Available online at www.soilscience.ro

Soil Forming Factors and Processes from the Temperate Zone 12.1 (2013) 53-58

QUALITATIVE ASSESSMENT FOR ORCHARDS CONVERSION OF SOME LAND IN SECAŞ AREA, TIMIS COUNTY

Dicu Daniel[a,b*], Țărău Dorin[a,b], Marinca Constantin[b], Țărău Adrian[a], Bertici Radu[a,b]

[a]*Banat`s University of Agricultural Sciences and Veterinary Medicine from Timisoara,*

[b]*Office of Pedological and Agrochemical Studies Timişoara*

Abstract

This paper aims at obtaining background information on soils and their morphological, physical, chemical and agrochemical characteristics, so as to substantiate the defining scientific and technical quality of an area of 19.00 ha for their conversion to orchards.

After a detailed presentation of the landscape (relief, lithology, hydrology, climate, vegetation, human influences) useful to explain the phenomena that occur in the soil and how these phenomena and processes can be influenced by farming, in his work were followed two distinct aspects: of production and the characterization of farmland and elements that help to define the productive capacity of land.

From an economic point of view the assessment of land is made by determining evaluation notes according to soil properties (physical, physico-mechanical, hydrological, chemical, etc.) and natural characteristics (geomorphology, hydrology, climate), traits that eventually determine the fertility of the soil and are closely correlated with human activity.

Given the complex of climatic (corrected temperature and average of annual rainfall values), technical and edaphic (relief, ground water, flooding, soil reaction in the first 20 cm, edaphic volume, the degree of base saturation, porosity, humus reserve, calcium carbonate) factors in the investigated specific perimeter, in the end was obtained a weighted average evaluation mark for the main categories of land use.

Keywords: assessment, orchard, conversion, land

1. INTRODUCTION

Formed under natural varied conditions, soils are very different as ownership and fertility, their ability to support plant growth and agricultural and forestry training from one area to another.

The knowledge of natural conditions and ecological features of the proposed area of land for various land uses and crops has an important economic and social importance, for both the large and the small farm producer.

Therefore, at present, the development of a community cannot even be conceived without the existence of a strategy relying on new concepts based on knowledge of natural resources and the human influences on their ecology.

Based on these considerations, the authors attempt to present, based on their research and on the basis of information gathered and stored in the archive of OSPA Timisoara, several issues

Corresponding author:
**e-mail address: dicudanield@gmail.com*

concerning the status of soil quality, as reflected through the characterizing indicators, the environmental factors and conditions, important for soil fertility and plant life.

2. MATERIALS AND METHODS

The problem addressed refers to an area of 19.00 ha, located in the plots with land registry numbers: A488 / 1 (3.29 ha), Fn491 (0.71 ha), A575 / 1 (9.42 ha), A575 / 2 (0.58 ha), A575 / 3 (5.00 ha) in the territorial administrative unit (ATU) of Secas, Vizma locality, in Timis County.

The research of the ecopedologic conditions, definition of soil units and land, and limiting factors analysis and / or restriction of land productivity was made according to "The Methodology of Soil Surveys", vol. I, II and III elaborated by ICPA Bucharest in 1987, completed with specific elements from the Romanian System of Soils Taxonomy (RSST-2012).

3. RESULTS AND DISCUSSION

From a geomorphological point of view, the study area is part of the vast Banato-Crisana geographical unit, which includes as major subunits the Carpathian foothills and the western lowlands of Lipova hills.

Lipova hills, also known as the Lipova Plateau, represent the largest hilly area between Mureş (to the north) and Bega (to south) rivers, to the east being limited through Fraguli hills by the Poiana Rusca Mountains and Vinga Plain.

The area has a lithology dominated by clays, marls, sands and gravels, overimposed on a crystalline basement, over which were deposited sequences of reddish clays, subsequently shaped by the tributaries of Bega river. In the past, the region was heavily wooded, but at the moment the area is occupied, for the most part, with agricultural lands.

The effects of deforestation have been intense, with accelerating soil erosion and landslides, which occur even now in the areas of Rădmăneşti, Ohaba Română, Bara, Hodoş, Secaş, Nadăş and Bogda.

The major landforms in the study area are those typical for a piedmont, with plateaus with local tectonic influences and piedmont terraces.

