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STUDIES ON SOIL COVER AND LAND SUITABILITY TO VARIOUS AGRICULTURAL USES, IN THE SOUTH/EAST OF THE OLT COUNTY

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Abstract

Researches start on the hypothesis that the soil is a natural body, that in terms of rational use improves its productive capacity, and can be characterized by the particularities of the natural environment in witch forms it and determines its suitability for various agricultural uses. Pedogenetical processes leading to formation of the five classes of soil in the Plapcea hydrographical basin, Olt county are especially influenced by the climate and hydrographic network. Based on the study of the landscape and the soil cover in estimation of its suitability for agriculture it considered the fact that most part of soil, about 75, belong to Luvisols class (Romanian System of Soil Taxonomy), land suitability is good till the hard limitation.[2]. These limitations, determined by the power of restricting factors, produce the structure of agricultural production and settle the boundaries of areas on the suitability classes, namely: 4.96% good suitability (class II), 54.2% middle suitability (class III), 34.4% hard limitation (class IV) and 6.5% with very hard limitation (class V). Although the land fertility is very low, the land use is predominantly agricultural and surfaces with grains grown at a rate of 77%.

Key words: *fertility, production capacity, soil, suitability.*

INTRODUCTION

In this research we studied the natural factors of the valley basin Plapcea, county Olt, in order to know objectively the potential of soil cover and thus their suitability to various agricultural uses.

Soil and its qualities are known by the natural features in winch it formed and evolved.

A fundamental factor of the soil genetically processes is climate which by its elements expresses and other components of the environment, like hydrographic network.

The focus is on land, because no other natural component has more implications not then this, which is increasingly thought like a complex territorial subsystem, imposing new ethics on soil resources and partnership relations between soil and society, as the basis for their sustainable use.

In this connection, Florea N., defines the ground, "complex territorial system with variable organization both vertically (pedon) and laterally, in space (geographical package of soil cover)" [1].

This set of soil genetically factors specifically Plapcea basin have led to a formation of complex soil cover in which are present a number of clearly differentiated types and subtypes, most of whom belong to the class Luvisols (77%).

MATERIAL AND METHOD

For the study undertaken were conducted analysis and interpretation of data obtained from conducting research in the south-eastern Olt county.

Soil type studied is albic luvisol, which occupies the largest area in the studied region. Documentation is a key element that is brought current soil genetically processes and phenomena setting challenges to agriculture, due to the natural environment.

Methods used in the classification of soils, into classes were made according to Methodology on development soil studies [9].

By using the map scale 1:200.000 have identified 14 soil taxonomic units in the old system, plus variants affected by different degrees of erosion and soil associations.

Statistical analysis highlighted Luvisols class rule, almost three quarters of the area studied (77%).

The analysis of topographic maps and longitudinal profiles show that the investigated basin Plapcea inclined, as well as the entire area of Piedmont Cotmeana from north to south [3].

Note of evaluation on uses and cultures product obtained by multiplying by 100 product of the 17 coefficients of the indicators taken into account in determining the note of evaluation for each culture, then made their average.

For arable land, note of evaluation is calculated as the arithmetic average of the grades for eight basic crops (wheat, corn, sunflower, sugar beet, potato, soy, peas beans, alfalfa) which shows the highest favorability, into the field considered unit. Weighted average scoring was performed on the plots for arable land and crops: wheat, corn, sunflower, sugar beet, potato, soybean, peas/beans and alfalfa.

RESULTS AND DISCUSSIONS

The concept on soil fertility has been addressed by various authors, including Stephanie, who defines it as "a natural ability to balance their accumulation processes underlying the formation of organic-mineral complex, with the balance of nutrients for vegetative cover" [8].

The soil, used in agriculture as a means of production, wear physical and moral even if it is used rationally, but has the property that when it is used in appropriate circumstances not to wear, but rather to improve so that the production power [6].

The investigated area is located in the south of the country, in Getic Piedmont and has over 25.000 hectares. From the administrative point of view, this territory belongs to the Olt County.

Under the influence of simultaneous and associated influence of factors and pedogenesis processes in Plapcea basin formed a relatively wide range of soils, which the Romanian System of Soil Taxonomy - 2003, belonging to classes Protisols, Cernisols, Cambisols, Luvisols and Hydrisols.

Luvisols class includes soils that have the diagnosis of a Bt horizon rich in clay migrated, and morphologically recognizable by the presence of clay films enveloping surface structural aggregates.

Luvisols are most widespread in the region (76.90%) and are represented by types, preluvosoil and Luvisol.

Albic stagnic luvisols

Due to special pedogenetic conditions especially climate, vegetation and relief, soils are in an advanced stage of degradation, albic luvisol, representing the most advanced period of development of Luvisol.

