THE ROLE OF PEDOLOGICAL STUDY ÎN ECOPEDOLOGICAL BASES FOUNDING OF AGRICULTURAL LAND PRODUCTIVITY FROM DIN ARANCA-GALAȚCA INTERFLUVE

Dan DOLOGA, Adrian ȚĂRĂU, Daniel DICU

Banat's University of Agricultural Science and Veterinary Medicine Timişoara Calea Aradului no.119, 300645 Timişoara, Romania
E-mail: dicudanield@gmail.com

Abstract: *The natural conditions of researched area are generally favorable for agro-alimentary sector development, under all the aspects, being an old tradition for cereal cultivation and valorization, especially by animal breedind. However, that area is situated in subsidiary, divagation and accumulation of Aranca`s, and Galaţca`s plain and his geomorfological evolution is correlated by the evolution, in time, of marine domain (Thetys) or lakes domain (Panonic), thing that have generate several types of soils. These types of soils present two situations: excess of humidity in cold season and deficit of humidity in warm season of the year, the both situation generate multiple form of stress, with negative effects on agro-ecosystems productivity and quality. Having in view all this aspects concerning at risk existence, owing sundries manifestation of natural factors or antropical irational interventions, the authors of this project try to transfer the teoretical describetively activitys to analitical activitys, who offers practical solutions for durable management of soils resources, for climatic extreme events prevention and reduction of crop waste trough intoducing of conservation tillages of soil accommodated at new climatic and soils conditions. The research of eco-pedological conditions, ordering and processingof dates was done in accordance with Development Methodology of Soil Studies (Vol I, II, III), developed by ICPA Bucharest in 1987 and the Romanian System of Soil Taxonomy (SRTS-2003). Some dates from this paper were extracted from research themes who have regarded the economical and social development in border area betwen Romania, Serbia and Hungary, trough transfrontier cooperation for protection and conservation of natural resources (wather, soil, etc) and antropical (tehnologies, cultivars), who lead to an improuvement of life standard in this region.*

Keywords: *study,land, productivity, agricultural*

INTRODUCTION

In the current socio-economic and political juncture in which our country hopes to return to what he deserves in the civilized countries of the EU, it is necessary to know well our offer, both in absolute and in relative values.

Presenting specific socio-economic attributes, the earth is an object of interdisciplinary research (soil, economy, land, etc.), defining it both as a means of production and object of human activity.

In this respect, the directions of the Romanian school of pedology roam on providing a unified framework, technological characterization of land, appropriate to the requirements of sustainable agriculture and environmental protection, will be solved following specific connotations of land, namely: environmental, economic, social, legal and technical, in order to connect to the European system, in full conformity and harmony.

Thus, Romanian methodology of evaluation and technological characterization of land, represent a heuristic mathematical model, which includes synthesis of knowledge in the field of different pedology schools and local experience, which defines land in relation to air and telurico-edaphic factors (ȚĂRĂU D, BORZA I. AND ALL., 2002).

The current system of evaluation and technological characterization of land, as a part of the soil and land resource assessment, is that the quantitative but also qualitative side that ground, a farm or administrative area can be distinguished from other areas with the same destination, after a single methodology for the country, it reflects the following aspects of land quality:

- determining the vocation of each piece of land use by the most appropriate terms;
- determine the favorability of each piece of land to be planted with certain plants;
- determining the production capacity for various land and crop use for a certain technology;
- determining the total income that can result from the cultivation of certain plants or land use as pasture or meadow land, etc.

The base of cadastral land evaluation, as an expression of capital size, is the vocation of land expressed throught their intake of certain opportunities that you get to create profits, profitability in the use of various agricultural or forestry land is differentiated in time and space (ȚĂRĂU D., IRINA ȚĂRĂU, BORZA I., 2002).

To those listed is obvious that the land evaluation includes both technical dimension, the economic aspect and not least, the social perspective with all the defining elements of sustainability. So, the working unit is the binomial land - use.

The land unit (UT) is a piece of land considered relatively homogeneous in terms of traits soil, climate, landscape and hydrological conditions, with certain specific features, distinct (both in terms of environmental characteristics and to show them how action against various technologies for cultivation and improvement), compared with neighboring areas.

Land use is a general concept that any human activity (agricultural or non-agricultural), permanent or cyclical, acting on a field or natural ecosystem for a particular purpose (CANARACHE A., TEACI D., 1980).