The minor landforms consists of flat-bottomed valleys, sometimes with a gully aspect, landslides with different shapes and sizes, that rarely exceed 0.5 hectares, as well as floodplain and man-made microforms.

The geological evolution of the area investigated is related to the great Pannonian Sedimentary Basin, its eastern part being formed by the gradual silting of the lake during Pleistocene - Quaternary.

The basis of this depression is formed by a Carpathian-origin basement consisting of Paleozoic and Mesozoic crystalline formations, covered by Tortonian deposits, and fragmented in different directions by a system of faults that intersect almost perpendicular. In terms of lithology, the area is characterized by a sequence of layers of age, thickness and composition according to the different types of meso and micro-relief.

In what regards the hydrology, the studied area belongs to the group of southwest water systems, the basin of Timis – Bega, the Sag - Topolovăț complex hydrological system. The main river is Minis, which south from Babsa flows into Bega, a tributary of Tisza. Springing from Lipova Hills (10 km upstream of Secaş) its regime is characterized by large variations of water levels and discharge rates. Of the many branches that have diverged during the past, the most important are currently the rivers of Visma, Gutui and Secasita.

Regarding the ground water level within the area investigated, it is closely related to forms of meso and micro-relief and the depth of horizons, weather, rainfall and existing hydrologic management works, oscillating between 0.5 - 4 m in the floodplains and under 10 m on the slopes or plateaus. Deep underground waters have depth values that increase from north to south from 4 to 80 m and contain drinkable water.

The characteristics of the microclimate of the area studied are determined by its geographical position. Thus it is characterized by a moderate continental climate with mild short winters, under the influence of frequent cyclones and air masses crossing the Mediterranean and Adriatic Sea. Its general features are marked by diversity and irregularity of atmospheric processes.

The dominant air masses during spring and summer are the temperate oceanic ones, which bring significant rainfall. Very often, even in winter, Atlantic humid air masses bring significant rain and snow.

The climatic characterization of the researched space was performed using data from the Faget and Lugoj weather stations. The annual mean temperature is 10.7 ^{0}C (Table 1), and the mean annual rainfall is of 734 mm (Table 2).

Table 1. Monthly and annual mean temperatures (Lugoj station) (^{0}C)

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
-1,4	0,8	5,6	11,1	16,0	19,3	21,3	20,5	16,6	11,3	5,7	1,1	10,7

Table 2. Monthly, annual and multi-annual rainfall (Faget station) (mm)

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
43.9	39.8	51.3	59.6	83.5	98.1	68.9	64.3	51.9	62.2	57.4	53.1	734,0

The diversified relief units and parental materials (even if on a small area of only 19 ha), combined with the climatic, hydrological conditions and the various human interventions, resulted in a large population of soils with specific characteristics (related or totally different from each other), represented by:

1.01. Typical Luvosol (haplic Luvosol in WRB-SR), stagnic in depth, silt loam/medium clay loam, on gradient materials, LV ti W_1 LP/TT 132_{50}, identified in plot A488 / 1,

2.01. Stagnic Luvosol, weakly stagnogleyed, medium clay loam / loamy clay, on gradient materials - LV st W_2 TT/AL 132_{50}, identified in parcel F491,

3.01. Stagnic Luvosol, weakly stagnogleyed, medium loam /medium loam, on gradient materials - LV st W_2K_5 LL/LL 131_{50}, identified in parcel F491,

4.01. Stagnic Luvosol, weakly stagnogleyed, silt loam/loamy clay, on eluvial materials, LV st W_2 LP/AL 122_{50}, identified in plot A488 / 1.

5.01. Vertic-stagnic Luvosol, moderately stagnogleyed, medium clay loam /medium clay loam, on eluvial materials, LV vs- st W_3 TT/TT 122_{50}, identified in plot A575 / 1.

6.01. Vertic-stagnic Luvosol, weakly stagnogleyed, medium loam /medium clay loam, on eluvial materials, LV vs- st W_2 K_5 LL/TT 131_{50}, identified in plot A575/1, A575/2, A575/3.

7.01. Vertic-stagnic Luvosol, weakly stagnogleyed, medium clay loam /medium clay loam, on gradient materials, LV vs- st W_2 K_5 TT/TT 131_{50}, identified in plot A575 / 1.

