STUDIES ON THE SUSTAINABLE USE OF SOILS FROM THE LOCATION OF GELU

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Abstract. *The purpose of the paper is a case study of a private farm in the town of Gelu, Timiș county. The objectives considered in carrying out this work were the following: characterization of the studied area from the point of view of natural conditions; identifying the type of soil, studying the influence of environmental factors on the formation and evolution of soils; the study of the soils within the farm, respectively the typical chernoziom and the solonets, the description of the two types of soil from the point of view of properties and fertility. When describing the soils identified within the farm, both data collected from the field and data taken from OSPA Timișoara and Variaș City Hall were used. The total area of the Variaș commune is 10369.51 ha, of which the extravillage of Gelu is 2641.07 ha (*RUSU RAUL ARIAN, 2007). *Regarding the two types of soil identified, the situation is as follows: The typical chernozem, weakly glazed, has a medium texture and a glomerular structure in the surface (Am), has good aeration and good permeability for water and air, as and a good capacity to retain useful water and a lower resistance to soil works, which gives it the highest productive potential and the weakly salinized Soloneță presents a series of soluble salts at a shallow depth which determined the appearance of salinization phenomena, something that severely limits soil fertility and the variety of crops on this type of soil. (*OKROS, A., 2015). *It appears only in islands, on small surfaces, being included in the fifth fertility class and occupied only by rare meadows of low productivity (*MIHUȚ, C., MATEOC-SÎRB, N., DUMA COPCEA, A., NIȚĂ, L., CIOLAC, V., OKROS, A., POPA, D., 2022; NIȚĂ, L., GROZAV, A., ROGOBETE, GH., 2019).

Keywords*: sustainable use, agricultural land, soil resources, chernozem, solonets*

INTRODUCTION

The first attempts to explain the phenomena of soil formation and evolution were based on one or more pedogenetic factors, which led to the existence of a multitude of conceptions and formulations (CANARACHE A., 1997; MIHUȚ CASIANA, RADULOV ISIDORA, 2012; DAVID-FEIER, S., MATEOC-SÎRB, N., MATEOC, T., BACĂU, C., DUMA COPCEA, A., MIHUȚ, C., 2020; GOIAN M., 2000; IANOȘ GH., GOIAN M., 1995; MIRCOV, V. D., VUXANOVICI, S., COZMA, A., OKROS, A., PINTILIE, S., NICHITA, A. I., MOISESCU, C. I., 2016).

(N.FLOREA, 1985), specifies that in the formation of the soil cover, in addition to pedogenetic processes, some geological processes also intervene, which interfere with the formation of the soil cover and which he calls pedogeological processes (GOIAN M., IANOȘ GH., RUSU I., 1993; ȚĂRĂU D. ȘI COLAB., 2007).

ROGOBETE GH., 1994, states that "nothing can more surely destroy a complex system like the soil, a good functionality depends on numerous interactions, than the emphasis on a single relationship: cause-effect", that is, in the case of man, deforestation. for cultivating the land and obtaining the largest possible harvests (IANOȘ GH., PUȘCĂ I., GOIAN M., 1997).

The town of Gelu is part of the Variaș commune in Timiș county, being located in the northwest part of the county, at a distance of 45 km from Timișoara and 50 km from Arad. The commune of Variaș also includes the town of Gelu and the town of Sîmpetru Mic (CREȚAN, REMUS, 2006; DAVIDESCU D., DAVIDESCU VELICICA, 1981; GHIBEDEA V., GRIGERESIK E., LUCIA BĂCANU, 1970; .

MATERIAL AND METHODS

As material, we studied the soil resources of a privately owned farm in the town of Gelu, Timiș county.

When describing the soils identified within the farm, we used both data collected from the field and data taken from OSPA Timișoara and from Gelu City Hall, Timiș County.

