PHYSICAL AND GEOGRAPHIC CONDITIONS AS ELEMENTS DEFINING SOIL QUALITY IN THE UPPER AND MIDDLE COURSE OF THE BEGA RIVER

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Abstract. *The purpose of the researches carried out is based on current scientific and practical discussions on the accumulation of knowledge regarding physical and geographic conditions as elements defining soil quality in order to elaborate strategic programmes for sustainable management of soil and land resources. The issue addressed refers to an area of 158.259 ha (of which 90.563 ha, 57.22% is agricultural land and 60.323 ha, 38.11% is forest), located in the upper and middle course of the Bega River. This paper provides basic knowledge and methodological elements for the evaluation and characterization of natural and anthropogenic resources, in the hope that the presented information will raise the interest of the decision maker so that in the near future the agricultural research and practice, together with environmental protection, should strive to develop interdisciplinary studies. The studied perimeter belongs to the great Pannonian Depression rather to the Timiș Plain, a plain from the western part of Romania. Over the Pliocene deposits, formed by a succession of clay-sandy, clayey and marly layers, in the lake phase were placed clayey muds. Groundwater in flat areas is 1.50 - 3.00 m deep in the dam area at 3.00 - 5.00 m deep, but in microdepressions at 1.00 - 1,500 m deep. The operation of classifying agricultural land in quality classes based on the assessment grades highlighted a series of limiting factors that influence the production capacity of agricultural land within the researched space among which we mention: granulometric composition (soil texture), the reserve of humus, soil reaction, degree of compaction, excess of humidity, some of which are exemplified by the affected areas.*

Key words: *quality, natural, land, management*

INTRODUCTION

Sustainable management of natural and anthropogenic resources is a modern form of ecosystem management that aims at maintaining and enhancing biodiversity and allowing the long-term production of high-quality products, which is why the localization and definition in the terrestrial space of each portion of land play an important role in determining the ecological conditions and the vocation of a certain part of land for certain utilities (agricultural, forestry, social-economic).

Among the factors and the physical-geographical conditions determining the environment in which plants grow and yield crops, the soil presents a major component, which has the role, on the one hand, of a complex indicator of the state of evolution of the characteristics that determine the growth of plants, and on the other hand, of depositary of the influence of all other conditions and factors. Numerous studies and researches at national level have highlighted the interdependence relations between agricultural technology systems, the state of the environment, the level of economic development and the quality of life (BORCEAN ET AL., 1996, CANARACHE, TEACI, 1980, COSTE AT AL., 1997, DUMITRU ET AL., 2000, IANOȘ ET AL. 1997, MUNTEANU, 2000, RĂUȚĂ, 1997, ROGOBETE ET AL., 1997, TEACI, 1980, ȚĂRĂU ET AL., 2017, 2018).

The paper presents, based on the pedological information existing in the OSPA archive in Timisoara, mostly on classical support, as well as on the SPED1 information system and the BDUST-B system implemented in the territory by ICPA Bucharest, (OSPA, BUASVM and PU of Timisoara), some aspects related to the pedoclimatic characteristics as elements that define the fertility and the quality of soils in

order to provide the field users with the specialized support for the elaboration of sustainable management programmes.

MATERIAL AND METHODS

The issue addressed refers to a surface area of 158.259 ha (Table 1) of which 90.563 ha (57.22%) are agricultural lands and 60.323 ha (38.11%) land with forest vegetation, situated in the upper and middle course of the Bega River, which from the administrative point of view belong to 17 territorial administrative units (TAU) from Timis County.

