

USING PEDOLOGICAL INFORMATION IN QUALITATIVE ASSESSMENT OF EDAPHIC COVER FROM TIMIȘ-BÎRZAVA INTERFLUVE

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Abstract: To determine the complex relationships that are established between the different 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, both in terms of genetic and the basic characteristics of the differential input relative to their productivity of land and suitability for plants. (Borza et al., 2005, Canarache, 1980, Răuță, 1997, Rogobete et al. 1997, Teaci, 1980, 1995). In this context, the research undertaken is in the collection, processing and interpretation of soil information for evaluating the quality of the edaphic coat and its origins in current scientific and practical preoccupations, increasingly hard to identify and put in place an integrated management of agro-ecosystems, efficient from agronomic and ecological point of view, with conservative role for soil and the environment. The research consists of the accumulation of scientific data on the development of components of agricultural ecosystems productivity, for providing to the public authorities from in the considered area, the specialized technical support. The investigated area is located between Timis (north), Pogăniș (east), Bârzava (south), border with Serbia (west), agricultural ecosystems identified in the perimeter in area of 119885 ha, of which 107996 ha is agricultural land. The research of the ecopedologic conditions was made according to "The methodology of elaborating of pedological studies", vol. I, II and III elaborated by the ICPA Bucharest in 1987, completed with specific elements from the Romanian System of Taxonomy of Soils (SRSTS-2012). To achieve the goal of research, were established objectives to identify and characterize the territorial administrative units (ATU) of the studied space: relief, hydrography and hydrology, climate, edaphic resources; Were also intended to identify water resources and how to use them in the investigated area, and qualitative assessment of soil resources, the nature and intensity of expression of natural and anthropogenic risk factors. Objectives and activities on which it proposes this topic falls within the current internationally and nationally concerns of agricultural research and practice for study eco-pedological relations between conditions and productivity of agricultural land.

Key words: soil, quality, assessment, resource, agro-ecosystem

INTRODUCTION

Defined systematically as a result of state formation and development of soil, as well as showing how to plant other environmental factors, since the cosmic-atmospheric (light, heat, rain) and continuing with the geomorphological and hydrological, resulting in differentiated human labor productivity in relation to how to meet their physiological requirements, soil quality represented by the amount of harvest per unit of area has a role in the rational use of the land, the practice showing that to work the great or small farm consists of knowledge prerequisites and proper management of soil resources.

Knowing of these features of the soil has great theoretical and practical importance.

Theoretical, because it provides to specialist the possibility to interpret the phenomena that occur in the soil and to predict soil evolution in particular and the environment in general in terms of present and future health and practical because practitioner warns the measures to

be undertaken to bring optimum soil conditions for growth and development of crops or spontaneous plants.

For this purpose, the Romanian evaluation methodology of agricultural land which is a mathematical model encompassing synthesis heuristic knowledge in the field of evaluation of the different schools and local experience (D. TEACI 1970,1980, ICPA Bucharest 1987) defines land in environmental terms in relation to atmospheric, cosmic-and technical-edaphic factors.

Evaluation, as part of the assessment of soil resources and land, that side is quantitative but also qualitative in that land, a farm can be differentiated from other surfaces with the same destination, by points awarded (from 1-100) by an index of evaluation techniques and notes as a unique methodology in the country.

Given these considerations, the authors of this paper tries to present some aspects regarding the use of soil information in quality assessment of agricultural lands from Timis-Barzava interfluve, information gathered in soil studies and stored in the archive of OSPA Timisoara, but also based on SPED 1 system from 1988 and BDUST- system implemented by ICPA Bucharest in territory since 2003.

MATERIALS AND METHODS

The issues addressed relate to an area of 119 885 ha, of which 107 996 ha is agricultural land.

Table 1

Situația fondului funciar din interfluviul Timiș-Bârzava

Crt no.	ATU	Arable	Pasture	Hayfield	Viney ards	Orchards	Total agricultural	Forest	Waters	Other	Total
1	Banloc+Livezile	12442	2816	214	0	9	15481	572	543	764	17360
2	Ciacova	10221	1964	263	0	58	12506	299	352	692	13849
3	Denta	7420	849	133	0	12	8414	195	158	373	9140
4	Deta	2379	463	56	0	6	2904	35	32	303	3274
5	Foieni	4728	931	151	0	6	5816	3	194	393	6406
6	Ghilad	8223	2076	162	1	25	10487	41	352	547	11427
7	Giera	6446	2002	101	0	7	8556	6	278	335	9175
8	Jebel	5292	753	155	0	2	6202	17	148	376	6743
9	Liebling	6498	858	406	0	12	7774	21	124	307	8226
10	Parța	4864	672	42	2	0	5580	35	180	342	6137
11	Pădureni	2753	881	103	0	3	3740	1243	171	177	5331
12	Sacoșu Turcesc	9201	1509	238	4	115	11067	381	452	553	12453
13	Șag	2353	458	58	53	24	2946	42	75	339	3402
14	Voiteg	5438	932	151	0	2	6523	11	101	327	6962
	Total	88258	17164	2233	60	281	107996	2901	3160	5828	119885

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.

