EVALUATION OF THE PRODUCTION CAPACITY OF AGRICULTURAL LAND FROM THE PERIMETRE OF THE PERIAM LOCALITY, TIMIŞ COUNTY FOR ITS SUSTAINABLE USE

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Abstract

The purpose of this paper is the evaluation of the agricultural land from the Periam commune, Timiş County, for their sustainable use. The proposed objectives cover the following aspects: characterization of the natural environment; identifying and outlining soil and land units; characterization of the mapped out soil units; land assessment and establishing the favourability of various crops; grouping the land in usage categories; identifying and characterizing soil types and subtypes; calculating assessment grades, establishing usage categories and grouping soils in favourability classes; identifying sustainable options and selecting the ones insuring the best usage; monitoring soil evolution after applying or non-applying of some pedo-ameliorative measures; insuring optimal solutions for various problems regarding the protection, improvement and efficient use of soils, and land characterization depending on the management requirements of an agricultural exploitation. The paper is concluded by a series of results and discussions referring to the production capacity assessment for two types of soil identified on the locality territory, namely chernozem and gley soil.

Key words: *evaluation, favourability, usage class, fertility, assessment grades, mapping, productive potential, soil*

INTRODUCTION

Similar research has been carried out by researchers from the Pedology discipline in Timişoara, namely Anişoara Duma-Copcea, V. Ştefana and Casiana Mihuţ, during 2009. [2]

The importance of land evaluation activities resides in the fact that due to the data they supply, these studies make up the basic documentation for establishing the optimal practical measures for soil protection, amelioration and rational usage, in order to produce biomass with an optimized dynamics, rigorously correlated with increasing environmental protection requirements. [1]

For the appreciation of production capacity of agricultural land in the Periam commune, Timiş County, [13] we chose 17 indicators from the entire ensemble of environmental conditions, more significant and more precisely determined. [6] [11]

Based on these indicators, assessment grades were calculated, which express the favourability degree of an indicator for each crop and land usage category. [6]

MATERIALS AND METHODS

For the current paper, we used data from field observations, as well as data from previous mappings. [3] In order to determine the chemical and physical-mechanical properties, samples were collected from 5 soil profiles, respectively 35 soil samples in deranged structure and soil samples from 3 profiles, respectively 9 soil samples in 3 and 4 repetitions for the determination of hydro-physical indices. [8]

The calculus of average productions per ha for each assessed plant is carried out according to the assessment grade in relationship with the technological level which can be insured at a certain moment and which establishes the productive capacity for each assessment point. [9]

The harvest quantity obtained per surface unit, that means the productivity of agricultural plants depends on the entire ensemble of environment conditions, as well as man's

influence, which can modify in a sense or another natural factors or the plant characteristics, so as to better capitalize the natural conditions. [4]

The assessment grade on usage and crops results from multiplying by 100 the coefficient product (the 17 indicators) [15] which directly participate in the establishment of the assessment grade: [5]

$$Y = (X_1 \text{ x } X_2 \text{ x } X_3 \text{ x}........X_{17}) \text{ x } 100 \text{ [14]}$$

where y is the assessment grade. [10]

The weighted average assessment grade thus obtained, insures general information over the agricultural land usage category for various uses and their favourability for different crops, as well as over their correct use during the production process. [5] [12]

RESULTS AND DISCUSSIONS

The obtained results are presented in detail for various usage categories or for crop groups with the same biological or technologic particularities.

For each indicator, depending on its usage scale or on the crop, tables containing the respective coefficient values were set up.

Table 1 calculates the assessment grades for the main agricultural crops occurring in this area, namely wheat, barley, maize and sunflower, as well as the fertility class of each soil, respectively each crop.

Table 1 Soil favourability for the wheat, barley, maize and sunflower crops

Nr Crt.	Type of soil	wheat		barley		maize		sunflower	
		assessment grades	fertility classes	assessment grades	fertility classes	assessment grades	fertility classes	assessment grades	fertility classes
1.	Chernozeum	90	II	90	II	90	II	90	II
2.	Typical batigley chernozem	80	III	80	III	80	III	80	III
3	Gleiosoil cernic	46	VI	46	VI	45	VI	48	VI
4.	Gleiosoil typical	39	VII	43	VI	44	VI	48	VI

Source: Own calculation.

From the analysis of the assessment grades for the strawy cereals (autumn wheat and autumn barley) one may observe an accentuated differentiation of soil units from the point of view of the conditions they create for crop plants. [7] The highest grades are obtained by

the typical batigley chernozem, falling under the 2nd respectively the 3rd fertility classes.

Table 2 presents the assessment grades and fertility classes for pastures and hay land.

Table 2. Soil favourability in the Periam commune, Timiş County, for pastures and hay land

Ct. No.	Type of soil	Pastures		Hay land	
		assessment grades	fertility classes	assessment grades	fertility classe
1.	Chernozeum	90	II	90	II
2.	Typical batigley chernozem	80	III	80	III
3.	Gleiosoil cernic	65	IV	56	V
4.	Gleiosoil typical	47	VI	41	VI

Source: Own calculation.

Hay land manifests a higher requirement regarding the physical and chemical properties of the presented soils, which leads to the accentuated decrease of assessment grades with the following soils: chernic gley soil and typical gley soil.

Table 3 Soil favourability in the Periam commune, Timiş County, for the apricot and peach cultures

Ct. No.	Type of soil	Apricot		Peach	
		assessment grades	fertility classes	assessment grades	fertility classe
1.	Chernozeum	80	III	70	IV
2.	Typical batigley chernozem	80	III	80	III
3.	Gleiosoil cernic	14	IX	14	IX
4.	Gleiosoil typical	12	IX	12	IX

Source: Own calculation.