Table 1

Situation of the land fund of the upper and middle course of the Bega River

Nr crt	Locality	Arable	Meadow	Pasture	Vignards	Orchards	Total agricultural	Forests	Waters	Other categories	Total general
1	Balinț	3601	1160	103	0	71	4935	242	93	290	5560
2	Bara	2193	2350	708	0	444	5695	823	335	214	7067
3	Bethausen	4764	2066	318	0	107	7255	1265	139	368	9027
4	Brestovăț	2595	2754	1365	0	31	6745	3384	28	158	10315
5	Coșteiu	4825	1798	191	1	25	6840	993	155	375	8363
6	Curtea	862	1211	225	-	110	2408	1872	22	132	4434
7	Dumbrava	3335	977	328	1	174	4815	548	39	265	5667
8	Făget	4780	3547	807	0	21	9155	4328	95	1509	15087
9	Fârdea	1476	2417	757	--	45	4695	7726	426	260	13107
10	Ghizela	3191	1670	869	0	10	5740	3056	95	316	9207
11	Margina	1821	1843	1223	0	62	4949	7931	63	342	13285
12	Mănăștur	1830	1030	157	0	15	3032	946	31	177	4186
13	Ohaba Lungă	2208	1940	737	4	53	4942	5256	21	252	10471
14	Pietroasa	570	2450	1299	--	45	4364	11095	27	160	15646
15	Secaș	1946	2265	569	0	226	5006	608	20	133	5767
16	Tomești	626	2371	975	--	24	3996	9673	45	380	14094
17	Traian Vuia	4111	1386	176	1	317	5991	577	112	296	6976
Total (ha)		**44734**	**33235**	**10807**	**7**	**1780**	**90563**	**60323**	**1746**	**5627**	**158259**
% total area		**28,27**	**21,00**	**6,83**	**0,00**	**1,12**	**57,22**	**38,11**	**1,11**	**3,56**	**100**
% total agricultural		**49,39**	**36,70**	**11,94**	**0,00**	**1,97**	**100**	-	-	-	-

The research of the ecopedological conditions was done in accordance with the Methodology of the Pedological Education Elaboration (vol I, II, III) elaborated by ICPA Bucharest in 1987, supplemented with specific elements of the Romanian Soil Taxonomy System (SRTS-2012), as well as other normative acts updated by MAAP Order 223/2002, respectively Order MADR 278/2011, based on the pedological information acquired in the OSPA archive in Timişoara (for more than 68 years), but also based on the research carried out in time by the authors (within OSPA, BUASVM and PU from Timişoara), studies that were supplemented with elements recently collected from the field.

RESULTS AND DICUSSIONS

The object of study is the area of 158.259 ha (Table 1), out of which 90.563 ha are agricultural lands (57,22%), situated in the upper and middle course of the Bega River, namely the soil and ground units (TEO) identified in that perimeter and their quality status.

Bega has its origins in the north-west of Poiana Ruscăi Mountains with two branches: *Bega Poenilor*, which springs from Rusca Peak (1335m) and flows to Crivina de Sus a plateau of limestone and dolomite, and *Bega Luncanilor*, which springs from Padeş Peak (1374m) then crosses an area of crystalline and dolomite shales.

The right branch of the Bega Valley is called *Bega Poenilor*, flowing through Poieni, Crivina de Sus and Pietroasa. Upstream of Crivina de Sus, the valley is deeply excavated in the limestone and dolomites in the plateau area of the massif, which passes south to Poieni, from where it continues through the steep slopes up to the main ridge.

The valley describes a large bend that bypasses the Poieni - Fărăşeşti plateau area. About 2 km upstream of Poieni, the valley branches into: Valea Mare, which bypasses Dârnbul Pascului, Sasa valley with the springs north of Rusca Peak.

From Crivina de Sus to Romăneşti, Bega Poienilor flows into the northern end of the mountainous relief that separates it from the hilly area between Curtea and Ohaba.

The main tributaries of the Bega brook are: Valea Domnească, Valea de Piatră, Pârâul Izvorului, their water flow varies depending on rainfall, but they have a constant flow due to the underground supply.

Valea Topla springs from underneath Padeş and Bordaru peaks. It receives the streams of Ştefania, Stânjeni and Ruzi creeks, and together they flow to the center of Luncanii de Jos in the Valea Mare. These united waters make ***Bega Luncani***.

Up to Colonia Fabricii, Bega receives the following tributaries: Valea Lupului, Pârâul de la hotar (left), Drobotă 's Creek, and Valea lui Liman (right).

Colonia Fabricii receives on the left side the Moga creek, and until the exit from the area, it benefits from the contribution of smaller tributaries: Valea Izvorului Drujii (right), in the locality Tomeşti, Valea Cornetului, the creek of the Church and Valea Leşului (on the left), Piatra Albă Valley, Gorniţel Valley, Cemetary Valley (right), and later it receives the largest tributary that comes from the Poieni-Crivina-Pietroasa localities, namely the river ***Şasa or Bega Poieni***.