A series of physical and chemical properties of the soil were determined, namely:

Soil texture, by the Cernikova method

Soil density (cm3) – with the pycnometer, using distilled water;

Apparent density (cm3) - determined by calculation;

Total porosity PT (%)- established by calculation;

Aeration porosity PA (%)- established by calculation.

Determination of chemical properties:

The humus content of the soil (%) - by titrimetric methods, respectively the Tiurin method;

Dosing of total nitrogen - was done by the Kjeldhal method (soil mineralization is done by boiling with concentrated sulfuric acid in the presence of a catalyst); Mobile phosphorus – was determined by Egner-Rhiem-Domingo on a UV-VIS spectrophotometer; Assimilable potassium - was extracted in ammonium lactate acetate and determined with the atomic absorption spectrophotometer;

The degree of saturation in bases (V%) - defines the proportion in which the colloidal complex is saturated in basic cations and was calculated by the formula:

High values of V% express weak leaching, neutral to alkaline reaction and a series of favorable properties, the exception being saline soils which present V= 100% but present Na+ cations which print unfavorable properties.

The low values of V% reflect a strong leaching, demineralization of the horizons and respectively acid reaction and less favorable properties of the soils for the growth and development of crop plants.

Base exchange capacity (sum of exchange bases) (SB) – is expressed in m.e./ 100 g of completely dry soil at 1050C, and results from the totality of basic cations Ca^{2+} + Mg^{2+} + K^{+} + Na^{+} adsorbed in the colloidal complex of the soil .

The exchange capacity for hydrogen (adsorbed hydrogen) (SH) – is expressed in m.e./100 g of soil and represents the totality of hydrogen cations H^{+} adsorbed in the colloidal complex of the soil (ROGOBETE GH., 1994).

Determination of SH was carried out by percolating the soil until exhaustion with a 1N solution of potassium acetate buffered at pH-8.3.

RESULTS AND DISCUSSIONS

The commune of Variaș has a total area of 10369.51 ha, i.e. 1.19% of the territory of Timiș County and 0.043% of Romania's area, of which the town of Gelu has 150.17 ha of intra-village land and 2641.07 ha of extra-village land.

The studies were carried out on a farm located in the town of Gelu in Timiș County, and following field trips, two types of soil were identified, namely:

- Typical chernoziol
- Solonet

The total area of the farm is 77 ha, of which chernozem occupies 72 ha, respectively 93.5% and was cultivated with a number of plants.

1. Class Inks

It is a class that includes soils with a high natural fertility, i.e. soils rich in humus and nutrients, respectively soils that have the best physico-chemical properties and the highest productive potential.Chernozium has the following properties (table 1 and 2): medium texture; glomerular structure in the Am horizon; it is well supplied with humus and nutrients; aero-hydric regime favorable to the majority of agricultural crops; it is a soil that is easy to work.

Table 1

Physical and hydrophysical properties of typical chernozem
(according to OSPA Timișoara, 1997)

Horizons	Ap	Am	A/C	Cca
Depths (cm)	0 – 27	-35	- 55	-80
Coarse sand (2.0 – 0.2 mm)%	0.3	0.3	0.2	0.1
Fine sand (0.2 - 0.02 mm)%	32.6	32.8	35.7	35.9
Dust (0.02 - 0.002 mm)%	26.5	27.1	25.9	28.2
Clay (below 0.002 mm)%	39.6	39.8	38.2	35.8
Soil density (D g/cm3)	2.74	2.76	2.67	2.79
Aparent density (DA g/cm3)	1.40	1.35	1.43	1.34
Total Porosity (PT%)	48.9	51.08	46.44	51.97
Aeration Porosity (PA%)	14.55	17.37	13.2	20.31
Coef. of hygroscopicity (CH%)	9.18	8.87	8.42	7.15
Coefficient of wilting (CO%)	13.77	13.3	12.61	10.72
Field Capacity (CA%)	24.53	24.97	2324	23.62
Useful water capacity (CU%)	10.76	11.66	10.62	12.89
Total water capacity (CT%)	34.93	37.84	32.47	38.78

In the Ap horizon, soil density has values of 2.74 g/cm3, apparent density of 1.40 g/cm3, total porosity of 48.90%, aeration porosity of 14.55%.