In this view, the determination of land production capacity and technology to improve their merits can not be achieved only through a good knowledge of soil of a particular area under consideration, with all the physical, chemical and biological, respectively agroproductive of predisposing factors and restrictive or limiting of productivity.The pedological substantiation of the evaluation operations reveal that the earth is very different, in territory, because of the factors and characteristics variation of environmental conditions.

MATERIAL AND METHODS

Coverage refers to an area of 85165 ha of which 78974 ha of agricultural land (table 1), the interfluve Aranca - Bârzava.

Table 1

Surface structure for the main categories of use

Cr no	Locality	Arable	Pasture	Grassland	Vines	Orchard	Total agricultural	Forests	Others	Total
1	Comlosu M	8203	495	3	18	5	8724	8	755	9479
2	Lenauhaim	10048	191	13	0	1	10253	9	281	10543
3	Lovrin	11339	138	6	13	223	11719	34	915	12634
4	Periam	7653	749	37	4	600	9043	74	790	9833
5	Saravale	7377	2138	98	6	1	9620	81	627	10247
6	Sânnicolau M	10668	1607	47	12	356	12690	36	1214	13904
7	Sâmperu M	8162	946	56	2	10	9176	120	983	10159
8	Teremia M	6641	625	28	453	2	7749	8	617	8366
	Total	**70091**	**6889**	**288**	**508**	**1198**	**78974**	**370**	**6182**	**85165**

The natural conditions of researched area are generally favorable for agro-alimentary sector development, under all the aspects, being an old tradition for cereal cultivation and valorization, especially by animal breedind.

However, that area is situated in subsidiary, divagation and accumulation of Mureş`s, Timiş`s and Bârzava`s plain and his geomorfological evolution is correlated by the evolution, in time, of marine domain (Thetys) or lakes domain (Panonic), thing that have generate several types of soils.

These types of soils present two situations: excess of humidity in cold season and deficit of humidity in warm season of the year, the both situation generate multiple form of stress, with negative effects on agro-ecosystems productivity and quality.

The research of eco-pedological conditions, ordering and processingof dates was done in accordance with Development Methodology of Soil Studies (Vol I, II, III), developed by ICPA Bucharest in 1987 and the Romanian System of Soil Taxonomy (SRTS-2003).

RESULTS AND DISCUSSION

Following its settlement, the natural conditions (relief, lithology, hydrology, vegetation) are specific to the low plains of subsidence, ramble and build where they formed and evolved main soil types who reflected by their geological, biological, chemical and morphological characteristics the main landscape characteristics defining and determining for the growth and fructification of the main cultivated plants.

The area in which the researchs were made is part of Aranca Plain Plain and Galaţca Plain, as part of Mures Plain, situated at south of the current course of Mures.

The geological past of the researched area is linked with the Banato-Crisana Plain, which also belongs, which is one of the great eastern portions of the sedimentary basin called Pannonian Depression (IANOŞ GH., ROGOBETE GH., PUŞCĂ I., BORZA I., ŢĂRĂU D., 1994).

This area it sank on the alignments of ancient north-south fault, more towards the west and less towards the Carpathians, from Badenian, with a maximum during the Pannonian and then became slower.

This fragmentation has created areas of least resistance, and the balance of fault blocks, amplified by a series of tectonic events have led to advances or withdrawals of marine (Tethys) or lake (Pannonian).

The Carpathian stages have different influenced the crystalline blocks movement from the foundation of fields, creating regular areas with greater tendency diving, or vice versa, the crystalline blocks east, generally higher, are found at depths of about 1000 m (980m in Găvojdia in the west and southwest down to 200 m, Giulvaz-Foeni.

The forming of plains from investigated space is closely related to the specific base level of Pannonian depression from the Danube middle by many rivers that debus from mountain , by the movements of elevation in the east and subsidence in west, leading to the development of two main groups arranged from east to west in: high plains (located in the border hills) and low plains towards the axis of the Tisza.

Low plains start at an altitude of about 80 m and are superimposed the subsidence area of the Pannonian Basin, composed of submerged sewage cones, who were identified under the fluvial-lacustrine deposits made under the swamp, then covered with different material: recent alluvium or wind deposits such as loess (which have grown old farming settlements practicing safer).

Lowered altitude and reduced depth of groundwater in recent alluvial layer that explains why does not show a continuous layout, topography consisting of a succession of banks and river-lake depression areas, characteristic of a continental delta (Mures Delta).

