THE USE OF PEDOLOGICAL INFORMATION IN THE MANAGEMENT OF SOIL RESOURCES IN SATU MARE COUNTY, ROMANIA

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Abstract. *The survey area is 8.97 ha, divided into 3 cadastral plots, namely A 1201, L 1221 and A 865. We studied a series of chemical and physical soil properties in Satu Mare County, Romania. Of the chemical soil indices, we determined IN (%), P (ppm), K (ppm), pH, base saturation degree (V%) and the sum of the exchange bases (m.e./100 g soil), and the of physical soil indices, clay content. The topic studied is of real interest in terms of practical importance as, after the assessment of soil resources, practical solutions are identified, solutions that lead over time to a development of modern and sustainable agriculture and to the need to develop concepts to bring together economic and environmental approaches, thus leading to a common language and a systemic vision of its ecosphere and subsystems. The human factor is the one that uses natural resources in a specific way, not only to satisfy its strict biological needs but also to create the means of transforming the environment, to satisfy some requirements generated by social development. People have an extraordinarily high capacity to consume a series of products that the soil gives, so that man's consumption of renewable resources takes place at a pace that often goes beyond the rhythm of restoration, i.e., overexploitation of these resources occurs, which can lead, in time, to exhaustion of soil resources. That is why we must always find practical solutions to help obtain high, good quality, low-cost production without exhausting existing soil resources.*

Keywords*: soil resources, pedological information, natural resources*

INTRODUCTION

The territory studied is in Satu Mare County, Romania, which is located in the north-west part of Romania, in the contact area of the Tisa Plain with the Oriental Carpathians and the Someșan Plateau, and is delimited, east by Maramureș County, south-east by Sălaj County, south by Bihor County, west by the border with Hungary, and north by the border with Ukraine (Fig. 1).(ANIȘOARA BĂRBĂLAN, LAURA UNIPAN, BOLDEA M., ANTOANELA COZMA, MIHAI D., 1999; L. NIȚĂ, ET. COLAB., 2012; NIȚĂ S., NIȚĂ L., PANAITESCU L., 2015; OKROS ADALBERT, 2015; OKROS ADALBERT, ET COLAB., 2019; SAIDA FEIER DAVID, NICOLETA MATEOC –SÎRB, TEODOR MATEOC, CRISTINA BACĂU, ANIȘOARA DUMA COPCEA, CASIANA MIHUȚ, 2020; MIHUȚ CASIANA, RADULOV ISIDORA, 2012; MIHUȚ CASIANA, OKRÖS A., IORDĂNESCU OLIMPIA, 2012; V.D.MIRCOV, C. MOISE, CODRUTA CHIS, 2015).

Fig. 1. Satu Mare County Map + its neighbours
(surce: http://www.satumare.insse.ro/)

Satu Mare County, Romania, includes two municipalities, namely Satu Mare, with 115,630 inhabitants, and Carei, with 23,268 inhabitants; four cities, namely, Negreşti Oaş, with 13,956 inhabitants, Livada, with 9,649 inhabitants, and Ardud, with 7,004 inhabitants, as well as 56 communes with 226 villages, and a total of 206,593 inhabitants. (MIHUȚ CASIANA, RADULOV ISIDORA, 2012; OKROS ADALBERT, PIRSAN PAUL, BORCEAN ADRIAN, MIHUT CASIANA, NITA SIMONA, MIRCOV VLAD DRAGROSLAV, HAMDAMOV SHAHZOD, GOZIBEKOV ABDUMANON, 2019; SAIDA FEIER DAVID, NICOLETA MATEOC –SÎRB, TEODOR MATEOC, CRISTINA BACĂU, ANIȘOARA DUMA COPCEA, CASIANA MIHUȚ, 2020)

Taking into account all the conditions in which the entire northern sector of the Tisa Plain was formed, including the unitary evolution of the river network, with all its consequences, one can speak of a *Someşului Plain*, which stretches from the last western extensions of the volcanic system Oaș – Gutâi, to the edge of the sandy plain of Nir. It presents the same geological, geomorphological, and geobotanic characters and, in general, the humanized landscape. (AURELIA PURDA, A ȚĂRĂU, D. DICU, L.NIȚĂ, 2013; OKROS ADALBERT, 2015).

MATERIAL AND METHODS

To reach the proposed objectives, research has been carried out in the field, in the laboratory and in the office. We identified and studied soil types and subtypes in this area, after which we studied the relief, hydrography, hydrology, and biodiversity conditions specific to this area; we collected a data on the sustainable management of these soil resources and we determined a soil chemical and physical properties, namely IN (%), P (ppm), K (ppm), pH, base saturation (V%), SB (m.e./100 g soil) and clay content.

RESULTS AND DISCUSSIONS

In Țara Oașului, thermal values are lower due to the influence of the mountain climate. Thus, in the Piedmont region, the annual average temperature is 8°C, and in the western part of the depression, 9°C. The winters are colder (average January -4°C) and

summers less warm (average of July 18°C). Therefore, the sum of temperatures greater than 5°C is lower (3,200-3,400°C). If we compare the thermal values recorded in Satu Mare and Carei (Table 1), we notice that the average spring and autumn temperatures are lower due to excess moisture in the soil, which, in spring, slows the heating of terrestrial surfaces by consuming a good part of the heat accumulated in the evaporation process, and autumn favours the emergence of early white frost.

Table 1.

