EVALUATION OF ECO-PEDOLOGICAL CONDITIONS FOR ORCHARDS CONVERSION OF LANDS FROM MORAVITA, TIMIS COUNTY

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Abstract: *The research has as purpose the support of sustainable agriculture system, responding to local requirements establishing the scientific data base necessary to support new technologies and develop integrated management measures of agro-eco-systems. This paper aims at obtaining background information on soil and agrochemical characteristics of soils (morphological, physico-chemical and agrochemical) to substantiate the defining elements of the scientific and technical quality status of land from Moravita area for orchard conversion. The objectives of this study are the following: identification, delimitation and inventorying of soil units from the analyzed land perimeter, morphological, physical, hydro and chemical characterization of soil units identified and delineated on the map, evaluation marks lands and establish suitability for the main tree species, highlighting nature and intensity of the limiting and / or restrictive factors, group of agricultural production land according to suitability for orchards, employment land quality classes for fruit growing use of and for the main tree species. After a detailed presentation of the landscape (relief, lithology, hydrography, hydrology, climate, vegetation, anthropogenic influences) are explained the phenomena that occur in the soil and how these phenomena and processes can be influenced by man in his farming activity. On these restrictive elements that affect the production potential of the soil cover is required, on a case by case basis, corrective action by amending the acid reaction with calcium periodic improvement of plant nutrition through fertilization improvement, removing excess moisture through works to prevent and combat it (sewers, ditches, gutters, drains, etc..), preventing and combating soil erosion (earth walls, furrows, canals coastal, erosion curtains), along with orchards conversion measures.*

Key words: *orchard, evaluation, conversion, land*

INTRODUCTION

Representing a well-defined condition with a high variability in space but relatively stable over time, pedological factors, the major components are essential in characterizing certain areas of land area.

Among soil properties and the main species cultivated can be established relations by a diverse and complex reciprocity. Soil properties can exert a decisive influence on the development of the root system, mineral nutrition, providing aerohidric and thermal regime needed to carry the main physiological processes and plants acts both directly and indirectly on the soil fertility status.

To determine the complex relationships that are established between various soil properties, were undertaken both in our country and in the world, numerous studies that have elucidated a number of mutual causality thereby helping to define soil taxa in terms of both

genetic and the fundamental characteristics, in relation to their contribution to the differential productivity and suitability of land for plants

Certainly knowledge of natural conditions and the specific area of the ecological potential of land for various utilities and some cultures have an important economic and social importance, for both large and small farm producer.

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Based on these considerations, the authors try to present in this paper, some aspects status of soil quality and the evolution of the main factors that contribute to its realization.

MATERIAL AND METHODS

The soil survey has been conducted to assess soil and land resources, for the establishment of orchards in Moravita, Timis County.

For preparation of this study, we used data obtained by observation in the field and processed in the laboratory. For identifying and delimiting ground unit on an area of 6.9 ha was opened a soil profile, of which 2 samples were collected in natural alignment and 6 samples in the amended settlement.

Pentru elaborarea prezentului studiu am folosit date obţinute prin observaţie în teren şi prelucrate în laborator.

Pentru identificarea şi delimitarea unităţii de sol pe o suprafaţă de 6,9 ha a fost deschis un profil de sol, din care au fost recoltate 2 probe în aşezare naturală si 6 probe în aşezare modificată.

These samples were investigated in relation to environmental factors, natural or man-made change, which makes the existence, together forming units of homogeneous ecological area (TEO) with the specific suitability or different technological requirements.

Characterization of ecopedological conditions specific to the investigated area, the definition of soil and land units, the limiting and / or restriction factors analysis of land productivity was made in accordance with, Elaboration Soil Survey Methodology (vol. I, II, III), prepared by the ICPA Bucharest 1987 ", together with elements of Romanian System of Soil Taxonomy (SRTS-2003 and SRTS-2012). Analyzes and other determinations were carried out in the research laboratories of the Department of Soil Science and Plant Nutrition, Faculty of Agriculture, or in the Research Department of OSPA Timişoara in partnership with USAMVB Timisoara, according with National Standards and Rules approved by the Romanian Standardization Association.

RESULTS AND DISCUSSION

In terms of geomorphology, the investigated part of the great unity Banato-Crisana Plain, Gataia Plain subunit. Gătaia Plain relief falls in steps from east to west, with altitude between 90-112 cm, constituting a relief of erosive piedmont with structural transition between relief from the high plains to the relief of subsidence accumulative of the low plain.

Its surface looks like a vast plain piedmont what is presented as a sequence of interfluvial plain width of 200 to 2000 m, crossed by valleys of erosion, shallow with little

verse, with slopes that rarely exceed 5% and meadows narrow aspect the alluvial plains with digression widths of 50-500 m. The maximum altitude is 90-112 m at interfluvial level and minimum altitude is 80-90 m on wide meadows of the valleys of erosion.