These soils, occur on high crawling of Plapcea Mica, south of Scornicesti (about 530 ha), under a flat relief such as fluvial deposits. Albic luvisols have a morphology type Ao-Ea-EBw-Btw-Ca.

Ao horizon level and Bt horizon level also is often subdivided in at least two sublevel.

Clay content of these soils is around 17-25% in the first 30-40 cm, and almost three times higher in the iluvial level Bt horizon (55-64%). Extremely low bulk density Ao horizon level (<1.00 g/cm^3) corresponds to a state of very strong aeration (<-18) and a low resistance to penetration (20-25 kgf/cm^2).

Wilting coefficient has low values (6.0% to 8.2%) at the surface, medium-large at the profile (13-16%), the opposite of field capacity (26-28%) in horizon Ao and under 26% in Bt horizon) [7].

In terms of useful water capacity, it is high and even extremely high (18-22%) (Table 1). Permeability expressed by hydraulic conductivity is high on the surface than in the first 25-30 cm and very low in Bt horizon. The reaction of these soils is strongly acid to the surface (4.9 to 5.1) and moderate acid-neutral in the rest of the profile (Table 2).

As the organic matter content is found in larger quantities only in the forest use (10-18%), while in cultures only reaches 2.5% and consists of fulvic acids (that is lower quality).

Table 1. Hydro- physical data on Albic stagnic luvisols

Soil horizon	Depth (cm)	Composition size				Bulk density g/cm^3	Total porosity %	Degree of soil compaction %	CO %	CC %	CU %	Hydraulic capacity (mm/h)
		< 0.002 (mm)	0.002-0.02 (mm)	0.02-0.2 (mm)	0.2-2.0 mm							
Ao	0-15	25.0	44.8	30.2	0.0	0.90	64.0	-29	8.2	27	18.8	18.1
Ea	20-31	21.9	42.8	35.3	0.0	1.04	61.2	-17	6.6	28	214	27.5
EBw	31-41	38.8	35.4	25.8	0.0	1.41	47.4	9	1.5	25	11.5	2.4
Bt_1w	60-80	53.6	33.6	12.8	0.0	1.42	47.0	12	15.1	26	10.9	0.3
Bt_2	120-140	64.2	25.1	10.7	0.0	1.52	43.3	19	15.3	25	9.7	0.3
B/C	158-170	53.8	32.6	13.6	0.0	1.60	40.2	25	13.2	24	10.8	1.8

Table 2. Chemical data on Albic stagnic luvisols

Soil horizon	Depth (cm)	pH - meter	Organic matter (%)	T (me/100 g sol)	V (%)	Mobile phosphorus (ppm)	Mobile potassium (ppm)
Ao	0-15	5.1	2.5	20.43	34.1	7	62
Ea	20-31	4.9	1.1	11.76	19.5	4	50
EBw	31-41	5.6	0.7	13.25	33.3	-	-
Bt_1w	60-80	5.7	0.5	35.34	58.9	-	-
Bt_2	120-140	6.9	-	39.63	71.9	-	-
BC	158-170	-	-	-	-	-	-

% - degree of base saturation; T% = hydrolytic acidity

Often contain quantities of mobile aluminum which are toxic to crop plants and may be phenomena of phosphorus immobilization by formation of aluminum phosphate and insoluble iron.

Luvisols Albic stagnic are part of the soil with low fertility and that because of the physical, chemical and trophicity less favorable. To these is added and defective air hydric regime. With low permeability, water from rain often remains above soil.

Grain (wheat, rye, oats and corn) production obtained in these soils is poor.

Better results are obtained only from areas where organic fertilizers were applied (30-40 t/ha) and nitrogen and phosphorus fertilizers. The study of the natural framework and soil cover allow the evaluation of suitability of these lands for agriculture.

An important feature of the valley basin Plapcea is the flatness piedmont (below 3%) which allows mechanization and agro chemical treatment in good condition especially for grain uses.

However, farming land is hampered by imperfect soil drainage, excessive wetting, which mostly takes between 15-60 days.

All agriculture crops suffer heavily, the sensitive in most years.

Also, the movement of agricultural machinery causes compaction on arable land, increasing the risk of standing water and inefficient use of nutrients by plants and their loss in depth, issues and other researchers observed [4].

The increased state of compactness and strength, soil requirement to work increase, leading to reduced fertility and productivity.

Soil reaction which in Plapcea basin is moderately acidic (4.5 to 5.8) affects more than 8000 hectares of surface, in their most

typical luvisol and albic stagnic luvisol and organic matter reserves are not satisfactory.
This land is predominantly agricultural used, although soils are not sufficiently capable by their qualities to meet the needs of development of any plant.
Cereals are grown on 77% of the land, wheat and corn occupying more than 50% of the grain surface.

For agricultural land conditional evaluation is to determine grades and classes of favorability for different cultures and classes of quality agricultural land uses: farmland, vineyards, orchards, pastures and meadows.