In the wider areas of the valley we can find Luncani and Tomeşti, and at the exit from the massif, the locality of Romăneşti. A county road, modernized till Valea lui Liman, climbs along the riverbed to the waterbase of the Padeş Valley, from where it descends to Voislova in the Bistra meadow.

Bega crosses the piedmont and depression region of Lugoj, the main tributaries of this sector draining the southern slopes of Lipovei Hills (Pădureni, Cladova, Fădimac, Miniş, Chizdia) and the northern slopes of Făget and Surduc (Glaviţa, Gladna, Săraz). Among them, stands out Gladna, which has a length of over 30 km, a basin surface of about 250 km^2, and a flow of about 1,1 m^3/s, on which the Surduc reservoir (Fârdea) was built.

The river penetrates upstream of Gladna Română to the middle of Poiana Ruscă Mountains, the catchment area of the springs being under the Bordarul Peak (865.0 m).

Downstream of Gladna Română, the river passes through a piedmont area, which includes a few small depressions: Gladna Română, Gladna Montană, Fârdea and Hăuzeşti.

The confluence of Gladna with Bega is at an altitude of 123 m, near the village of Leucuşeşti, where Bega digresses and shows deviation tendencies to the right.

A significant contribution to the flow of the Gladna River is brought by its tributaries, among which we mention: Valea Băniţă, Valea Rozalia, Valea Sărazului, Valea Hăuzeşti, Valea Zoldiană and Valea Minişului.

The Gladna River is currently captured in a reservoir made by building a dam at the entrance to the epigenetic strait of Surduc's crystalline piedmont.

The Surduc reservoir is located about 90 km east of Timisoara and about 30 km east of Lugoj on the administrative territory of Fârdea commune.

From a geographic point of view, the reservoir is located in the northwest of the Poiana Ruscă Massif, on the Gladna River gorges, about 4 km upstream of Surduc locality.

The flowing waters that feed Surduc Lake are the Ilăuzeasca creek, flowing from north to south, the Meuniscel stream flowing from northeast to southwest, the and the Glodna creek flowing from east to west.

After the dam, the three united creeks are named Gloviţa, which is one of the tributaries that Bega receives in the Traian Vuia area.

The Surduc reservoir was designed to provide drinking water and industrial water to the Timişoara area and the area upstream of Timişoara by adjusting and supplementing the flow on the Bega Canal (under emergency regime). A second use is to provide water for irrigation and fishing. The construction began in 1972, and it came into operation in 1976, reaching a volume of 25 million cubic meters in 1977 (stage I, 192 m elevation). The second phase of the construction started in 1981. Currently, the works are continued with the works from the 4.8 km induction tunnel, which is to lead a spring in Begăi from Luncani (Tomeşti commune) to the Gladna course, reaching the level of retention for Stage II at the 198 m elevation.

The Hydrotechnical Node Coşteiu was executed in 1758 under the guidance of the Dutch engineer Max Fremaut in order to derive the additional flow from the river Timiş into the Bega River, thus ensuring the activity of floating, navigation, flood protection as well as water supply of the riparian area, including Timişoara. The Coşteiu dam, together with the Topolovăţ dam, solved the problem of regularizing the flows from the Timiş and Bega rivers, upstream of Timişoara, so that the city is still protected against floods.

In order to drain these marshes and to achieve a communications waterway, after 1717 large hydrotechnical works were made in the middle and lower basin of Bega. Between Făget-Chizătău and Timişoara (1728-1760), the channel that collects the upstream waters, draining the large swamps in the Izvin-Remetea Mare area, was built. Also in this sector, two channels of communication between Bega and Timiş were developed in order to regulate the flows: the Coştei-Chizătău Canal, which supplies the Bega with water from Timiş and the Topolovăţu Mic-Hitiaş Canal, which ensures the discharge of the surplus water from Bega into Timiş.