The research of ecopedological conditions was made according to "Soil Survey Elaboration Methodology" (Vol. I, II, III) developed by ICPA Bucharest in 1987, supplemented by specific elements of Romanian System of Soil Taxonomy (SRTS - 2012).

Analyzes and other determinations were carried out in the research laboratories of the „OSPA-USAMVB,, from Timișoara, 119 Calea Aradului Street, LI 1001/11.25.2013, certified laboratory RENAR, according with National Standards and Rules approved by the Romanian Standardization Association.

RESULTS AND DISCUSSIONS

The subject of the study is the land located between Timis (north), Pogăniș (east), Bârzava (south), border with Serbia (west) and agricultural ecosystems identified in that area.

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 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.

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 Găvoajdia 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).

Depending on the north-south variation of morpho-hydrographic conditions, lithologic and the nature of generating agents, can be identified several subunits:

Timiș low Plain represent the subsidence zone at south of Bega, which is open from Lugoj that contains a huge scattering cone of Bega, Timiș și Bârzava rivers, in the area of old continental Quaternary deltas. With an average altitude between 88-95m, the plain is characterized by a great unevenness, both the relief of many differences, meanders and wetlands, as well as parental materials. All these features have led, since the eighteenth century, at the intensive draining, dams, and sewer adjustments works. The placing at small depths of groundwater strongly mineralized, favored the emergence of numerous salted soils, who are giving a dominant note in particular Dinaș area.

Banloc Plain, between Timiș-Bârzava rivers and Timiș low plain, is one of the sectors with most low altitude (75-85m) of the researched perimeter. General slope of the land is very low, resulted in a sharp loose ramble of rivers, the plain operating until the XVII century as a

large area of swamps, punctuated by rare banks. This space between the rivers is the southern boundary of the formation and spread of saline and alkalic soils in the west of the country.

The most important rivers are: Timiș and Bârzava (with Birda and Lanca-Birda).

Timiș river, the most important river in the Banat, collects water from a basin of 5248.0 km², with a route length of 241.2 km. After it springs from Vf. Piatra Goznei (at 1447m), massif Semenic, it follows a short route with west-east orientation, then changing its direction from south to north, become the main collector of a large number of rivers that drains Semenic, Țarcu, Godeanu and Poiana Rusca mountains.

The lower course of Timiș begin approximately at Costei, where forms a wide valley with numerous meander, ramble arms and ponding phenomena favored very low slope and depth of impermeable clay loam deposits. The great hydraulic works, begun in the eighteenth century, who created the system of drainage and navigation Bega - Timis through sewers, and dams regularization of courses of two rivers, the floods have turned off their lower basins.

Among the tributaries receive by Timis in its lower basin, the most important is Pogănișul. It collects water from the hills of the same name, having a collection basin of 700 km² and a length of about 100 km.

Flow regime, with strong flood, caused the regulation and damming of the river.

Bârzava has its origin in the Semenic mountain, collecting waters from the length of 127.6 km, to the border with Serbia, about 20 tributaries, with a basin of 971.5 km².

In its lower course, Bârzava feed with water through Morii channel the Soca-Topolea system, arranged towards the end of the eighteenth century.

The existence of groundwater close to the surface, the slow leak, caused arrangement in this area three drainage systems: the middle Bârzava system, Partos system (on the left side of Bârzava) and Banloc-Livezile system (on the right side of Bârzava), the largest being the last, which may contribute to draining an area of 204 square kilometers, spilling water excess in Bârzava by two pumping stations, along with the dams on Bârzava and Birda, it defends from flood an area of 141 km².

Arriving in Serbia, the river flows through the channel Theresa in Timis.

The hydrographic network, as a whole, has petulance, rivers flow with large variations depending on rainfall at certain times. Land inside the dams are periodically flooded, sometimes overflowing floods over them.

Besides the mentioned rivers, the rivers of studied perimeter are represented by a series of white and abandoned meanders and a vast network of drainage channels that flow into Bârzava.

