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THE CHARACTERISTICS OF THE SOILS IN THE DOMNESTI AREA AND THEIR POTENTIAL FERTILITY FOR HORTICULTURAL USE

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Abstract

Domnesti Village is located in the west of Bucharest, on the county road DJ 602. The village is made up of two places: Domneș ti where the administrative center and village Teghes. It is bordered to the north-west of the village Ciorogarla southwest of Giurgiu County is Clinceni southeast and northeast Bragadiru City and Bucharest. A big advantage is the proximity of the village shopping area in west Bucharest, about 2-3 km away.
In this area of pedological study was conducted in order to identify morphological, physical and chemical properties of soil area. The area studied, 16.9 hectares private property, is divided into two bodies: the first S1 S2 10.9 hectares and 6.0 hectares second. The purpose of the studies conducted in the area was establishing productive potential of soils and their suitability for different crops, especially vegetables.

***Key words**: aluviosol, suitability, potential.*

INTRODUCTION

The above mentioned locality was conducted a study on the identification pedological soil type, morphological properties and physico-chemical properties. Domnesti the adjacent city, offers the possibility of recovery and fresh horticultural products, due to advantages on regional soil suitability, ensuring smooth and fast transport and the possibility of irrigation of crops because the area is located on the interfluve Argeş – Sabar.
The area studied is approximately 17 hectares, privately owned, divided into two bodies, the aim of the study was to determine the productive potential of soils and their suitability for various uses, especially horticulture (vegetables).
The studied, has a morphologically uniform energy relief, slope degree of fragmentation and reduced the overall appearance of large meadow.
The foundation area consists of Proterozoic crystalline formations. Quaternary surface deposits belonging, being composed of alternating sands with clays, gravels, sands, marl complex near surface covered with loess. In the afore mentioned meadow alternations are more pronounced, forming fluvial deposits without loess blanket.
In terms of basin study area lies in the meadow Arges-Sabar widths from 4-7 km. Note that the Arges River is regulated, the closest retention hydrotechnical work is the accumulation of Mihăileşti, one source of water supply to the city.
Hydrological problems posed Sabar, causing major floods and eroding banks of the river bed. Ground waters are weakly mineralized located at a depth between 2-5 m. The mineralization is of type bicarbonates, bicarbonato-chloride or calc-magnesian, with predominance of calcium and secondary salinisation possibility for irrigation.
As Bucharest, Domnesti has a temperate continental climate with average annual temperatures of 10-11^{o}C and average annual rainfall of 500-600 mm. A feature of the area is torrential rains and local high flow producing Sabar overflow.
The natural vegetation in soils that have evolved in the area is steppe. In the meadow vegetation is mixed, predominantly the forest, near the village Royal Tegheş giving special beauty landscape.

Meadow soils were formed on medium texture fine fluvial deposits. Intense alteration and weathering processes of loamy deposits, mainly led to the formation of clays. The soil profile is found fine clay fractions and fragments of sand visible.

In these conditions have evolved fluvisols (aluviosols) with different subtypes according to local environmental conditions. These soils provide optimal culture vegetables and fodder plants, meadow Argeş-Sabar with tradition in supplying the capital with food and agriculture.

Figure 1. Location territory studied

MATERIALS AND METHODS

In the village Royal district Teghes, pedological study was lead in order to identify morphological, physical and chemical properties of soil area. The area studied is 16.9 hectares, divided into two bodies: the first is 10.9 hectares and the second is 6.0 hectares. The second area is located a greenhouse (Figure 2).

In each surface was established two main points of control, where soil samples were collected at two depths (0-20 and 20-40) in S1 points P2 and P3, and P1, P4 in S2. Each profile was morphologically described the samples were then performed physical and chemical analysis. Interpretation of results was done according to the "Methodology developing soil studies" ICPA Bucharest, 1987.

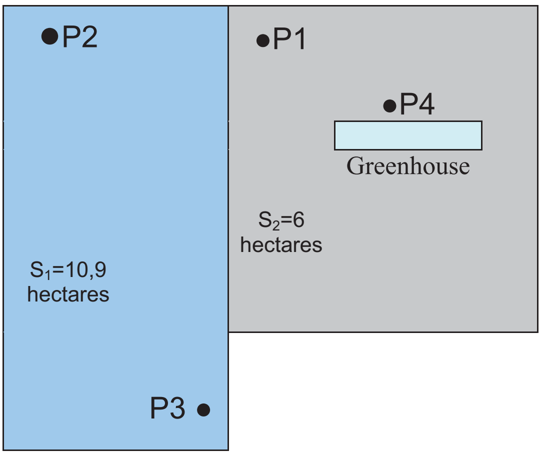

Figure 2. Plan of the area with location of profiles

The analytical methods used for determination of physical, hydro and chemical

Determination of particle size fractions:

- pipette method fraction ≤ 0. 002 mm;
- wet sieving method for fractions 0.002 to 0.2 mm and dried fractions > 0.2 mm. The results are expressed as a percentage of the remaining material after the pretreatment.