The relief on which the Bega River basin is grafted is mostly formed of mountains and hills where petrographic facies vary from one area to another. At the same time, the investigated space also has a pronounced climatic, pedological and geobotanic nuance, the components of the natural framework, with their particularities, to which the human activity is added (directly or indirectly), influencing all the hydrological and pedogenetic processes and phenomena unfolded over time.

Located in the northeastern part of the Banat region, the Poiana Ruscă Mountains make the transition between the Apuseni Mountains and the Banat Mountains.

Their name is of Latin origin, "Poiana Rustica", a deforested place outside the town of Sarmisegetusa, inhabited by the Dacians and then by the Dacian-Romans who have terraced many slopes and it is possible to say that these mountains are *the cradle of the Romanian people*.

The Poiana Ruscă massif, positioned in the northwest of the Southern Carpathians, is delimited by the Deva-Făget-Lugoj alignment to the north, by Haţeg-Oţelu Roşu alignment to the east, and by the Lugoj-Caransebeş alignment to the west.

The geological substratum is formed almost entirely of crystalline shales, to which small surfaces of metamorphosed (marble), volcanic rocks ("Magura" Devei) and sedimentary rocks on the edges are added, while the edging formations contributed to the filling of Făgetului depression, from east to west, covering successively the crystalline-mesozoic formations with Tortonian, pliocene and then quaternary deposits.

The relief of the massif is in the form of large and gentle ridges with moderate heights and narrow valleys, radially arranged. Within the researched perimeter, there are only the southwestern peaks of the massif, which appear in the form of a bulging shield, with heights that reach 1374m (Padeş Peak) and 1356m (Rusca Peak), from which narrow peaks with sharp slopes descend.

From the Padeş Peak, a summit descends to the north, which through the peaks of Balaurul, Preslop, Ambros, Beneşu, reaches Tomeşti. From the top of Balaur peak there is another summit to the west that extends through the peaks of Brăinul Mare and Gomila Mare to Fîrdea, while to the south Padeş-Rareş-Fântânii it forkes to Voislova, through Ascuţita Mică, Scărişoara and Magura.

From the Rusca peak, a peak over the top of the Stâlpului, Druja and Scalinului peaks starts towards northwest up to Romăneşti, and a ridge emerges through the Cririnii Hill and Chiciora peak, up to Măgura Frunţii towards southeast, from where a branch descends to the south, at Marga.

In the marginal areas of the east, northwest and southwest, between the mountainous area and the peripheral depressions, there is a relief of hills with altitudes between 200-300 m. On the left side of the Bega valley, between Margina and Traian Vuia, this corrugated relief passes in the extensive fluvial terraces. The alluvial plains and the terraces of the Mureş and Bega rivers mark the peripheral area of the massif.

A distinct part of the Western Piedmonts, the hills of Lipova appear immediately in the south of Mureş, and continue with the Făget and Surduc Hills, which stretch as a hillside at the foot of the mountains to the Timiş Valley.

Lipova Plateau is the largest hill area between Mureş (Mureş Corridor) to the north and Bega (Făgetul Depression) to the south, being bound to the east by the Poiana Ruscăi Mountains and to the west gradually descending to the Vinga Plain to the Beregsău valley. They are made of clays, marls, sands and gravels, which are on a crystalline foundation, over which a blanket of reddish clay is deposited and then shaped by tributaries from the right bank of the Bega River.

The Făget Hills, between Surduc's spur, mountain range, meadow and bega terraces, are carved in Panonian deposits made up of clay and fine sands.

In the contact area with the mountain frame a series of depressions and tectonic basins and erosion were formed, among which the Gladna Depression.

The Surduc Hills, located at the contact with the Poiana Ruscă Mountains, on the Crivina - Hăuzeşti - Gladna - Zolt - Tomeşti alignment, have a maximum development to the west between the Timiş and Bega valleys.

They are made of clays, sands and gravels based on a crystalline foundation that appears in the form of a spur around Bucovăţ.

Located between Zarand and Poiana Ruscăi mountains and bordered to the north by the Lipova Hills, and to the south by the Lugoj Hills, the Lugoj-Făget Depression includes a graben diving zone starting from the Lugoj sector, which branches towards northeast on the direction of Făget-Ilia, where it connects to the Mureş corridor, and southeast towards Caransebeş, up to the Timiş gorge.

