	29,70	PL
44-55	6,20	28,50	7,30	30,70	27,30	PL
60-80	36,75	23,15	3,90	21,10	15,10	LN
90-100	32,16	27,54	4,80	20,10	15,40	LN
120-140	2,80	10,30	13,70	19,10	58,10	AL

Also according to these two properties of the soil is the movement of soil water on profile. So, the infiltration rate is low at 25-44 cm depth and hydraulic conductivity is also low on the depth 25-55 cm and extremely low on 120-140 cm depth (table 5) which is clayey layer (58.10 % clay), dark purple.

Table 5. Soil permeability

Depth cm	Vt mm/h	Interpre-tation	K mm/h	Interpre-tation
0-25	66,4	Middle	2,0	Middle
25-44	22,3	low	0,7	Low
44-55	-		0,7	Low
60-80	-		18,0	High
90-100	-		12,2	High
120-140	-		0,125	Extremely low

The data presented in table 6, table 7 and table 8 on chemical characteristics, there is an acidification of the horizons of 25-55 cm and a low content of soluble salts.

Table 6. Chemical properties

Depth cm	pH	Interpre-tation	Fixed residue g/100 g soil	Interpre-tation
0-25	6,45	Poorly acid	0,055	Low
25-44	5,30	Moderately acid	0,038	Very low
44-55	4,96	Moderately acid	0,035	Very low
60-80	6,05	Poorly acid	0,035	Very low
90-100	6,14	Poorly acid	0,043	Low
120-140	6,17	Poorly acid	0,038	Very low

Regarding nutritive substances, Fluvi-Gleyi-Eutric Cambisol has a very low content of total nitrogen (0.096%) on the surface, middle of mobile phosphorus (19.7 to 29.7 ppm) and small of mobile potassium (84-120 ppm).

Table 7. Content of nutrients

Depth cm	Ntotal %	Interpre-tation	Pmobil ppm	Interpre-tation
0-25	0,096	Very small	19,7	Middle
25-44	0,078	Very small	29,7	Middle

44-55	0,071	Very small	21,4	Middle
60-80	0,060	Very small	17,6	Low
90-100	-	-	12,3	Low
120-140	-	-	6,2	Very low

Table 8. Content of nutrients

Depth cm	Kmobil ppm	Interpretation
0-25	84	Low
25-44	120	Low
44-55	115	Low
60-80	104	Low
90-100	92	Low
120-140	83	Low

Appears the necessity of filling the reserve of nutrients through fertilization and pH correction by calcium amendment.

Soil profile. no 2 is located in the corn crop on a plot plan and alluvial parent material, clay, and soil type is: Verti-Gleyic Fluvisol.

Soil profile consists of the following horizons:

Ao - 0-38 cm, silty, polyhedral structure, surface cracks;

AoCY - 38-53 cm, dusty loam to clay loam, large polyhedral structure, presents cracks and characters vertices, weak gleyzation;

CYGo - 53-126 cm, strongly marked by gleyzation, loamy-clayey;

CGr - 126-150 cm, gray-purple, clay-silty, massive, wet.

Granulometric composition analysis (table 9) reveals a content of 31-39% clay in the depth of 0-53 cm and a significant increase of the percentage of clay in the transitional horizon (56.6%) and in parent material (46.2 %).

Table 9. Granulometric composition

Depth cm	Ng %	Nf %	P %	A %	Interpretation
0-25	1,49	24,71	42,04	31,40	PL
50-60	2,25	23,25	35,50	39,00	PA
60-80	2,64	21,96	18,80	56,60	AL
100-130	0,70	15,70	28,80	54,80	AL
130-150	1,18	16,12	36,50	46,20	AL

This clay has character vertices such as montmorillonite and at humidity variations give rise to cracks.

From Table 10 it can observe a compaction of the base of first horizon (0-60 cm) apparent density is 1.43 g /cm^3, compared to values of 1.14 to 1.29 g /cm^3 in other horizons.

At the same time, aeration porosity is less than value of 10% from the depth of 50-80 cm with the values of 3 and 4.8%.