The bulk density (DA): the method of the metal cylinder of known volume (100 cm^3) in soil temporary humidity (g/cm^3).

The total porosity (PT) by calculation: PT= (1-DA/D)*100 (% by volume).

The porosity of aeration (PA) by calculation: PA= PT - CC*DA (% by volume).

Degree of compaction (GT) by calculation: GT = [(PM - PT) / PMN] x 100 (% by volume), where: PMN - minimum required total porosity, varied depending on the clay content of the sample, is calculated by formula PMN = 45 + 0.163 A (% by volume); PT = total porosity (% v/v); A - the clay content (% g/g).

The coefficient hygroscopicity (CH): drying at 105°C of a sample of soil moistened in advance in equilibrium with an atmosphere saturated with water vapor (in the presence of a solution of H_2SO_4-10%) - % by weight (% g /g).

Withering coefficient (CO): by calculation, by multiplication with 1.5 coefficient hygroscopicity, determined by the method of modified Mitscherlich - % by weight (% g/g).

Initial soil moisture (wi): by drying soil sample in an oven at a temperature of 105 ^{0}C (% by weight of dry soil at 105 ^{0}C).

pH: potențiometric, determined the combined glass electrode and a calomel, in aqueous Field water capacity (CC): by estimate based on texture and apparent density, according to the "Methodology developing soil studies", ICPA, 1987, vol. I, p. 101 (% by weight).

Total water capacity (CT): by calculation from the formula CT= PT/DA, % by weight.

Useful water capacity (CU) by calculation: CU= CC - CO;% by weight.

The physical and hydrophysical, were calculated according to the methodology-ICPA, 1987.

Organic matter (humus) determined by volumetric method Walkley - Black wet oxidation after the change Gogoaşă - STAS 7184 / 21-82.

$CaCO_3$ (carbonates): the method gasometric using calcimetrul Scheibler, after SR ISO 10693: 1998 (per cent).

Total Nitrogen (N): Kjeldahl method disintegration H_2SO_4 at 350°C, a catalyst of potassium sulfate and copper sulfate - SR ISO 11261: 2000.

Phosphorus accessible (P mobile): method-Riehm-Domingo and dosed with colorimetric molybdenum blue method after Murphy-Riley (reduction with ascorbic acid).

Potassium (K mobile) accessible: after extraction method Egner-Riehm-Domingo and determination by flame photometry.

pH: potențiometric, determined the combined glass electrode and a calomel, in aqueous suspension the soil/water ratio of 1/2, 5 SR-7184/13-2001.

Interpretation of the results has been submitted in accordance with “Methodology developing soil studies”, ICPA Bucharest, 1987, provided for in current legislation on the subject.

RESULTS AND DISCUSSIONS

Profile 1 presents a material brittle at harvest moisture. Features numerous biogenic neoformations in the first 10 cm (roots, the bunks of larvae, coprolite). Glomerular structure partially degradated (agricultural work carried out). Visible grains of sand in 20 cm deep, fine texture, moderately plastic and sticky. Color 10 YR 2/2 wet.

Profile 2, like the previous one, has felt the roots in the top 20 cm, common biogenic neoformations (traces of roots), sand grains visible. Polyhedral structure converted by subsidence. Vertical cracks of 2-5 cm. Fine texture, moderately plastic and sticky. Color 10YR3/2 wet.

Profile 3 horizontal and oblique fine cracks, many biogenic neoformations, polyhedral structure formed by compaction, very few grains of sand 20 cm down weakly cohesive. Color 10YR 2/2 wet.

Profile 4 is wet at the time of harvesting, the compact environment of 20 cm below the surface and brittle. Several biogenic neoformations, common root for the entire depth of the harvest. Texture fine, grains of sand from 20 cm down moderately plastic and sticky medium-well developed glomerular structure (low degree of compaction).

The sections examined were determined: texture (the percentage of particle size fractions (sand, dust, clay), apparent density (DA g/cm^3), total porosity (PT%) and the degree of compaction (GT).

Soil texture is medium dusty clay loam in all profiles. The fine fraction (less than 0.002 mm clay) is between 39% and 44%, powder fraction between 32% and 36%, and the sand is between 20% and 28%. Figure 3 presents the variation of depth texture collection.