From a genetic point of view, the area is characterized by an accumulative, piedmont relief consisting of pliocene fluvial deposits.

The morphogenetic processes are conditioned in particular by the existing and current hydrographic network, which generated a hilly relief with altitude values between 135 and 308,80 m.

As a whole, the relief is a general inclination from northeast to southwest, and in cross-section, the relief descends from north to south through routes of different generations.

Vivid expression of the pedo-hydro-climatic and floristic conditions, as well as due to human intervention (starting from the pre-Roman period to the present), the soils in the researched space show a great diversity, according to the Romanian Soil Taxonomy System (SRTS-2012), 16 types and associations of soils being identified (Litosols, Regosols, Aluviosols, Humosiosols, Prepodzols, Podzols, Eutricambosols, Districambosols, Preluvosols, Luvosols, Planosols, Stagnosols, Glyosols, Histosols, Antrosols, Tehnosols), comprising 8 of the 12 classes of soil (Protisols, Umbrisols, Cambisols, Luvisols, Spodisols, Hydrisols, Histisoluri, Antrisoluri), their distribution being shown below (Table 2).

In this context, the quality of agricultural lands as a result of the diversity of physical-geographic conditions and their intrinsic attributes, as well as of anthropogenic interventions occurring in time, it is very different in space, which is why the Romanian methodology for the qualification of agricultural lands that

includes the synthesis of knowledge (D. Teaci 1980, ICPA Bucharest 1987) defines the land in ecological terms in relation to the cosmic-atmospheric and technical-edaphic factors. The basic principle of the assessment methodology developed in our country is the one that for each unit of homogeneous ecological territory (TEO) within a territorial administrative unit (TAU) defined according to the current Methodology for Development of Pedological Studies using the 23 indicators which are usually found in the pedological mapping works developed after 1987 by the territorial OSPA under the methodological guidance of ICPA Bucharest, their quality is established by bonuses from 1 to 100. Each of the units identified within the investigated area was characterized according to the Methodology of Elaboration of Pedological Studies (MESP 1987, vol. I, II, III), using the 23 assessment indicators, indicators representing more important, more significant, and more easily measurable characteristics, which are usually found in soil studies and research (developed by territorial OSPA), namely: *climatic indicators* (indicator 3C - annual average temperature - corrected values, indicator 4C - annual average precipitation - corrected values), *indicators of some morphological, chemical, physical, hydro-physical characteristics and volume of soil cover* (indicator 14 - gleying, indicator 15 - stagnogenization, indicator 16 or 17 - salinisation or alkalization, (indicator 61 - total $CaCO_3$ content on 0-50 cm, indicator 63 - soil reaction in Ap or in the first 20 cm, indicator 144 - the humus reserve in the 0-50 cm layer, indicator 23A - texture in the Ap or the first 20 cm, indicator 44 - the total porosity in the restrictive horizon, indicator 133 - the edaphic useful volume), *indicators of the refief characteristics* (indicator 33 - slope, indicator 38 - landslides), *hydrography, hydrology and river drainage indicators* (indicator 40 - floodability, indicator 181 - excess of stagnant humidity, indicator 39 - groundwater depth), *indicators related to some anthropogenic interventions* (indicator 29 – pollution, indicator 271 - land improvement), and the interactions between these values of characterization of natural and anthropogenic characteristics.

Table 2

The main types and associations of soils in the upper and middle course of the Bega River