Galaţca Plain (Pesac-Lovrin-Teremia), based on an old grind of Mureş and the main river Galaţca, with varying altitudes around 100 m share, the plain is made up mostly of coarse river deposits, then wind reviewed, this area being covered in Teremia Mare area with sand dunes set with vine plantings .

Although it is bordered in the north of the current course of Aranca, the area taken into account is part of the Bega-Timis catchment, the courses most importantly, from north to south: Aranca and Galaţca.

To characterize the specific climatic conditions were used data from the Sânnicolau Mare meteorological station and from SC-DA Lovrin meteorological station (table 2).

Table 2

Average temperatures (^{0} C) and monthly precipitation (mm) and annual (normal values)

Agricultural year	Month												
	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII	Yearly
Temperature													
Sânnicolaul Mare	16,7	11,2	5,3	0,3	-1,5	0,9	5,5	11,3	16,9	19,4	21,5	20,4	10,7
Lovrin	17,9	11,3	5,4	1,5	-1,2	0,8	5,5	11,0	16,6	19,7	21,6	21,7	10,9
Precipitation													
Sânnicolaul Mare	37,1	36,5	44,0	47,8	33,8	28,7	32,7	42,5	55,3	73,2	45.7	40.4	517,7
Lovrin	36,5	36,0	43,1	44,5	31,2	27,5	28,0	40,6	51,6	67,0	54,1	46,1	506,2

Due to the cyclonic activity and the invasions of moist air from the west, southwest and northwest, in the high plains of the western part of Romania quantitative precipitation are higher than in other parts of the country, except a corner of north-western plain.

Wind regime in the south-west of Romania is determined to develop systems that interfere barrel over Europe at 45^0 north latitude.

In the investigated area are found elements of flora and fauna are similar to those of the entire Western Plain, represented by historical provinces Crisana and Banat, but with several thermophilic and xerofiles species, Balkan ecosystems and Central European type.

In phytogeographic terms, the flora of studied area is part of the Illyrian region Dacian province, Banat plain district.

In this context the highlighted importance have the woody species southern European, representative for the studied area, the species as: Quercus cerris, Quercus fornitto, Quercus pubescens, Till tomentosa, Fraxinus ornus, Cornus mas is associated forming biocenosis to host a remarkable number of thermophilous grass species.

Following geographical positions, in the former delta of Mures, the study area has geological and physical-geographical conditions varied, which has the formation of a complex soil cover.

So closely interrelated with the variety of geo-morphological factors who determining the existence of diversified relief units, those geological which led to a diversity of parental materials and the climate or the hydrological factors and the various human interventions, have result a large soil population with specific characteristics (related or totally different from each) in continuous evolution.

According to the Romanian System of Soil Taxonomy (SRTS 2003) in the investigated area of **Comlosu Mare** were identified the folowing types of soils:

- Arenosols (gleyic), including 9 TEO (1-9) on 7,4 %,

- Fluvisols (mollic, gleyic), including 2 TEO (10 -11) on 0,7 %,
- Chernozems (typic,pellic, gleyic,cambic,argic), including 34 TEO (12-45), on 71,9 %,
- Vertisols (stagnic, gleyic), including 8 TEO (46-54), on 14,8 %,
- Gleysols (mollic, pellic), including 9 TEO (55-64), on 5,0 %,
- Solonetzs (salinic), including 1 TEO (65), on 0,2 %,

In the area of **Lenauheim** were identified the folowing types of soils:

- Arenosols (gleyic), including 4 TEO (1-4) on 0,8 %,
- Chernozems (typic,pellic, gleyic,cambic,argic), including 43 TEO (5-48), on 82,5 %,
- Vertisols (stagnic, gleyic), including 7 TEO (49-56), on 2,0 %,
- Gleysols (mollic, pellic), including 6 TEO (57-63), on 3,8 %,
- Soils associations, including 12 TEO, on 10,9 %,

On **Lovrin** teritory were identified the folowing types of soils:

- Arenosols (gleyic), including 4 TEO (1-4) on 1,2 %,
- Chernozems (typic,pellic, gleyic,cambic,argic), including 55 TEO (5-60), on 90,2 %,
- Eutric Cambisols (typic, mollic, gleyic), including 3 TEO (61-64), on 2,3 %,
- Vertisols (stagnic, gleyic), including 2 TEO (65-66), on 1,3 %,
- Gleysols (mollic, pellic), including 5 TEO (67-71), on 3,5 %,
- Solonetzs (salinic), including 2 TEO (72-73), on 1,5 %,