It can be seen that the percentage of clay decreases profile, more pronounced in the profiles P2 and P3. Higher percentages of the sand are 20 cm below the profile is correlated with morphological appearance, the grains of sand are visible to the naked eye at that depth.

Bulk density is medium, with values ranging from 1.17 g/cm^3 and 1.34 g/cm^3. The total porosity is medium varying between 51.6% and 49% (Table 1). The ratio between the total porosity and bulk density expresses the degree of compaction of the soil. Values of two determinations carried out on properties obtained samples of the four profiles, expresses a poor compaction of soil (degree of compaction values fall between 1 and 10).

From this point of view stands profile P4, the degree of compaction is the lowest (2.6), the structure less degraded by agricultural work (see morphological description). The highest values of the degree of compaction is at P3 (8.6), only the profile of the modified structure is cohesive and horizontal and oblique cracks.

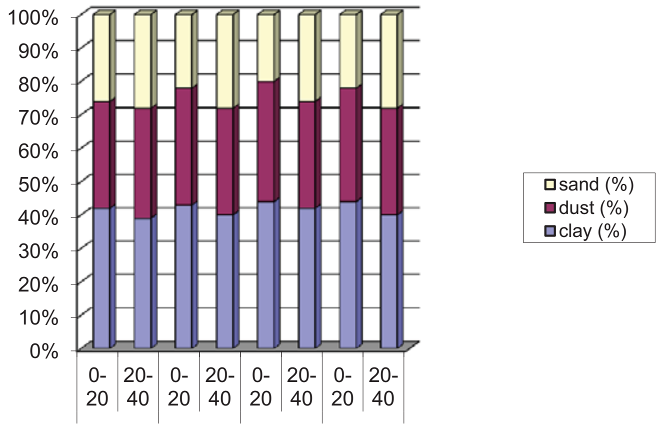

Figure 3. Granulometric composition, depth 0-20 cm and 20-40 cm profiles analyzed

Table1. The values of apparent density, total porosity and the degree of compaction in the analyzed profiles

No. profile	Depth (cm)	Bulk density (DA)	Total porosity (PT)	Degree of compaction (GT)
P1	0-20	1.32	49.8	4.2
	20-40	1.33	49.6	2.4
P2	0-20	1.34	49.0	5.7
	20-40	1.33	49.1	5.7
P3	0-20	1.25	47.5	8.6
	20-40	1.26	47.2	8.6
P4	0-20	1.17	51.6	2.6
	20-40	1.17	51.6	2.6

Of the four profiles samples were taken to determine the soil moisture at two depths of 0-20 cm and 20-40 cm. The method used for the determination is based on measuring the amount of water of the soil sample by successive weighings and drying in an oven to constant weight.

Hydro indices were calculated (CO-wilting coefficient, CH-coefficient hygroscopicity, CC-Field water capacity and CT - total capacity of

the soil water) based on clay content. Useful water capacity was calculated using the formula CU= CC - CO (Table 2).
Wilting coefficient is high, varying between 13.7% and 15.1%, the lowest at 20-40 cm depth P1. Field capacity is medium, values close to 24 %. The total capacity of the soil water is high, with values above 37%. Useful water capacity is low at between 9.1% and 10%.
Soil water availability for plants is not equal throughout the range of useful water capacity (CU). The soil moisture values approaching water field capacity (CC) will be greater water availability. The values of soil moisture at harvest time almost on CC.

Table 2. Humidity values and hydrophysical indices the analyzed profiles

No. profie	**Depth (cm)**	**Humidity (%)**	**Coefficient hygroscopicity (CH)**	**Wilting coefficient (CO)**	**Field water capacity (CC)**	**Total capacity (CT)**	**Useful water capacity (CU)**
P1	0-20	19.2	9.3	14.8	24.1	37.7	9.3
	20-40	20.3	9.1	13.7	23.2	37.3	9.5
P2	0-20	18.8	10.1	15.1	24.5	36.6	9.4
	20-40	17.4	9.4	14.1	24.1	36.9	10
P3	0-20	18.4	10.3	15.5	24.6	38.0	9.1
	20-40	18.4	9.9	14.8	24.3	37.5	9.5
P4	0-20	22.9	10.3	15.5	24.6	44.1	9.1
	20-40	21.0	9.4	14.1	24.1	44.1	10

Consequently, the soil temporary supply state is expressed by the water supply, which is calculated from the instantaneous moisture. In Table 3 are shown the values determined in the water supplies 4 profiles in the depth of 0-40 cm (Ru, m^3/hectare), the date of collection, the average value for the whole area is 994 m^3/hectare.
Soil water supply is fundamental to agricultural production activities, particularly horticultural plants. Yields obtained depends on soil water reserves, supplemented by deficit irrigation periods.