Also included are a series of ponds and paddy fields (Partos-Topolea- Soca), irrigation canals, ponds and borrow pits in a large number of shapes and sizes.

The climate is moderate continental, with mild and short winters, frequently under the influence of cyclones and air masses from the Mediterranean and Adriatic seas. The annual average temperature is around 10.7 ° C and annual rainfall average is 604.7 mm (station Banloc). The studied area belongs geo-botanical to Central European province, strongly influenced by the proximity of the Southern European (Coste et al., 1997), so that vegetation has a relatively high number of species and plant associations adapted to conditions environmental extremes, the deficit or excess of the water and slightly soluble salts.

Arborescent vegetation comprises by species such as: *Populus pyramidalis*, *Juglans regia*, *Aesculus hippocastanus*, *Castanea sativa*, *Acer negundo*, *Morus alba*, and the cultivated species: apple, hair, plum, apricot, cherry and peach.

Herbaceous vegetation occurs depending on soil or land use categories. Thus, on the low, wet lands, are present: *Cirsium arvense*, *Polygonum aviculare*, *Chenopodium album*,

Matricaria inodora, Convolvulus arvensis, Setaria viridis, Amaranthus spp., Melilotus officinalis, Plantago spp., Agrostemma githago; Plantago lanceolata, Polygonum aviculare.

As a result of geographical position, at the interference of low plains and hills, in the old delta of Mureş, the studied territory present various geological and physical-geographical conditions, matter that have condition the forming of a complex cover of soils.

So, in pressed correlation with the variety of geomorphological factors that cause the existence of a diverse types of relief units, of geological factors that have guide to a diversity of materials (even for a reduced territory, of 119 885 ha) and of climatic or hydrological factors, with anthropical interventions, have result a varied population of soils with specific characteristics (related or totally different) in permanent evolution.

According with Romanian Taxonomic System of Soils (SRTS 2003) and WRB for SR 1998, in researched area have been identified 7 classes, 9 types, 35 undertypes, 99 varieties and other units, which are different through their properties, their productivity capacity and measures for maintenance and increase their fertility. So, the map of soils include types and subtypes of soil, on a surface of 107996 ha, that represents 100% of researched area:

- Fluvisols (mollic, gleyed, salic, sodic), on 4590 ha, 4.25%.
- Chernozems (typical, gleyed, salic, sodic, vertic), 17906 ha, 16.58%
- Phaeozems (typical, gleyed, vertic), 6998 ha, 6.48%
- Eutric Cambisols (mollic, gleyed, salic, vertic), 38155 ha, 35.33%
- Luvisols (mollic, gleyed), 5540 ha, 5.13%
- Pelosols (gleyed), 10368 ha, 9.60%
- Vertosols (gleyed, salic, sodic), 19785 ha, 18.32%
- Gleysols (mollic, pelic, sodic, salic), 3520 ha, 3.26%
- Solonetz (mollic, gleyed), 1134 ha, 1.05%

Crop production can be done in various conditions: natural ecosystems (without or with very little human intervention) or agro-ecosystems, extensive or intensive imposes an urgent deep knowledge of all determinants ecological, for each field units (TEO), characterized under the current methodology of the Soil Survey of evaluation using 23 indicators: (3C–medium temperature, 4C–yearly precipitation, 14–gleysation degree, 15–stagnation-gleysation degree, 16–salinity degree, 17–alkalization, 23A–texture in worked layer, 23B– texture in first 200 cm, 29–soil pollution, 33– terrain slope, 34–land exhibition, 38–land slope, 39–pedofreatic water level, 40–land inundability, 44–classes of total porosity, bulk density and compaction degree, 50– permeability classes, 61–CaCO₃ content, 63–soil reaction, 69–classes of base saturation, 133–Volume edaphic classes, 144–humus reserve classes, 181–surface moisture excess, 271–land improvement), indicators which represent character and traits most important, more significant, specific and measurable, which is usually found in pedological mapping work, prepared after 1987 by territorial OSPA, under methodological guidance of ICPA Bucharest.

Depending on the values of these indicators and specific behavior for each major category of use (PS–pasture, FN–hayfield, LP– orchards, VN –noble vine, AR–Arable) and the main cultivated species (GR–wheat OR–barley, PB –maize, FS–sunflower, CT–potato, SF–sugar beet, SO–soybean, MF–beans), were obtained on the basis of evaluation notes which lands were classified into quality classes for the main categories of use for arable being those of Table 2.