Hygroscopicity coefficient of 9.18%, wilting coefficient of 13.77%, field capacity of 24.53%, useful water capacity of 10.76% and total water capacity of 34.93 %.

Table 2

Chemical properties of typical chernozem
(according to OSPA Timișoara, 1997)

Horizons	Ap	Am	A/C	Cca
Depths (cm)	0 – 27	-35	- 55	-80
pH in water	7.12	8.11	8.23	8.45
Carbonates ($CaCO_3$ %)		1.73	3.72	22.3
Hydraulic conductivity (K = mm/h)	1.25	1.50	1.70	
Humus %	2.97	2.39	2.06	
Total Nitrogen %	49.98	25.81	44.18	
Bases of exchange	26.66			
Exchangeable hydrogen	4.22			
Cation exchange capacity	30.88			
Degree of saturation in bases V%)	86.33			
Total water capacity (CT%)	34.93	37.84	32.47	38.78

Among the chemical properties, the soil reaction, in the Ap horizon, is neutral (pH= 7.12), the humus content is 2.97%, the total nitrogen content is 49.98% and the degree of saturation in bases has the value of 86 .33%, as a result of these favorable properties, this soil has the highest agro-productive potential.

The slightly salinized Solonets, within the farm, appears insular, occupying an area of 5 ha, i.e. 6.5% of the farm area, on microrelief and nanorelief forms, where the leaching process is more pronounced, on marls and clays.

Their formation is most likely due to salinization and desalination processes due to water level fluctuations. The presence of soluble salts at shallow depth has determined the emergence of salinization phenomena, which sharply limits soil fertility and the variety of crops.

Solonets is characterized by the following chemical properties:

- high pH values, between 9.76 (At) and 10.16 (Btna sc k);
- high content of soluble salts ranging from 165.17 (At) to 241.40 mg/100 g soil (Btna sc k);
- loamy to loamy - clayey texture at the base of the soil profile;
- low humus content, with values ranging from 2.19 (At) to 0.42% (Btna sck).

CONCLUSIONS

There are a number of determining factors in the formation and evolution of the soils within the farm under study, namely: the rocks on which they were formed, climate, time, groundwater and surface water, plant and animal organisms and last but not least, human activity.

The farm has a total area of 77 ha of land, own property.

During the period suitable for agricultural crops, almost 80% of the precipitation falls, which is a favorable condition for the development of native crops. However, the rainfall regime is irregular, with years much wetter than average and years with very little rainfall. Due to its location in the open field, but located not too far from the Carpathian massifs and the main valleys that separate this part of the country (the Timiș-Cerna corridor, the Mureș valley, etc.), Timișoara bears, from the north. -west and west, a movement of air masses slightly different from the general air circulation over the western part of Romania. The local channels of the air circulation and the unstable balances between the baric centers impose a great variability of the frequency of the winds in the main directions.

Within the farm, following field trips, two types of soils were identified, namely: typical chernozem and solonets.

The fertility of the soils in the studied area is presented as follows:

Typical chernozem, weakly glazed. The medium texture and glomerular structure in the surface horizon (Am) ensures good aeration and permeability for water and air, good useful water holding capacity and lower resistance to tillage, which gives it the highest . productive potential. However, being located in an area with low and unevenly distributed rainfall, it requires, first of all, arrangements for irrigation. To maintain and restore the fertility of this soil, organic and mineral fertilization is necessary.

Solonets weakly salinized. The presence of soluble salts at a shallow depth has determined the occurrence of salinization phenomena, which sharply limits the fertility of the soil and the variety of crops that can be grown on this soil. It appears only in islands, on small surfaces, on forms of microrelief and nanorelief, where the leaching process is more pronounced, being classified in the fifth fertility class and occupied only by rare meadows of low productivity.

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