Table 3. HEO (environmentally homogeneous area) unit no. 6 Stagnic luvosols
(note of evaluation - 32 grade IV / a)

INDICATOR	CROPS							
	Wheat	**Corn**	**Sunflower**	**Potato**	**Beet**	**Soy bean**	**Peas/Beans**	**Alfalfa**
Mean temperature	1.0	1.0	1.0	0.8	0.9	0.9	1.0	1.0
Mean precipitation	0.9	0.9	0.9	0.7	0.9	0.9	0.9	0.9
Gley process	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Stagnogley process	0.8	0.7	0.7	0.5	0.6	0.7	0.7	0.6
Salinization and alcalisation	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Texture in Ap	1.0	1.0	1.0	0.9	0.9	1.0	1.0	1.0
Edafic volum	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Polution	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Slope	1.0	0.9	0.9	0.9	0.9	0.9	1.0	1.0
Land slides	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Grownd water	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Inundability	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Humidity	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total porosity	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Calcium carbonate	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Reaction in Ap	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8
Organic matter	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0
Note evaluation	0.52	0.41	0.41	0.16	0.28	0.37	0.40	0.38
Mean HEO	32							

Knowing the notes of evaluation can be calculated yields per hectare.
Yields the main crops is determined by multiplying the evaluation notes with the equivalent in kg of a point of evaluation, according to the details of rent calculation stipulated in OM 126/20.06.1994 (Table 4).

Depending on the evaluation notes, HEO units (homogeneous ecological area) representative of the studied area are incuded into several classes of soils: Protisols (regosols, fluvisols), Cernisols (Phaeozem), Cambisols (eutricambosol), Luvisols (Preluvosol, Luvisol) and Hydrisols, retaining attention Luvisols.

Table 4. Equivalent in products for a point of evaluation

Equivalent in products of a point of evaluation	CROPS					
	Wheat	Barley	Corn	Sun flower	Potato	Beet
Kg/point	40	45	52	36	200	280

Area in hectares and percentages of total area studied on quality class is presented in table 5.

Table 5. Surfaces on quality class

Quality class	Soil	Surface (ha)	%
II	Phaeoziom	1325.0	4.96
III	Eutricambosol, Preluvosol	14447.0	54.2
IV	Luvosol, Regosol, Fluvisol	9157.7	34.4
V	Stagnosol	1737.5	6.5
Total		26667.2	100

In Plapcea basin were distinguished according to the suitability of the arable land following classes of land:

• Class II surface area of 1.325 ha, good land suitability, the low limitations due to soil texture and compaction; here falls flat land, represented by calcareous faeozems;

• Class III surface area of 14.447 hectares, land suitability middle, with moderate limitations that reduce the structure of crops in rotation;

• Class IV in the area of 9.157,7 ha land with low suitability, requiring severe restrictions, with considerable limitations of field crop; deficiencies relate to soil characteristics, land and comprehensive drainage;

• Class V surface aria of 1.737,5 ha land with severe limitations, useless for arable without interfering with soil hydrological improvement development works.

Of great importance in achieving production results bear in mind that in rainy years, considerable land surface water reaches the soil cover up to 50-60 days. This explains the weaker productions of the land (Fig. 1).

Land use creates such opportunities perceived as risks or degradation phenomena, which may cause damage or injuries by reducing agricultural production.

Wheat and corn production in this area is diminished by more than 65% compared to the national production [10].

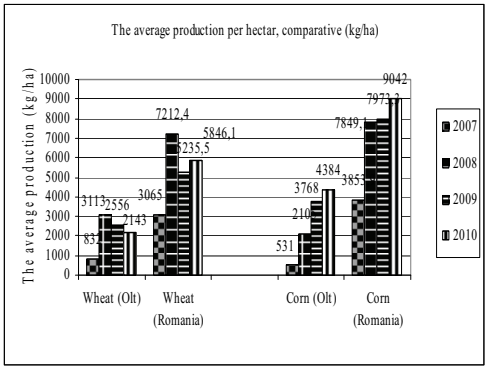

Fig.1. Comparison of average production Olt county and Romania (kg/ha)

CONCLUSIONS

Due to complex physical and geographical conditions of the basin Plapcea was formed and evolved a wide range of soils classified in several classes: Protisols, Cernisols, Cambisols, Luvisols and Hidrisols.

Preluvosols are represented by a large variety of subtypes: typical, mollic, stagnic, representing 46.44% and luvisols occupy second ranks in area (30.36%) and includes subtypes stagnic, albic and albic stagnic.

Grouping into categories of suitability to arable land is made regarding the nature and intensity of limiting factors for production, in this case, the land is included in most in the quality class III (54.2%) and class the fourth (34.4%), where it is found mainly in the studied soil type - Luvisol.

Harvests in this area are 3 times lower than the national average for the main crops: wheat and corn.

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