The data obtained shows that an area of 14543 ha (16.47%) of arable land (located across UAT: Jebel, Pădureni and Liebling) have a weighted average mark of evaluation (55 points) for the specified category of use, equal with weighted average obtained in the Timis county.

Table 2

Land quality (fertility) classes for Arable use category

Nr crt	UAT	Class I	Class II	Class III	Class IV	Class V	Evaluation mark	Total Ha
		Ha	Ha	Ha	Ha	Ha		
1	Banloc+Livezile	201	4371	3201	3607	1062	50	12442
2	Ciacova+ Ghilad	587	4889	8282	3344	1342	54	18444
3	Denta	1168	1752	3641	802	57	69	7420
4	Deta	325	1324	575	120	35	71	2379
5	Foeni	451	1142	1201	1203	731	49	4728
6	Giera	570	1955	1848	1682	391	50	6446
7	Jebel+ Pădureni	34	3776	2694	992	549	55	8045
8	Liebling	774	1795	1898	1405	626	55	6498
9	Sacoșu Turcesc	182	3788	3460	1694	77	58	9201
10	Șag+ Parța	135	3816	2334	925	7	62	7217
11	Voiteg	1124	2893	951	328	142	75	5438
	TOTAL	5551	31501	30085	16102	5019	648	88258

Below the average potential of the area is the surface of 42060 ha (47.66%) arable land (located across UAT: Banloc, Livezile, Ciacova, Ghilad, Foeni and Giera).

Limiting factors that put pressure on soil quality in this area are: salting (moderate and strong on 21.62%), low humus content (8.22%), clayey texture (45.95%), compaction (76, 84%), excessive ground moisture (30.95%), excess of stagnant moisture (36.40%), small portion (10.36%).

Improvement of the potential production can be done in terms of mainstreaming current hydro and cultural measures, which will aim at ensuring a hydric regime in soil, with optimal parameter for functionality.

Also, are needed measures to improve the physical condition of soils on surfaces affected by degradation processes at the surface (crust, dusting, etc. clogging pore space), which refers primarily to reduce the number of tillage, the introduction of long-term crop rotations protecting plants, integrated control of pests and diseases, ameliorative fertilization.

About the ameliorative fertilization, a needful attention paid to the use of liquid and semi-liquid manure on poorly drained land, the frozen lands located near water courses or avoid applying excessive amounts, being agricultural practices that should be avoided.

Special attention should be given to nitrogen fertilization because of the complex behavior of this nutrient in the soil and the ease with which one can lose the form of nitrate leaching by entrainment and surface runoff.

The amount of mineral and organic fertilizers applied per unit area does not exceed 170-210 kg N / ha / year. For farms in areas vulnerable to nitrate pollution, the exceeding of these quantities specified is prohibited.

Also, from economic and environmental reasons, in each farms larger than 10 ha, it requires proper management of manure at farm level. To achieve this goal, it is necessary to draw up a plan of fertilizing with nitrogen and other nutrients for each field or parcel occupied by a certain culture.

Making reference to water stress situation, in the context of climate change, it requires rehabilitation and modernization of irrigation works and extension farmland moisture deficiency, irrigation price in terms of economic efficiency, rehabilitation of wetlands through land of rice paddies and ponds.

The use water from Bârzava river for irrigation is mentioned in a document dating from 1801, when at west from Deta was made Topolea paddy, on Partos village territory, today located in the Banloc village.

All water required for that area (paddy, fishpond) was taken at the time and much later by Morii channel, branching from the right bank of Bârzava upstream of Deta (Rovinita Mare).

The whole system was subsequently refined in 1896, arranged a new pond, in 1899 they built a trap for the Morii channel undercrossing Bârzava and in 1904 was modernized.

CONCLUSSIONS

Knowledge of the natural conditions and especially ecological potential of land (defined as MESP-ICPA Bucharest, 1987) for major crops has an particular importance in the completion of the zoning works, justifying the need and timeliness of mapping and land evaluation activity.

With good natural ecological potential, the soil quality situation is disappointing as most of them are affected by the existence of one or more limiting or restrictive factors, being the subject since the early beginnings of human intervention more intense than in other regions from Timis county.

The climatic conditions specific to the research area permit the development of sectors (vegetable, fruit growing, fishing), which requires detailed knowledge of the productive, technological and restrictive or limiting factors of agricultural production, for each portion of territory in terms of both current manifestation and real change for the better possibilities thereof.

This is an appropriate tool for the practical measures of plant biomass production in a dynamic rigorous coupled with ever-increasing ecological requirements on environmental protection for the benefit of man, to improve living conditions of the entire community.

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