In the area of **Periam** were identified the folowing types of soils:

- Arenosols (gleyic), including 2 TEO (1-2) on 3 %,
- Fluvisols (entic, mollic, gleyic,), including 5 TEO (3 -8) on 2,8 %,
- Chernozems (typic,pellic, gleyic,cambic,argic), including 32 TEO (9-41), on 65,9 %,
- Eutric Cambisols (typic, mollic, gleyic), including 10 TEO (42-52), on 10,2 %,
- Vertisols (stagnic, gleyic), including 1 TEO (53), on 0,2 %,
- Gleysols (mollic, pellic), including 8 TEO (54-62), on 5,9 %,
- Solonetzs (salinic), including 3 TEO (63-65), on 0,5 %,
- Soils associations, including 12 TEO, on 11,5 %,

On **Sânnicolau Mare** cadastral teritory were identified the folowing types of soils:

- Fluvisols (entic, mollic, gleyic,), including 11 TEO (1 -11) on 8,0%,
- Chernozems (typic,pellic, gleyic,cambic,argic), including 24 TEO (12-36), on 42,0 %,
- Eutric Cambisols (typic, mollic, gleyic), including 18 TEO (37-55), on 16 %,
- Vertisols (stagnic, gleyic), including 11 TEO (56-67), on 8 %,
- Gleysols (mollic, pellic), including 12 TEO (68-80), on 3 %,
- Solonetzs (salinic), including 7 TEO (81-87), on 2 %,
- Soils associations, including 20 TEO, on 20 %,

In the area of **Saravale** were identified the folowing types of soils:

- Fluvisols (entic, mollic, gleyic,), including 10 TEO (1 -10) on 10,4 %,
- Chernozems (typic,pellic, gleyic,cambic,argic), including 11 TEO (11-22), on 25,5 %,
- Vertisols (stagnic, gleyic), including 15 TEO (23-38), on 32,7 %,
- Gleysols (mollic, pellic), including 3 TEO (39-41), on 2,8 %,
- Solonetzs (salinic), including 8 TEO (42-50), on 8,3 %,
- Soils associations, including 12 TEO, on 20,3%,

In the area of **Sâmpetru Mare** were identified the folowing types of soils:

- Fluvisols (entic, mollic, gleyic,), including 12 TEO (1 -12) on 18,4 %,
- Chernozems (typic,pellic, gleyic,cambic,argic), including 20 TEO (13-33), on 45,5 %,
- Vertisols (stagnic, gleyic), including 12 TEO (34-46), on 16,6 %,
- Gleysols (mollic, pellic), including 3 TEO (47-49), on 0,5 %,
- Solonetzs (salinic), including 5 TEO (50-55), on 4,7 %,
- Soils associations, including 12 TEO, on 14,3%,

On **Teremia Mare** teritory were identified the folowing types of soils:

- Arenosols (gleyic), including 2 TEO (1-2) on 1,1 %,
- Fluvisols (entic, mollic, gleyic,), including 2 TEO (3 -4) on 1,8 %,
- Chernozems (typic,pellic, gleyic,cambic,argic), including 30 TEO (5-35), on 66,0 %,
- Eutric Cambisols (typic, mollic, gleyic), including 2 TEO (36-37), on 1,3 %,
- Vertisols (stagnic, gleyic), including 12 TEO (38-50), on 6,5 %,
- Gleysols (mollic, pellic), including 2 TEO (51-52), on 0,5 %,
- Solonetzs (salinic), including 4 TEO (53-57), on 1,0 %,
- Anthrosols (pellic) , including 1 TEO (58), on 0,1 %,
- Soils associations, including 6 TEO, on 21,7 %,

Each of the units of land (TEO) identified were characterized according with the current Methodology for Elaboration of Pedological Studies.

The studies are using the 23 indicators of evaluation, indicators representing characters and qualities most important, more significant, clear and easily measurable, which is usually found in pedological studies, produced after 1987 by territorial OSPA under the methodological guidance of ICPA Bucharest.

The evaluation of agricultural land is a complex operation of knowledge of the conditions of plant growth, development and fruition and determining the degree of favorability (suitability) for their particular culture (or category of use), through a system of technical indicators and notes of evaluation.