Gătaia Plain at first glance almost has an area fairly flat, however, studied carefully, it appears that shows frequent bumps represented by the presence in the horizontal surfaces and quasi horizontal within interfluves many compacted loess, large areas depression, localized at the top of the valleys of erosion, so rare smooth surfaces, the specific micro-relief form. Because of this varied microrelief, the interfluvial surface present with numerous water excess in spring.

Geologically, Gătaia Plain, is part of the great Pannonian Depression, eastern end, which was formed by the gradual clogging of the Pannonian lake in Pleistocene-Quaternary.

The base of this depression is formed on Carpathian foundation, consisting of crystalline formations and sediment in Mesozoic and Paleogene age, over which were made tortoniene, Sarmatian and Pliocene deposits. Quaternary deposits have from top thickness meters to several tens of meters.

In terms of catchment, the area studied is part of a river system south-western basin of Bârzava-Moravia. Moravita main watercourse that crosses the investigated area from east to west, with the tributary the creek Jimnita.

Located in the southwest of the country, the investigated area is characterized by a temperate continental climate with mild winters shorter and milder, being frequently under the influence of cyclones and air masses from the Mediterranean and Adriatic seas.

The average annual temperature recorded at Banloc Station is 10.7 ° C. The average yearly of rainfall on Banloc station is 604.7 mm.

After Koppen, the climate of researched territory falls within the province climate c, f, b, x characterized by a temperate climate with rainfall throughout the year (but deficient moisture in the summer months).

Investigated perimeter soils were formed and evolved through the complex interaction of pedogenetic factors among the most important are: relief, parent rock water, climate, vegetation and man.

The main factor in the diversification of soils is the relief. On flat ground forms printed evolving towards bioclimatic factors mentioned above, the blanket of soil being represented by cambic, argic chernozioms or faeozems. Water tables are found below the critical level, so to great depths and therefore does not influence the formation of typical cambic chernozem.

Following pedogenesis processes mentioned above formed a soil cover varied in the studied area identifying the Chernozem cambic - stagnic, stagnogleyed weak, mezocalcaric, medium clay loamy / clay loamy, developed on fluvial materials with the formula: CZ cb-st W2 - k3, 52/61 – Tf-t; At

The physical, physico-mechanical and hydro-physical properties of soil that determines the limits of physical and edaphic environment combines three phases: solid, liquid and gaseous of soil and intermediate stages between them, resulting from the biological and physical, chemical activities. The physical, physico-mechanical and hydro-physical properties of soil from the area where research has been undertaken, are strongly determined by contextual factors that naturally formed and evolved and the impact suffered as a result of long and intense human activities .

Size composition, the solid mineral particles that make up soil, indicates in the investigated soil profile, namely its upper sequence, the fact that it was affected by vigorous and prolonged human intervention (plowing, repeated disking at improper moisture conditions), which led to the degradation of the structure and an increased dust fraction on the expense of coarse and fine fractions.

Table 1

Physical and chemical properties of cambic stagnic Chernozem from Moravita

Horizonts	UM	**Ap**	**Atp**	**Am**	**AB**	**BAw$_2$**	**Bvw$_3$**	**BCk**	**Cca**
Deepness	cm	0-18	-23	-32	-55	-70	-95	-118	-180
Coarse sand (2.0 – 0.2 mm)	%	2,9	2,7	1,9	1,5	1,7	1,9	3,6	0,5
Fine sand (0.2 – 0.02)	%	24,7	24,6	24,6	24,8	25,8	27,4	28,1	29,9
Silt (I + II) (0.02-0.002 mm)	%	28,9	28,3	27,7	27,4	26,9	26,1	26,8	26,6
Coloidal clay (sub 0.002)	%	43,5	44,4	45,8	46,3	45,6	44,6	41,5	43,0
Phisical clay (praf II +arg col)	%	60,0	60,4	60,4	60,6	59,7	58,0	55,6	56,8
TEXTURE		TT	TT	AL	AL	AL	TT	TT	TT
Specific Density (Ds)	g/cm^3	2,65	2,68	2,7	2,72				
Aparent density (Da)	g/cm^3	1,56	1,60	1,65	1,70				
Total phorosity (Pt)	%	41,13	40,30	38,89	37,50				
Aeration phorosity (Pa)	%	4,63	3,18	0,11	-1,77				
Higroscopical coefficient(CH)	%	21,04	22,85	25,88	28,64				
Fadind coefficient (CO)	%	10,18	10,39	10,72	10,84				
Field capacity (CC)	%	15,28	15,59	16,08	16,26				
Total capacity (CT)	%	23,4	23,2	23,5	23,1				
Utile water capacity (CU)	%	26,37	25,19	23,57	22,06				
pH in water	unit	7,89	7,75	7,59	7,60	7,73	7,84	7,99	8,63
Carbonates (CaCO3)	%	0,42	0,42	0,42	0,42	0,42	0,42	1,46	23,9
Humus	%	1,94	1,89	1,69	1,58				
Nitrogen index (IN)		1,90	1,85	1,64	1,53				
Humus reserve (50 cm)	t/ha	54,48	15,12	25,10	48,35	**143**			
P mobile	ppm	15,57	14,32	6,84	5,63				
K mobile	ppm	153	148	139	131				
Saturation in base degree (V)	%	98	98	97	97	98	98	99	100

The texture is medium clayey loamy between 0-23 cm and 70-180 cm and clay loam between 23-70 cm; total porosity is very small between 0-55 cm; bulk density is high between 0-18 cm and very high between 18-55 cm; wilting coefficient is large between 0-55 cm; field capacity is medium between 0-55 cm.

