

SOIL RESOURCES AND QUANTITATIVE ASSESSMENT OF ARABLE LAND

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Abstract

The purpose of this research is the soil, observed and analyzed in its complex relations to natural factors among which it exists so that the thesis on " Ecopedological Foundation of Cadastral Value of Agricultural Land in the Olt County" be prepared, based on the knowledge of physical, chemical, and hydro-physical characteristics of soil as well as on the data regarding natural factors in relation to which the research is performed as part of the preparation programme of the doctoral school of USAMVB Timisoara. As a result of observation, data collected from the field according to "Guide to Describe the Soil Profile and Environmental Conditions" and "Romanian System of Soil Taxonomy" (SRTS-2003) as well as of the interpretation of results according to the Methodology of Elaboration Soil Studies, 1987 (Vol. I, II, III) five types of soil were identified: Arenosol, Chernozem, Phaeozems, Luvisols and Vertosol, belonging to four classes of soil that: Protisoluri, Cernisoluri, Luvisoluri and Pelisoluri. It may be observed that the dominant soil in the investigated perimeter is the Chernozem (typically cambic), occupying 348 hectares (of 823 ha researched), while the one with the smallest share is the Arenosol (gleyic), occupying 15 ha the investigated area. Throughout the whole, the soils have good fertility, medium texture, glomerular structure, very high aeration porosity, good permeability for water and air and a low resistance to ground works. The soil samples were collected during the years 2010-2011, together with specialists from the Office for Soil and Agrochemical Studies Olt, and physical and chemical features of soil samples were analyzed in the laboratory of the same office, in accordance with rules and standards existing. In the concept of evaluation the notion of "land" includes all environmental factors (soil, relief, climate, hydrology, etc.), which have significant influence on usage. Because of the economic conditions, different grounds in the same class of natural evaluation may have different economic results, materialized in the net value of the net income and consequently different economic values. Quantitative assessment of land was based on estimates of production potential by evaluation marks, calculated for the conditions in the area (current or natural conditions). The comparison of environmental conditions (climate and soil) of a territory with environmental requirements of crops of interest, results the ecological evaluation class, its quantitative expression being the production per hectare achievable under normal conditions of climate and at optimal technological level.

Keywords: soil resources, favorability, productive potential, quantitative assessment lands conditional evaluation.

Introduction

Soil is the general term used in soil science and modern agriculture and it is defined in the literature as follows:

Soil is a natural means of production formed on the land surface in a long time under the influence of environmental conditions and human activities.

Complex scientific knowledge of soil resources of a particular territory, by characterization and classification of soils based on morphological, physical, chemical, microbiological, features is of major importance for land use planning.

Detailed knowledge of productive and technological characteristics of each portion of territory both in terms of capacity and current characteristics and in terms of real possibilities

of change in well, ensures for each production unit and for decision makers from different levels, a powerful tool to achieve those work processes and those socio-economic measures that lead to full utilization of land resources for the benefit of man, of all our communities.

Formed under very different natural conditions, soils have different characteristics and fertility meaning their ability to support plant growth (cultured or wild) and formation of agricultural and forestry production from one zone to another.

Production capacity of soil (land), represented by yields, is the basic criterion for determining the tax on land, assessing agricultural land to establish a fair tax, land appreciation for the guidance of loans and land buyers.

Ecopedological knowledge, conditional evaluation and assessment of land are necessary for modern "rational" agriculture which, by some agricultural and agropedologica ameliorative work, contribute to change soil characteristics (fertilization and improvements in various ways).

The goal of ecopedological characterization of lands is to establish what might be called their ecological specificity in terms of their physical properties, mechanical, chemical, hydrological, morphological, climate characteristics, the relative situation of this specificity related to the optimum organic land in relation to plant requirements, that their productive potential, the specific conditions existing environmental and productivity possible and establishing the nature of ameliorative measures necessary to bring soil or other factors and vegetation conditions most favorable condition for growth and fruiting plants.

The purpose of this research is to delimit and to evaluate soil resources, estimate the productive potential of agricultural land, expressed as natural evaluation marks.