8.01. Vertic Erodosol, bati-calcaric, medium loam /medium clay loam, on gradient materials -ER vs K_5 LL/TT $131_{50.}$

9.01. Vertic Erodosol, bati-calcaric, medium clay loam / loamy clay, on gradient materials - ER vs K_5 TT/AL $131_{50.}$

Based on recent observations collected in the field (current aspect of landforms, soil surface and depth) as well as information from the archive of OSPA Timişoara, each soil and land units were characterized according to the methodology of Soil Surveys (MESP) developed by ICPA Bucharest 1987, supplemented with elements from the Romanian System of Soil Taxonomy (SRTS 2003 and SRTS 2012).

In order to characterize soil quality, have been using the 23 indicators of evaluation and characterization, indicators that represents the most important characteristics, as well as the most meaningful, precise and measurable, which are usually found in soil surveys (Table 3).

Table 3. Values of the technical indicators of evaluation

TEO / Indicators	1.01 LV ti	2.01 LV st	3.01 LV st	4.01 LV st	5.01 LVvs-st	6.01 LVvs-st	7.01 LVvs-st	8.01 ER vs	9.01 ER vs
3C	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
4C	650	575	650	650	650	650	650	475	575
14	0	0	0	0	0	0	0	0	0
15	1	2	2	2	3	2	2	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
23A	43	42	42	43	52	42	52	42	42
23B	52	61	42	61	52	52	52	52	61
29	2	2	2	2	2	2	2	2	2
33	12	17	7	1	1	17	7	30	22
38	0	0	0	0	0	0	0	0	0
39	15	15	15	15	15	15	15	15	15
40	0	0	0	0	0	0	0	0	0
44	25	25	25	25	25	25	25	25	25
50	1	1	1	1	0.4	0.4	0.4	1	1
61	0	0	0	0	0	0	0	0	0
63	4.7	5.2	6.1	5.6	6.6	5.6	6.6	6.1	5.2
69	43	43	79	43	87	43	87	87	43
133	175	175	175	175	175	175	175	175	175
144	90	90	140	140	140	140	140	140	90
181	1	1	1	1	1	1	1	1	1
271	0	0	0	0	0	0	0	0	0

According to the mentioned methodology, for each soil type have been established evaluation grades for the main crops (GR, OR, PB, FS, CT, SF, SO, MF, IU, RU, CN, LU, TR, LG) and land use categories (PS, FN), as they are shown in the following (tab 4):

PS = pasture	CS = apricot	PB = maize	IU = oil flax
FN = hayfield	PC = peach	FS = sun flower	IF = fiber flax
MR = apple	VV = vineyard	CT = potato	CN =hemp
PR = pear	VM = vineyard	SF = beet	LU = alfalfa
PN = plum	GR = wheat	SO = soybean	TR = clover
CV= cherry	OR = barley	MF= pea, beans	LG = vegetable

Table 4. Evaluation marks

TEO Evaluation marks	1.01 LV ti	2.01 LV st	3.01 LV st	4.01 LV st	5.01 LVvs-st	6.01 LVvs-st	7.01 LVvs-st	8.01 ER vs	9.01 ER vs
PS	52	37	73	58	66	47	73	40	33
FN	37	26	58	47	52	33	58	26	23
MR	47	37	72	58	58	41	72	25	33
PR	29	32	72	51	58	41	72	23	24
PN	44	41	81	58	73	52	81	39	36
CV	52	47	81	65	66	52	73	44	41
CS	35	28	72	58	52	40	65	14	16
PC	31	28	72	58	52	35	65	14	14
VV	29	37	72	58	58	46	72	39	32
VM	23	22	65	58	58	35	65	13	18
GR	35	37	73	58	66	47	73	20	37
OR	26	29	65	52	52	41	65	17	22
PB	26	32	66	58	66	41	66	12	18
FS	21	24	66	58	66	35	66	13	12
CT	29	18	59	52	47	24	53	5	7
SF	24	20	66	66	59	30	59	5	8
SO	23	25	58	52	58	36	58	12	14
MF	21	29	65	46	58	37	65	12	18
IU	14	18	65	46	52	37	65	17	13
IF	23	23	65	52	52	37	58	16	17
CN	14	22	65	46	58	37	65	16	16
LU	16	25	72	51	58	41	72	32	22
TR	37	30	58	47	52	34	58	20	26
LG	18	16	52	46	52	24	52	10	9
AR	26	27	65	55	59	32	63	12	17
LV	40	36	75	58	60	44	71	27	27
VIE	26	30	69	58	58	41	69	26	25

In order to define and characterize the land, are also used the following group of factors: geomorphology, hydrology, lithology and soil cover. Each of these elements have a number of measurable attributes that can be expressed numerically, and influence either directly or indirectly the conditions of growth and fruiting of plants.