Nr ctr.	Territorial Administrative Unit (TAU)	Agri ha 2014	Type, subtype of soil														
			LS	**RS**	**AS**	**FZ**	**EC**	**DC**	**EL**	**LV**	**PL**	**VS**	**PL**	**SG**	**GS**	**AT**	**Asc**
1	Balinț	4935	-	-	**1105**	-	-	-	**1012**	**622**	-	**617**	-	-	**10**	**355**	**1214**
2	Bara	5695	-	**247**	-	-	**549**	-	**2116**	**2429**	-	**103**	**3**	**106**	**7**	**135**	-
3	Bethausen	7255	-	**163**	**320**	-	-	**1073**	**904**	**3203**	-	-	-	**732**	**663**	**83**	**114**
4	Brestovăț	6745	-	-	-	-	**882**	-	**2904**	**1040**	-	**934**	-	**75**	**285**	**320**	**305**
5	Coșteiu	6840	-	-	**1563**	-	**860**	-	**1122**	**1006**	**547**	**311**	-	**455**	**393**	**583**	-
6	Curtea	2408	-	**2**	**221**	-	**262**	**6**	-	**1737**	-	-	-	**56**	-	**97**	**27**
7	Dumbrava	4815	**9**	**24**	**93**	-	**1212**	-	**15**	**3236**	-	-	-	**81**	**101**	**44**	-
8	Făget	9155	-	**168**	**505**	-	**1537**	-	**679**	**5647**	-	-	-	**188**	**53**	**331**	**47**
9	Fârdea	4695	**145**	**56**	**244**	-	**178**	**103**	**113**	**3737**	**38**	-	-	**37**	-	**44**	-
10	Ghizela	5740	-	**197**	**88**	-	**1551**	-	**2078**	**1047**	-	**51**	**159**	**461**	**108**	-	-
11	Margina	4949	**22**	**99**	**180**	-	**1426**	-	**155**	**2742**	-	-	-	**60**	**46**	**219**	-
12	Mănăștur	3032	-	**16**	**37**	-	**285**	-	-	**1761**	-	**62**	-	-	**750**	**87**	**34**
13	Ogaba Lungă	4942	-	-	-	-	-	-	**876**	**1104**	**114**	**153**	-	**10**	-	**1030**	**1655**
14	Pietroasa	4364	**323**	**1176**	**95**	-	**51**	-	**95**	**738**	-	-	-	**2**	**53**	-	**1831**
5315	Secaș	5006			**12**	**26**	**337**	-	**1545**	**1249**	-	**412**	-	**20**	**389**	**1016**	-
16	Tomești	3996	**13**	**407**	**198**	-	**192**	-	**1611**	**174**	-	-	-	**53**	-	**19**	**1329**
17	Traian Vuia	5991	**59**	**31**	**664**	-	**525**	-	**1031**	**1930**	**86**	-	-	**162**	**1354**	**34**	**115**

Total	**90563**	**571**	**2586**	**5325**	**26**	**9847**	**1182**	**16256**	**33402**	**785**	**2643**	**162**	**2498**	**4212**	**4397**	**6671**
% of total agricultural	**100**	**0,63**	**2,86**	**5,88**	**0,03**	**10,87**	**1,31**	**17,95**	**36,88**	**0,87**	**2,92**	**0,18**	**2,76**	**4,65**	**4,85**	**7,36**

When grading land for natural conditions, each of the above indicators is involved in establishing the credit score by a rating coefficient varying between 0 and 1 as the appropriation is totally unfavourable or optimal for the requirements of the plant under study (Appendices 3-1 to 3-18, MESP-1987, Vol. II).

Thus, on the basis of pedological information processed according to the Methodology for the Development of Pedological Studies (ICPABucureşti 1987) and other normative acts updated by Order MADR278 / 2011, the agricultural lands of the researched space can be grouped (from 20 to 20 points) in V classes (quality) according to their vocation for arable use (table 3), their distribution in the five quality classes being different according to the local particularities.

Table 3

Classes of suitability (quality) for category of use „ARABLE" (ha)

TERITORRIAL ADMINISTRATIVE UNIT (TAU)	Year of execution	Arable	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.)	Weighted average grade
Balinț	1991	3601	52	755	627	1329	838	**36**
Bara	1991	2193	0	6	1128	676	383	**35**
Bethausen	1987	4764	0	502	1325	2553	384	**39**
Brestovăț	1986	2595	0	0	991	1345	259	**31**
Coșteiu	1987	4825	82	636	1035	1367	1705	**36**
Curtea	1989	862	0	29	356	442	35	**38**
Dumbrava	1983	3335	0	322	1741	999	273	**36**
Făget	1984	4780	0	28	1781	2022	949	**34**
F\rdea	1989	1476	0	0	504	758	214	23
Ghizela	1987	3191	0	163	1331	1188	509	**35**
Margina	1989	1821	0	25	706	796	294	**37**
Mănăștur	1982	1830	0	102	452	926	350	**33**
Ogaba Lun	1992	2208	0	209	619	845	535	**35**
Pietroasa	1992	570	0	0	49	126	395	10
Secaș	2012	1946	0	38	598	988	322	**32**
Tomești	1992	626	0	0	104	398	124	31
Traian Vuia	1998	4111	65	777	1965	1229	75	**47**
Total	-	44734	199	3592	15312	17987	7644	-