The objectives of this work fit into current research for the study, delineation, and evaluation of soil resources, land and setting conditional evaluation favorability for various crops, the production potential of land, quantitative evaluation method of land evaluation marks in report with running the study and are part of the preparation of the doctoral school in pursuit of Timisoara USAMVB thesis on "the foundation ecopedological cadastral value of agricultural land Olt".

Materials and Methods

This paper characterizes the agricultural land, especially the arable one of the Olt County, from different areas and territorial administrative units of the county (Spineni, Dobrețu, Seaca, Gura Padinii, Stoenеști and Băbiciu).

According to land records of OJCPI Olt on 12.31.2005, the Olt county agricultural area was 437.165 ha, of which 390.569 ha was arable land. The agricultural area of the county on 12/31/2011 was 434.442 ha, of which 388.445 arable ha, so there is a decrease in agricultural area approx. 0.62% reduction that resulted from keeping land fallow.

To achieve the objectives data were collected from both specialized literature and from the field and 7 main sections were developed, where the soil samples were collected and pedogenetic horizons were analyzed in the laboratory OSPA Olt. The soil samples were dried, milled up to a particle size less than 2 mm, after which they were subjected to laboratory analysis.

Results

Olt County is located in the south-west of Romania, being crossed from the north to the south by the lower course of the Olt River, and it has an area of 5.507 km².

The underlying rocks found in Olt County are:

- unconsolidated detritic rocks represented by loess cover large areas in the lowlands (Romanian Plain) in the terraces of the Olt terraces, Danube, Olteț and Vedea Rivers, and isolatedly in the southern Getic Plateau.

- unconsolidated silicate rocks represented by contractile clays covers large parts of the Getic Plateau and the Boian Plain.

Olt county territory is situated on two geomorphological units, the Getic Plateau (north) and the Romanian Plain (south), which are characterized by landforms found in the county, that is hills and plains.

The Getic Plateau spreads over the northern part of Olt County, with an altitude of 200-400 m.

The Getic Piedmont landscape is kept in current relief as the largest piedmont unit in our country.

The Romanian Plain characterizes the southern part of the localities alignment Bals-Potcoava-Corbu-Slatina, being separated by the Olt Valley into two sectors: the Oltenia Plain to the west of Olt River and the Teleorman Plain to the east.

The main hydrographic by the Olt Valley basin is Olt River, that contribute to ensuring drainage around throughout the county. Other surface waters crossing the Olt County are: the Danube, the Olteț, the Vedeia, the Tesluiului of Resca, Călmățuiul.

For the characterization of climatic elements data from three weather stations have been used namely: Steharet-Slatina, Caracal and Drăgășani.

The Olt County climate is temperate continental, with slight Mediterranean influences, more humid in the north and drier in the south.

Temperature is the one that can foster the development of vegetation mitigate or exclude certain species due to low values recorded at certain times of the year.

Monthly average values of air temperature in the Olt County for the period 1980-2000 are 10.9⁰C at the weather station Steharet-Slatina., 11.3⁰ C the Caracal weather station. During the years 1986-2001 the average air temperature was 11.3⁰ at Dragasani weather station.

Precipitations have a decisive role both in the development of a type of vegetation and in specific processes of the soil.

Regarding precipitation we can say that they have the same influence as continental air temperature they are predominantly rains but unevenly distributed.

Average annual quantities of precipitations during the years 1980-2000 were 519.9 mm at the weather station Steharet-Slatina, 492.4 mm at the weather station Caracal; for the period 1986-2001 the value was 555.2 mm at the weather station Dragasani.

Following observations, measurements and determinations in the field, in conjunction with interpretation of laboratory test results, in the Olt county, according to SRTS 2003, four soil classes, five soil types and six soil subtypes have been identified, which are different in terms of nutrient contents and productive capacity.

Protisoluri Class - includes intrazonale, young, soils with poorly differentiated pedogenetic horizons. Within this class the Arenosol type has been identified.

Arenosol gleyic (Profile 5) was identified in the meadow that is the southern part of the administrative territorial unit Gura Padinii, occupying 15 ha.