Thermal values recorded by Satu Mare and Carei meteorological stations

Months weather station	I	II	III	IV	V	VI	VII	VII I	IX	X	XI	XII	Annual average	Amplitude
Satu Mare	-3,3	-1,2	4,5	10,6	15,7	18,6	20,3	19,4	15,6	10,4	5,7	-0,7	9,6	23,6
Carei	-3,2	-1,5	4,2	9,7	15,3	18,5	20,5	19,9	15,7	9,8	5,6	-0,5	9,3	23,7

Permanently supplied by the ocean air masses loaded with water vapour, atmospheric moisture remains high all year round, in summer – 64%, and in winter – 83%, with an average of 71%, ensuring normal vegetative activity for all plants, both cultivated and spontaneous. Its influences are exercised more specifically through nebulosity and precipitation.

Nebulosity was reduced to 5.5, conditioning a large number of sunny days (70-75 days), amounting to about 2,000 hours a year, enough for the timely ripening of all field crops.

The *amount of precipitation* was around 600 mm, of which nearly half (45.6%) fell at the end of spring and summer. The maximum precipitation periods occurred in May and June (about 25%), which is very important for agriculture. In the rest of the year, except for December, the distribution was quite even, as shown by data in Table 2.

Table 2.

Distribution of average monthly precipitation (mm)

PerioF	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**Total**
1990-2020	38.7	*41.4*	31.7	40	67	79.2	55.2	71.4	42.1	45.2	45.4	57.9	615.1

The total area surveyed was 8.97 ha with 3 cadastral plots (A 1201, L 1221 and A 865) (Tables 3, 4, and 5).

Table 3.

Plot and number of soil sampling points

Plot number	sample number soil	Surface (ha)	Number of harvesting points
A 1201	P1 P2	1.10 1.57	1 2
L 1221	P3 P4	0.90 1.00	3 4
A 865	P5	1.10 1.10 1.10 1.10	5 6 7 8
Total surface		8.97	8

The soil samples were taken from several points, namely:

- from plot A 1201, with an area of 2.67 ha, two soil samples were taken from two different units;
- from plot L1221, with an area of 1.90 ha, two soil samples were taken from two different units;
- from plot A 465, with an area of 4.40 ha, four soil samples were taken from a single unit.

While soil sampling, the area, the slope of the land and the change of natural vegetation were taken into account.

Table 4.

Main chemical soil indices in Satu Mare County (Stage I)

Plot number	number of harvesting points	IN (%)	P (ppm)	K (ppm)	pH	V %	SB me/100g
A 1201	1	1.87	8	101	6.01	88	23.87
	2	1.87	18	113	6.41	88	23.87
L 1221	3	2.44	13	134	6.36	93	28.98
	4	2.44	12	174	6.36	94	28.90
A 865	5	2.02	8	87	5.24	71,32	12.36
	6	2.02	10	112	5.77	71,32	12.36
	7	2.02	11	132	5.63	71,32	12.36
	8	2.02	10	106	5.48	71,32	12.36

The nitrogen index had values between 1.87% in plot A 1201 and 2.44% in plot L 1221.

The soil reaction had values between 5.24 in plot A 865 (sampling point 17), 6.01 in plot A 1201 (sampling point 1), 6.41 in plot A 1201 (sampling point 2) and 6.36 in plot L 1221.

The content in phosphorus had values between 8 ppm in plots A 1201 (sampling point 1) and A 865 (sampling point 17), and 18 ppm in plot A 1201 (sampling point 2).

Potassium content varied between 87 ppm in plot A 865 plot (sampling point 17) and 174 ppm in plot L 1221 (sampling point 4).

The degree of saturation in bases (V%) had values above 71% in all studied plots.

The amount of exchange bases had values ranging from 12.36 m.e./100 g soil in plot A 865 and 28.98 m.e./100 g soil in plot L 1221.

Table 5.

Content in clay

Plot number	number of harvesting points	Content in clay (Clay < 0,002 mm)
A 1201	1	52.48
	2	52.00
L 1221	3	31.21
	4	32.00
A 865	5	43.58
	6	43.58
	7	44.08
	8	44.10

Clay content had values ranging from 31.21% in plot L 1221, the texture being medium, 43.58-44.10% in plot A 865 whose texture fell into the medium-fine class and 52.48% in plot A 1201 where the texture was fine.

CONCLUSIONS

The area studied was 8.97 ha, divided into three plots: A 1201, L 1221, and 865.

The soil samples were taken from several points and, after the determinations made, we could draw the following results:

1. Nitrogen index had values between 1.87% in plot A 1201 and 2.44% in plot L 1221.
2. Soil reaction had values between 5.24 in plot A 865 (sampling point 17), 6.01 in plot A 1201 (sampling point 1), 6.41 in plot A 1201 (sampling point 2) and 6.36 in plot L 1221.
3. The content in phosphorus had values between 8 ppm in plot A 1201 (sampling point 1) and plot 865 (sampling point 17), and 18 ppm in plot A 1201 (sampling point 2).
4. Potassium content varied between 87 ppm in plot A 865 (sampling point 17) and 174 ppm in plot L 1221 (sampling point 4).
5. The degree of saturation in bases (V%) had values above 71% in all studied plots.
6. The amount of exchange bases had values between 12.36 m.e./100 g soil in plot A 865 and 28.98 m.e./100 g soil in plot L 1221.
7. Clay content had values between 31.21% in plot L 1221, the texture being medium, 43.58-44.10% in plot A 865 with a texture fallen into the medium-fine class, and 52.48% in plot A 1201 where the texture was fine.

At soil sampling, the area, the slope of the land and the change of natural vegetation were taken into account.

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