The amount of harvest that is obtained per unit of surface, so the productivity of agricultural plants, depends on the entire set of environmental conditions (relief, climate, hydrology, soil), and the man who can influence change for the better natural factors or characteristics of the plant in so as to better exploit the natural conditions (Table 3).

Table 3

Fertility (quality) classes for Arable use category (ha)

Crt. No.	Locality	Total arable surface ha	Class I 81-100 pct.	Class II 61-80 pct.	Class III 41-60 pct.	Class IV 21-40 pct.	Class V 0-20 pct.
1	Comlosu M	8203	3289	2346	1641	845	82
2	Lenauhaim	10048	5918	1990	1196	462	482
3	Lovrin	11339	5375	4864	930	1134	57
4	Periam	7653	3650	2480	1454	31	38
5	Saravale	7377	752	1866	2884	1173	701
6	Sânnicolau M	10668	416	5281	3755	917	299
7	Sâmperu M	8162	1665	3240	1983	637	637
8	Teremia M	6641	3650	2480	1454	31	38
	Total	**70091**	**24715**	**24547**	**15297**	**5230**	**2334**

This goal requires a detailed knowledge of organic supply generically defined as all natural factors of a complex variable development and maintaining necessary structural genesis of abiotic and biotic systems by achieving a harmonious balance between improving soil and plant improvement measures consistent according with the production of them.

In this context, land productivity, as a result of the diversity of physical and geographical conditions and the intrinsic qualities of soil and human interventions occurring, is much different in time and space.

CONCLUSIONS

Natural conditions and ecological potential of certain territory knowledge, represents a very important base in nutrient management system setting (especially in new and higher environment protection requirements).

Such information avoid subjective approach and assure an unitary survey of main ecopedological characterization indicators evolution, for all cathegories of land use, no matter property nature, delivering to decident person all necessary data to establish causes that affect environment quality for proper measures election in its conservation and degrading prevention.

The pedological substantiation of evaluation operations reveal that the earth is very different, in territory, because of the variation factors and characteristics of environmental conditions.

The vegetable production is accomplished in the different conditions: natural ecosystems, agricultural extensive or intensive ecosystems and it require as an urgent need deep knowledge of all the ecological factors which contribute to the growth and plant development.

BIBLIOGRAPHY

1. BORZA I., ȚĂRĂU D., ȚĂRĂU IRINA, 2001, Soil degradation process and restoring measurements in south-west Romania, Proceedings of the Symposium Restoration Ecology, University of Agricultural Science, Ed. Oriz. Univ. Timişoara,
2. CANARACHE A., TEACI D., 1980, Caracterizarea tehnologică a terenurilor agricole ca bază a lucrărilor de raionare ameliorativă./Evaluation and tehnological charactezation of agricultural lands esential document for the amelioration microzoning, Buletin Info. ASAS Bucureşti nr. 10;
3. CÂRSTEA S., 1995, Studiile pedologice componentă a cadastrului funciar./Soil surveys – Important component of cadastre, Ştiința Solului, seria III-a, vol. XXIX, nr.2, Bucureşti;
4. DUMITRU M., ŞTEFĂNESCU S.L., 2000, Scheme agroambientale în contextul dezvoltării rurale, Ştiința solului nr. 2, vol. XXXIV, Ed. Signata, Timişoara,
5. FLOREA N., MUNTEANU I., 2003, Sistemul Român de Taxonomie a Solurilor, Ed. Estfalia, Bucureşti, pag. 35-54.
6. IANOŞ GH., ROGOBETE GH., PUŞCĂ I., BORZA I., ȚĂRĂU D., 1994, Evoluția Câmpiei Banatului de la faza submersă la starea actuală, Lcr. şt. S.N.R.S.S. nr. 28C, Bucureşti,
7. ȚĂRĂU D, BORZA I. ŞI COLAB., 2002, Evaluarea condițiilor naturale şi a celor induse antropic sub aspectul definirii capacității de producție a terenurilor din vestul României, Ştiința Solului nr. 2, vol. XXXVI, pag. 148-160
8. ȚĂRĂU D., IRINA ȚĂRĂU, BORZA I., 2002, West Romania, land resources, recent evolution out thein actual state, International Conference Constanța;
9. * Metodologia Elaborării Studiilor Pedologice, I.C.P.A. Bucureşti, 1987