Cernisoluri Class - includes A mollic horizon soils followed by intermediate A / C or Bt, Bv horizons with a minimum thickness of about 10-15 cm, with dark colors and chrome values less than 3.5 moist, at least in the upper part of the mentioned horizons. Within this class two soil types have been identified Chernozem and Phaeozems.

Typical chernozem (Profile 1 ') was identified in the central southern part of Băbiciu territorial administrative unit, occupying 103 ha (Figure 1 and 2) and cambic chernozem (Profile 9:33 p.m.) was identified in the SV and the NV of Stoenești territorial administrative unit, occupying 245 hectares (Figure 3 and 4).

Phaeozems cambic (Profile 4) was identified in the central eastern territorial administrative unit of Seaca occupying 150 hectares.

Luvisols class - represented by soils showing textural differentiation, high cation exchange capacity of clay. Within this class of soil: the Luvisol type has been identified.

Vertic-stagnic Luvisol (Profile 1) is fine textured soil it occupies 245 hectares, being identified in the northern part of the administrative territorial unit of Spineni.

Pelisoluri Class - includes heavy soils (clay), with cracks on the surface and oblique slipping sides. Within this class two Vertosol soil types have been identified.

Brown Vertosol (Profile 2) was identified in the central and NE parts of the territorial administrative unit, of the Dobretu occupying 65 ha.

Profile 1 (SPINENI)	LVvs-st	$\frac{W_3 - K_5 - t/a - Ssa - A}{D - DR - P_{01} - NIa - Q_7}$
Profile 1' (BĂBICIU)	CZti	$\frac{G_1 - K_3 - l/l - Tem - A}{T - DM - P_{01} - NBm - Q_5}$
Profile 2 (DOBREȚU)	VSbr	$\frac{W_2 - K_5 - a/a - Ssa - A}{D - DR - P_{01} - NIa - Q_7}$
Profile 4 (SEACA)	FZcb	$\frac{K_4 - l/t - Tet - A}{C - DM - P_{01} - NBt - Q_7}$
Profile 5 (GURA PADINII)	PSgc	$\frac{G_3 - K_2 - n/n - Tfg - A}{L - SJ - P_{01} - NBg - Q_5}$
Profile 21 (STOENEȘTI)	CZcb	$\frac{K_5 - l/t - Tem - A}{C - DR - P_{01} - NBm - Q_6}$
Profile 33 (STOENEȘTI)	CZcb	$\frac{K_5 - l/l - Tem - A}{C - DR - P_{01} - NBm - Q_6}$

Conditional evaluation is an estimate of production potential of a territory for a certain type of usage and for certain crops through a system of technical indicators and evaluation marks.

Of the multiple environmental conditions that characterize every unit of land defined in this research only those considered most important, easily and accurately measurable were chosen.

Since agricultural economics is ruled objectively by the differential ground rent law, which shows the different productivity of agricultural labor depending on natural conditions in which this labor takes place, I have sought to provide information on how natural factors influence the productivity of agricultural land.

For agricultural land natural conditional evaluation aimed to establish evaluation marks and favorability classes for the use of arable land and crops. Natural conditional evaluation of agricultural land was done for arable use.

Indicators of ecological characterization are natural environmental conditions that characterize each unit of Homogeneous Environment Territory, taken as synthetic biophysical parameters, expressed by coefficients of evaluation with different values according to the way the natural condition affects the requirements of use or plant taken into account (Table 1).

In the process of the conditional evaluation of land for natural conditions, each of the indicators of ecological characterization participated in determining the mark of evaluation by limiting factors.

The evaluation mark for usage and crops was obtained by multiplying by 100 the product of the indicators coefficients directly involved in establishing evaluation marks.

This is expressed in points of evaluation on a scale from 1 to 100 and it was set at TEO for agricultural use during the research.

For the category of arable use, the evaluation mark is the arithmetic average of the evaluation marks for eight crops namely wheat, barley, corn, sunflower, potato, sugar beet, soybean, peas and beans (Table. 2).

The comparison of environmental conditions (climate and soil) of a territory with environmental requirements of crops of interest, results in the ecological, evaluation class its quantitative expression being the production per hectare achievable under normal conditions of climate and at optimal technological level (Table 3).