Table 3. Water reserves in the soil momentary 0-40 cm, the analyzed profiles

No. profil	**Humidity (%)**	**Ru (m^3/ha)**
P1	19.8	1053
P2	18.1	970
P3	18.4	927
P4	21.9	1025
The average value of the Ru momentary		**994**

During the growing season soil water consumption is intense, may be associated with prolonged drought, when temporary humidity can reach the wilting coefficient value or less. There is a shortfall of moisture needed by irrigation.
The amount of water that must be administered to compensate for the shortage of moisture, is called the optimal watering time is calculated: m = H Da (CC-PM), H - depth of soil to be watered; DA - apparent density; CC- field water capacity; PM - minimum threshold.
Values frequent watering rules aluviosol fine texture that consideration, are in the range 150-600 (m^3/hectare) and the minimum threshold in the range 18-24%. The data in Table 4 fall within these ranges, the average standard watering studied area is 154 m^3/hectare (Table 4). It is recommended to calculate the actual watering norm, mr = H Da (CC-u), where u - temporary humidity determined at regular intervals of time (example on days 1 and 15 of each month).
Chemical analyzes performed on soil samples collected from four profiles, and interpretation of results was done according to the

"Methodology for developing soil studies" ICPA, 1987.
Soil reaction is slightly acidic (pH is between 6.2 and 6.8) at sections P2, P3 and P4 and P1 in the depth of 20-40 cm. In the first 20 cm of the profile one is neutral reaction (Table 5).

Table 4. Minimum threshold and optimal watering norm 0-40 cm depth

No. profil	Minimum threshold PM (%)	Norm optimal watering M (m3/hectare)
P1	21.0	133.0
P2	21.1	171.5
P3	21.3	161.3
P4	21.2	150.0
Media	**21.15**	**154.0**

Table 5. Chemical characteristics of soil depth 0-20 cm and 20-40 cm

No.profile	Depth (cm)	pH (H_2O)	Humus content (%)	Degree of base saturation V (%)	Humus reserve Rh (t/hectare)
P1	0-20	7.2	6.0	90	158.4
	20-40	6.8	4.3	88	114.4
P2	0-20	6.6	7.8	86	209.1
	20-40	6.6	7.0	86	186.2
P3	0-20	6.4	8.6	84	215.0
	20-40	6.6	5.2	86	131.1
P4	0-20	6.2	8.6	79	201.2
	20-40	6.2	6.0	79	140.4

The soil is analyzed eubazic all over the degree of base saturation (V%) is between 79-90%.
Humus content has higher values in the first 20 cm of the profile analysis. The analysis of data presented in Table 5 shows that the soil has medium containing organic matter (humus). Humus reserve (Rh t/hectare) is large and very large, with lower values P1 profile. We can say that the surface S1, P2 and P3 reserves of humus, the 40 cm depth, is Rh = 185.4 t/hectare, and the surface S2 with P1 and P4, Rh = 153.6 t/hectare to 31.8 t/hectare less. High humus content in soil fertility analysis expressed its good.
Approximately 95% of the nitrogen is nitrogen linked to soil organic matter, nutrients are mostly used by plants during all phases of vegetation. In cultivated soils derived nitrogen and organic fertilizers and minerals applied at the end of the growing season may be negative balance. When nitrogen plant nutrition is poor, they have poor stamina, reduced growth, less branched slender stems, leaves and small fruits. Soil nitrogen balance is influenced by the humid during the growing season.
Total nitrogen content (Nt) is analyzed middle ground between 0.20 to 0.27 % values (Table 6). Nitrogen indicator is determined by calculation based on the content of humus and helps to establish the required dosage of organic fertilizer of the soil. Thus, S1 optimal dose is 22.7 t/ hectare, and for surface S2 is 23.5 t/hectare to 0.75 t/ha higher.

Table 6. The total nitrogen content, nitrogen and optimal dosages index organic fertilizer, the analyzed profiles, the depth of 40 cm

No. profile	Total nitrogen (%)	Nitrogen indicator IN	Organic mater t/hectare
P1	0.20	5.3	23.5
P2	0.27	6.4	22.8
P3	0.23	5.8	23.6
P4	0.24	6.0	23.2

CONCLUSIONS

Ameliorative measures recommended farmland studied are:

- compensation moisture deficit irrigation, watering rate is calculated based on temporary humidity;
- organic fertilization with manure or incorpore lush growing species (white lupine, mash, rape, etc.);
- -correct and timely execution of mechanical works, so as to avoid soil compaction that can damage soil structure studied is susceptible to compaction;
- morphological and physico-chemical roperties of soils in the study area allow their use for horticulture, especially for gardening.

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