The soil reaction is slightly alkaline between 0-118 cm and moderately alkaline between 118-180 cm; humus reserve in the first 50 cm is moderate; index of nitrogen is small between 0-55 cm.

Framing land suitability classes for orchards was done by considering the restriction of the highest intensity, resulting formula suitability units is: IIICZ W3A2U2 - f52h3. The restrictions on land for development as fruit tree plantation are: moderate limitations due to

excess of surface moisture (W3) and limitations due to low alkalinity (A2) and the unevenness of the terrain (U2). They were forecasting character, referring to the present situation.

The evaluation marks for orchard use category is calculated as the arithmetic mean of the six tree species and for the vineyards the arithmetic mean of the two species. For arable use category, the natural evaluation note is the arithmetic average of the eight evaluation marks for given culture (GR, OR, PB, FS, CT, SF, SO, MF) Ord MAAP223/2002 respectively Ord.MADR 278/2011. Classes of quality (fertility) shall be those specified in the regulations that:

- class I , from 81 –100 points ,
- class II , from 61 –80 points ,
- class III , from 41 –60 points ,
- class IV , from 21 –40 points ,
- class V , from 0 –20 points.

The next operation after defining map and ground units is its overlap over the cadastral plan. Cadastral plan is a plan that the thematic structure, conduct land inventory (by category of use and owner), recording the contour shape, configuration and hence their limitations, and their surface.

This means that outside of these elements (points of triangulation, leveling, etc..), all other elements reported on the cadastral plan must have a definite shape to be able to determine the area, how to use, holder.

Table 2

Bonitation notes for tree species

MR		PR		PN		CV		CS		PC		Medium	
Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class	Note	Class
40	III	52	III	58	III	47	III	52	III	47	III	49	III

Field units were grouped with respect to their suitability for horticulture in classes, subclasses, groups and subgroups. The grouping was done to the nature and intensity of the restrictive factors for production.

Restrictions were given the climate, soil, relief. The favorable conditions, on the basis of evaluation note is the extent to which land satisfies the life of a crop data, under normal weather conditions and the rational use. Thus, fruit species, was group with respect to the environmental suitability of the 5 classes as follows:

Table 3

Land favorability classes for orchards

Use		Orchard		Favorability	
		note	class	points	group
MR	Apple	40	IV	21-40	Favorable II
PR	Pear	52	III	41-60	Favorable I
PN	Plum	58	III	41-60	Favorable I
CV	Cherry	47	III	41-60	Favorable I
CS	Apricot	52	III	41-60	Favorable I
PC	Peach	47	III	41-60	Favorable I
Orchard		49	III	41-60	Favorable I

CONCLUSIONS

The study provides data on soil and land, constituting pedological documentation for project design setting up and planning of orchards, but not the sole basis for decision making in relation to establishing the plantation and choosing varieties, intervening often with technical considerations, economic, social or and otherwise, and so we recommend consulting a professional horticulturist for choosing tree species.

After a detailed presentation of the natural conditions (relief, lithology, hydrography, hydrology, climate, vegetation, anthropogenic influences) to explain phenomena that occur in the soil and how these phenomena and processes can be influenced by human the work of farmers, were followed two distinct sides of the production activity, evaluation of farmland and analysis of the elements that contribute to defining the productive capacity of agricultural land that identify the limiting factors of land productivity.

Economically, the evaluation of farmland consider in establishing of evaluation marks the soil properties (physical, physico-mechanical, hydro-physical, chemical, etc), the environmental characteristics (geomorphology, hydrology, climate), traits that lead eventually to fertility status of soil and is closely correlated with human activity.

In deciding to establish orchards bear in mind that some restrictions are alleviated and that the Land suitability pass into the upper classes, while other restrictions are unimproved. And in one case and in another, considering restrictive factors resulting from reclamation requirements and necessary measures to optimize production factors.

According to data collected in the field and processed in accordance with the methodology of writing Soil Survey developed by ICPA Bucharest in 1987, formula units of suitability is IIICZ W3A2U2 - f52h3 territory falls into grade-III for suitability to tree species, ameliorative measures necessary represented by surface drainage.

Agricultural land, by the use of incorrect or incomplete strategies seriously affects both quantitatively and qualitatively not only agricultural production but especially soil resources. So, when traveling in land were use cadastral situation plans records provided by ADS Timis and were found following:

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