The employment of arable land into quality classes according to the natural evaluation mark in the studied territory is presented in Table. 4

Table 1 Classification of agricultural land into quality classes according to the natural evaluation mark

No. Profile	No. TEO	Area -ha-	Quality classes									
			I		II		III		IV		V	
			ha	mark	ha	mark	ha	mark	ha	mark	ha	mark
1	001	245					245	60				
1'	001'	103			103	80						
2	002	65					65	59				
4	004	150			150	70						
5	005	15									15	19
21	021	123			123	64						
33	033	122			122	64						
TOTAL ARABIL = 823					498	69	310	60			15	19
Class and average grade - class II - mark 65												



Figure 1. Sampling of soil-profile 1 '



Figure 2. Typical chernozem in U.A.T. Băbiciu



Figure 3. Sampling of soil-profile 33



Figure 4. Cambic chernozem of la U.A.T. Stoenești

Table 2. Ecopedological of evaluation indicators

No profile	Soil type and subtype	Codes of evaluation indicators																	
		3C	4C	14	15	16	17	23	29	33	38	39	40	44	63	69	133	144	181
1	LV vs-st	10,5	575	0	3	00	00	52	00	01	00	15,0	0	+05	6,6	96	175	180	3
1'	CZ ti	11,5	475	1	0	00	00	42	00	01	00	03,5	0	-05	6.1	87	175	180	1
2	VS br	10,5	575	0	2	00	00	61	00	01	00	15,0	0	-05	5,2	65	175	090	2
4	FZ cb	10,5	525	0	0	00	00	42	00	01	00	15,0	0	-05	5.6	79	175	180	1
5	PS gc	11,5	475	3	0	00	00	12	00	01	00	03,5	0	-15	7,5	87	138	090	1
21	CZ cb	11,5	475	0	0	00	00	42	00	01	00	07,0	0	-05	6,1	79	175	180	1
33	CZ cb	11,5	475	0	0	00	00	42	00	01	00	07,0	0	+05	6,1	79	175	180	1

Table 3. Evaluation notes sites of TEO

No. TEO	Use TEO	Area TEO (ha)	GR	OR	PB	FS	CT	SZ	SO	MF	IU	IF	CN	LU	TR	LG	AR	Cp AR
001	A	245	65	65	65	58	42	52	65	65	58	47	58	58	47	65	60	3
001'	A	103	90	90	80	90	56	63	81	90	90	56	72	90	44	81	80	1
002	A	65	64	64	64	58	45	50	64	64	56	52	56	64	46	56	59	3
004	A	150	72	72	72	72	58	72	72	72	72	65	72	72	51	72	70	2
005	A	15	15	22	22	22	23	15	13	22	16	15	12	24	8	26	19	3
021	A	123	72	72	64	72	45	50	65	72	72	45	58	72	39	72	64	1
033	A	122	72	72	64	72	45	50	65	72	72	45	58	72	39	72	64	1

Table 4. Production per hectare achievable under normal climate

No. TEO	Culture	Class	Mark	Kg/point	Productive potential Kg / ha
001	Grain	II	60	60	3.600
001'	Grain	II	80	60	4.800
002	Grain	III	59	60	3.540
004	Grain	II	70	60	4.200

005	Grain	V	19	60	1.140
021	Grain	II	64	60	3.840
033	Grain	II	64	60	3.840

Discussion

Objectives have been achieved by identifying and establishing the types of soil, determining the production potential of land surveyed and by quantitative assessment of land through the method of natural conditional evaluation.

Of the soil types established in the investigated territorial administrative units, Chernozem has the largest share. Soil structure is granular and it has medium texture and good permeability for water and air.

Investigated arable land falls within class II, taking a natural evaluation mark of 65 points, that is good land pretability, medium and fine textured with moderate limitations that do not reduce the range of crops and do not require to prevent degradation and / or improvement, development or improvement measures, investment funds (providing average yields in undeveloped conditions).

Economically, class II quality lands (evaluation marks) are lands that do not cause losses. Benefits are achieved in optimal conditions and require no special effort.

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