The evaluation marks for orchard use category are calculated as the average of the six tree species. For the category of agricultural use, the evaluation mark is the arithmetic average of six crops (GR, OR, PB, FS, CT, SF, SO, MF). According to this methodology, have been computed the weighted average evaluation grades for agricultural use for each cadastral parcel under study, namely:

- A488 / 1 in area of 3.29 ha - 46 points
- A575 / 1 in surface 9.42 hectares - 54 points
- A575 / 2 in area of 0.58 hectares - 40 points
- A575 / 3 in area of 5.00 hectares - 52 points.

Ultimately the study area received a weighted average mark of 52 evaluation points, which puts it in the 3rd quality class.

The evaluation score for orchards use category, calculated as the average of those six tree species, revealed that the area of 18.29 ha has obtained a weighted average mark of 61 points, which classify it into the 2nd favorability class. It is characterized by good suitability for apple, plum and cherry and less favorable for peach and apricot.

Walnut specimens found on these lands show that this species can resist, but it gives low and inferior productions and does not warrant the establishment of intensive plantations.

4. CONCLUSIONS

After a detailed presentation of the landscape (relief, lithology, hydrology, climate, vegetation, human influences) which explains the phenomena that occur in the soil and how these phenomena and processes can be influenced by man in his farming activity, two distinct sides of the production and farmland characterization were described.

From an economic point of view, the land evaluation considers the evaluation notes determined by soil properties (physical, physico-mechanical, hydrological, chemical, etc.) and by natural characteristics (geomorphology, hydrology, climate), traits that eventually determine the fertility of the soil and are closely correlated with human activity.

The Romanian methodology of evaluation of agricultural land represents a synthesis model that incorporates the knowledge in the field of evaluation from different schools and local experience. The current system of evaluation enables the elaboration of evaluation notes for all land use types and most crops through the use of ecopedological characterization indicators for each ecologically homogeneous field (TEO) and for each land owner, according to a single methodology.

As a part of the soil and land resource evaluation process, evaluation is the quantitative and qualitative aspect according to which a farm or administrative territory can be differentiated from other areas with the same destination, using scores on a scale from 0 to 100, that reflect the suitability of a certain area to a certain land use or a certain crop system.

References

Borza I., Ţărău D., Ţărău I. (2001). Soils degradation process and restoring measures in south-west Romania, Ed. Oriz. Univ. Timişoara.

Canarache A., Teaci D. (1980). Caracterizarea tehnologică a terenurilor agricole ca bază a lucrărilor de raionare ameliorativă, Buletin Info. ASAS Bucureşti nr. 10.

Cârstea S. (1995). Soil surveys – Important component of cadastre, Ştiinţa Solului, seria III-a, vol. XXIX, nr.2, Bucureşti.

Coste I., Ţarau D., Rogobete Gh. (1997). Tendinţe ale evoluţiei mediului înconjurător în Sud-Vestul României, Lcr. Şt. Simp. Naţional de Pedologie Timişoara, 7-25.

Dumitru M. şi colab. (2000). Monitoringul stării de calitate a solurilor din România, Ed. GNP Bucureşti, pag. 23-90.

Florea N., Balaceanu V., Canarache A. (1987), Metodologia elaborării studiilor pedologice, vol. I, II, III, ICPA Bucureşti, pag. 10-15 (I), 30-71 (II), 29-100 (III).

Florea N., Munteanu I. (2003), Sistemul Român de Taxonomie a Solurilor, Ed. Estfalia, Bucureşti, pag. 35-54.

Teaci D. (1980). Bonitarea terenurilor agricole, Ed. Ceres, Bucureşti

Teaci D. (1995). Agricultura şi Sivicultura Românească- 2020. Integrare în structurile europene şi mondiale, Ed. Omnipres Bucureşti.

Ţărău D, Borza I. şi colab. (2002). Evaluarea condiţiilor naturale şi a celor induse antropic sub aspectul definirii capacităţii de producţie a terenurilor din vestul României, Ştiinţa Solului nr. 2, vol. XXXVI, pag. 148-160