Table 10. Physical properties

Depth cm	DA g/cm^3	D g/cm^3	PT %	PA %	Interpre-tation
0-25	1,17	2,50	53,2	21,3	Middle
50-60	1,43	2,50	42,8	4,8	Extremely low
60-80	1,29	2,60	50,4	3,0	Extremely low
100-130	1,20	2,60	53,8	13,7	Low
130-150	1,14	2,60	56,2	16,0	Middle

Calculating the degree of compaction revealed the following data (table 11).

From Table 12, which includes hydrophysical properties are found increasing humidity in the base of profile and high values of water retention in the soil in the horizons from 50-60 cm.

Table 11. Degree of compaction

Depth cm	Degree of compaction, %	Need scarification
0-25	0	It is not necessary
50-60	16	Urgency 2
60-80	10	Urgency 2

Thus, the capacity of the field is more than 35%, and the rate of fading is found to be 22.46%. Although useful water is quite high values (14-20%) results that the soil requires more water for irrigation for the plants can defeat high suction montmorillonite clay.

Table 12. Hydrophysical indexes

Depth cm	W %	CH %	CO %	CC %	CU %
0-25	19,5	7,69	11,54	27,30	15,76
50-60	17,0	7,87	11,80	26,60	14,80
60-80	37,8	12,98	19,47	36,70	17,23
100-130	39,2	14,97	22,46	43,40	20,94
130-150	20,8	10,93	16,40	35,40	19,00

In addition, as can be seen from Table 13, if the first 50 cm water is vertically moving, quite well (infiltration speed is 22-73 mm/h and K = 2.6 mm/s, in depth, respectively from 60 cm down hydraulic conductivity decreases significantly (K = 0.08 mm/h, so it is very small).

The chemical characteristics (Table 14, 15 and 16) show a slight acidification of the surface, the absence of soluble salts (only in the base soil is 0.086% due to groundwater) nitrogen content is very low, the phosphor medium to the surface, the potassium is low.

Results that for this soil is required fertilization with complex fertilizers of nitrogen, phosphorus and potassium.

Table 13. The permeability

Depth cm	Vt mm/h	Interpre-tation	K mm/h	Interpre-tation
0-25	73,4	high	2,60	Middle
50-60	22,3	low	0,63	Low
60-80	-	-	0,08	Extremely low
100-130	-	-	0,12	Extremely low
130-150	-	-	0,19	Extremely low

Table 14. Chemical properties

Depth cm	pH	Interpre-tation	Fixed residue g/100 g soil	Interpre-tation
0-25	6,00	poorly acid	0,038	Very low
50-60	6,25	poorly acid	0,035	Very low
60-80	6,68	poorly acid	0,055	Very low
100-130	7,15	neutral	0,076	Very low
130-150	7,65	poorly acid	0,066	Very low

Table 15. Content of nutrients

Depth cm	Ntotal %	Interpre-tation	Pmobil ppm	Interpre-tation
0-25	0,091	Very low	30,6	Middle
50-60	0,066	Very low	13,6	Low
60-80	0,051	Very low	10,5	Low
100-130	-	-	10,0	Low
130-150	-	-	7,2	Very low

Table 16. Content of nutrients

Depth cm	Kmobil ppm	Interpretation
0-25	113	Low
50-60	81	Low
60-80	75	Low
100-130	71	Low
130-150	62	Low

CONCLUSIONS

Physical properties of soils analyzed indicate an accumulation of clay in the Bv horizon located approximately at 50-100 cm.

It is found a soil compaction particular at depths between 25-80 cm, where the aeration condition is inadequate and advanced degree of compaction which requires scarification to 4-5 years, eventually destroying the hard pan.

The soils require a large amount of water in order to overcome fading coefficient and achieve an adequate moisture field capacity.

The permeability to water is, generally, low in the first 100 cm, which supports the recommendation of implementation of scarification and the need of irrigation adjustment for not to cause ponding of water.

There is an acidification of arable layer so required calcium amendment and avoid fertilizers with physiologically acid reaction.

Low content of nitrogen and medium of phosphorus and potassium involves fertilization.

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