Fruit tree cultures present higher requirements, especially with regard to gleization and alkalization processes. The occurrence of mineralized underground water at a low depth excludes planting apple, pear and plum tree cultures on chernic gley soil and typical gley soil.

CONCLUSIONS

From a geomorphologic point of view, the territory of the Periam locality presents general characteristics of all other loess plains from the great Tisa depression, the same large plane horizons, with slightly irregular forms represented by isolated, shallow depressions resulting from local compaction.

Of the frequently encountered forms and processes, we can count here: strong loops, floods with alluviations and divagations. The locality plain is crossed by the Aranca and Galaţca streams, which are old courses of the

Mureş river.

The soils occurring frequently in the studied perimeter, are of the chernozem type, with good drainage. This type of soil includes several subtypes, among which humid phreatic chernozem soils predominate.

In depression areas, gley soils occur (typical as well as chernic ones), due to the high level of potassium rich underground waters.

Chernozems are soils with the best physical and chemical properties. That is why they present the highest agro-productive potential.

Chernozems are optimal for all pants.

Very good results are obtained with: wheat, barley, maize and sunflower.

Good results are obtained with fruit trees.

In order to increase the fertility of these soils, the following measures are recommended:

• Agro-technical works which lead to the accumulation and preservation of water in the soil;

• Periodical application of organic fertiliser and moderate fertilisation with NPK;

• Avoiding monoculture and rigorously applying crop rotation;

• Complementing the humidity deficit through irrigations in the case of the sugar beet crop, maize crop, etc.

In *Gley soils,* due to periodic oscillations of the underground water which influence negatively the physical-chemical indices and the fertility, cultivated plants have problems adapting to the alternation of humidity excess and humidity lack.

Gley soils evolving on more permeable rocks, with a good drainage, are more productive, being covered with medium quality pastures or forests.

After their amelioration, one may cultivate: wheat, maize, barley, sunflower.

Gley soils are not recommended for fruit tree cultivation, due to the low depth underground water.

In order to increase the natural soil fertility, we recommend the following measures:

• Organic and mineral fertilisation;

• Applying calcareous amendments.

Chernozem soils present the best physical and chemical features. That is why they also present the highest agro-productive potential.

These soils are optimal for all plants, with very good results in wheat, maize, barley and sunflower and good results in fruit trees.

Gley soils present periodical underground water oscillations, thus negatively influencing physical-chemical indices and fertility, cultivated plants having problems adapting to the alternation of humidity excess and humidity lack. Wheat, maize, barley and sunflower can be cultivated after amelioration, while fruit tree cultivation is no recommended due to low depth underground water.

REFERENCES

[1]Căbăroiu G., Niţă L., 2013, Land quality classes and natural landscape of the mining area Valea Mănăstirii 2, Gorj county, The 9th International Symposium "Young People and Agriculture Research" Timisoara, 29 November 2013, Research Journal of Agricultural Science, Vol. 45(4):14-18, www.rjas.ro/, Accessed January 10, 2018.
[2]Duma-Copcea Anişoara, Ştefan, V., Mihuţ Casiana, 2009, Soil production capacity from Periam, Timiş Country for different crops and agricultural use, Research Journal of Agricultural Science, Vol. 41 (1), Timişoara
[3]Goian M., 2000, Agrochimie, Editura Marineasa, Timişoara, 43-44.
[4]Ianoş, Gh., Goian M., 1992, Influenţa sistemelor de agricultură asupra calităţii solurilor din Banat. Probleme de agrofitotehnie teoretica şi aplicata, Vol. 14, 3-4, ICCPT Fundulea
[5]I.C.P.A., Bucureşti, 1987, Metodologia elaborării studiilor pedologice vol. I, II, III.
[6]Lotreanu, I., 1985, Monografia Banatului, Institutul de Arte Grafice, Timişoara, pag. 103-105
[7]Mihuţ Casiana, Laţo, K.I., 2007, Pedologie. Metode de analiză. Ed. Gutenberg, Arad, pag. 74
[8]Mihuţ Casiana, Radulov Isidora, 2012, Ştiinţele Solului. Ed. Eurobit, Timişoara, pag. 86-88
[9]Niţă, L.D., 2007, Pedologie, Editura Eurobit, Timişoara, pag. 112
[10]Okros, A., 2015, Fertility status of soils in western part of Romania, Journal of Biotechnology, Volume 208, Supplement, 20 August 2015, -09.05.2015 Bucuresti Romania 3,14.
[11]Okros, A., Pop Georgeta, 2014, The influence of the western plain topoclimate on cereal and cereal derivative production quality and quantity, Research Journal of Agricultural Science, 46 (4):140-145.
[12]Rogobete, Gh., Ţărău, D., Chisăliţă, Gh., 1997, Evoluţia solurilor din Câmpia joasă a Banatului şi problemele de clasificare, Lucr.şt. Acad.Română, Fii. Iaşi, pag. 175-179
[13]Rogobete, Gh., Ianoş, Gh., 2007, Implementarea Sistemului Român de Taxonomie a solurilor pentru

partea de vest a României, Timişoara.
[14]Ţărău, D., Luca, M., 2002, Panonic al comunelor bănăţene din perspectivă pedologică, Editura Marineasa, 2002, pag. 58-60
[15]Ţărău, D., 2003, Bazele teoretice şi practice ale bonitării şi evaluării terenurilor din perspectivă pedologică, Ed. Solness, Timişoara, pag. 94
[16]Ţărău, D., 2003, Cartarea şi bonitarea solurilor, Ed. Eurobit, Timişoara, pag. 115