Table 4

The situation of land affected by excess surface and ground humidity

Nr. crt.	Commune Town Municipiul	Total ha (agricultural)	of which land with:					
			excess of surface humidity			excess of ground humidity		
			slight	moderate	strong; excessive	moderate	strong	very strong; excessive
1	Balinț	4935	374	232	642	866	733	27
2	Bara	5695	432	1050	110	666	60	10
3	Bethausen	7255	2305	2305	954	292	629	480
4	Brestovăț	6745	2567	1771	80	565	151	246
5	Coșteiu	6840	1609	1102	458	649	533	395
6	Curtea	2408	901	563	60	69	278	14
7	Dumbrava	4815	883	541	85	193	114	105
8	Făget	9155	2422	3383	98	528	323	58
9	Fârdea	4695	890	158	70	60	0	10
10	Ghizela	5740	1638	1500	460	640	939	111
11	Margina	4949	1389	763	87	358	349	48
12	Mănăștur	3032	1252	1066	39	193	290	770

Nr. crt.	Commune Town Municipiul	Total ha (agricultural)	of which land with:					
			excess of surface humidity			excess of ground humidity		
			slight	moderate	strong; excessive	moderate	strong	very strong; excessive
1	Balinț	4935	374	232	642	866	733	27
14	Ohaba Lungă	4942	1171	1813	19	169	20	6
15	Pietroasa	4364	1019	145	125	503	265	17
16	Secaș	5006	880	721	28	113	172	389
17	Tomești	3996	814	665	515	541	87	56
18	Traian Vuia	5991	986	640	168	1011	618	1376
		90563	21532	18418	3998	7416	5561	4181

The operation of classifying agricultural land in quality classes based on the assessment grades highlighted a series of limiting factors that influence the production capacity of agricultural land within the researched space among which we mention: granulometric composition (soil texture), the reserve of humus, soil reaction, degree of compaction, excess of humidity, some of which are exemplified by the affected areas (Tables 4-5). From their analysis results a series of requirements and improvement measures and/or mandatory uses as well as requirements and measures to prevent degradation and preserve soil-land fertility.

Table 5

The situation of land affected by compaction and acidification

Nr. Crt	Commune Town City	Total ha (agricultural)	of which land with:					
			compaction			acidification		
			slight	moderate	strong excessive	slight	moderate	strong excessive
1	Balinț	4935	1114	2047	1433	1733	2563	117
2	Bara	5695	1210	3112	1104	1940	2914	277
3	Bethausen	7255	1639	3176	2070	2013	3808	1080
4	Brestovăț	6745	1110	2593	2846	3074	2325	850
5	Coșteiu	6840	879	3446	1647	844	3778	1153
6	Curtea	2408	1300	530	95	763	1417	77
7	Dumbrava	4815	2120	897	85	206	489	452
8	Făget	9155	2326	4727	693	1432	5636	326
9	Fârdea	4695	856	2731	816	414	3163	807
10	Ghizela	5740	529	4225	739	2409	2605	281
11	Margina	4949	1587	1935	573	1931	1622	118
12	Mănăștur	3032	373	1122	1561	788	2072	171
13	Ohaba Lungă	4942	43	1103	3502	2348	2179	90
14	Pietroasa	4364	680	450	230	1080	520	330
15	Secaș	5006	3954	224	681	1120	417	609
16	Tomești	3996	530	410	320	980	310	280
17	Traian Vuia	5991	948	2620	1825	1862	2519	266
TOTAL		90563	21198	35348	20220	24937	38337	7284

From the enumeration of the main physical-geographic and edaphic characteristics of the lands within the researched space and from the analysis of the limiting factors (tables 4-5) identified together

with their classification in quality classes, there is a need for interventions with pedohydroameliorative or cultural measures required from case to case:

- the use of agricultural practices that reduce the phenomena of soil impoverishment (extension of organic farming practices, regulation of pesticide consumption, etc.);
- increasing soil fertility by reducing the level of erosion and other degradation processes, and by using only organic fertilizers, practicing proper crop rotations, expanding the areas occupied by legumes, preserving, improving and expanding existing pastures and meadows, applying agri-forest schemes;
- preventing and fighting landslides and soil erosion (earth waves, coastal channels, furrows, anti-erosion curtains);
- increasing the protection degree of the protected areas by organizing buffer zones around them, but especially by organizing improvement areas, revising and modernizing the existing ones;
- protecting biodiversity by introducing agri-environmental schemes experienced in pilot farms with regard to the application of an agricultural management appropriate to the ecopedological conditions specific to a certain place at a certain time etc.;

All measures aimed at raising soil quality will aim at fostering the processes leading to the concentration of nutrients and organic matter. In order to prevent the physical degradation of soil it is necessary to minimize the preparation works, to perform the agri-technical works at the optimal humidity level, as well as to ensure an adequate structure of the crops with improved plants.

With regard to ameliorating fertilization, special attention must be paid to the use of semi-liquid and liquid slurry on poorly drained, frozen land, on land near watercourses or avoiding the application of excessive amounts and wrong choice of time of administration, these being agricultural practices to be avoided.

CONCLUSIONS

Knowing the natural conditions and especially the ecological potential of the lands (defined according to MESP-ICPA Bucharest, 1987) for the main categories of use and crops is of particular importance in carrying out the qualitative evaluation of lands, which justifies the necessity and the actuality of the pedological mapping activity and periodic agrochemistry, as well as the need to respect the frequency of field and laboratory investigations at all points in the 8x8 Km grid of the National Soil Monitoring System (organized by ICPA) and completing it with pedological and agrochemical studies.

The determination of the land production capacity as well as the foundation of the improvement technologies can be, for the decision-maker (Government, Local Public Administration), an effective tool for choosing working procedures that favour the efficient use of the land resources within the space researched according to the specific pedro-climatic conditions that allow the integration of the vegetal and animal sectors with the processing and selling of agri-food products, which can be an ecological and efficient solution for the future.

The systematic pedological and agrochemical mapping of soils carried out by the Pedological and Agrochemical Offices in our country offer valuable data on the evolution of soil quality, the differentiation and setting of crop technologies, the quality of land and the establishment of favorability for different crops, substantiating land improvement and improvement technologies, organizing and systematizing the territory.

In this respect, the methodology for elaborating pedological studies, ICPA (1987), integrates organically and unitarily the mapping of soils and other environmental conditions with multiple applicative aspects regarding the sustainable management of natural and anthropogenic resources, thus representing a modern form of land management, aiming at maintaining and increasing soil fertility.

BIBLIOGRAPHY

BORCEAN I.,TABĂRĂ V.,DAVID GH.,BORCEAN EUGENIA,ȚĂRĂU D.,BORCEAN A.,1996,Zonarea , cultivarea și protecția plantelor de camp în Banat, Ed. Mirton Timișoara,

BORZA I., Ameliorarea şi protecţia solurilor, Ed. Mirton, Timişoara, 1997,

CANARACHE A., TEACI D., 1980, Caracterizarea tehnologică a terenurilor Agricole ca bază a lucrărilor de raionare ameliorative, Buletin Info. ASAS Bucureşti, nr.10,

COSTE I., ȚĂRĂU D., ROGOBETE GH., 1997, Tendinţe ale evoluţiei mediului înconjurător în Sud-Vestul României, Lcr. Şt. Simp. Naţional de Pedologie Timişoara,

DUMITRU M., ȘTEFĂNESCU S.L., 2000, Scheme agroambientale în contextul dezvoltării rurale, Ştiinţa solului nr. 2, vol. XXXIV, Ed. Signata, Timişoara,

IANOȘ GH., PUȘCĂ I., GOIAN M., 1997, Solurile Banatului (II) condiţii naturale şi fertilitate, Ed. Mirton, Timişoara,

MUNTEANU I., 2000, Despre unele aspecte privind relaţiile dintre secetă, pedogeneză şi degradarea terenurilor (deşertificare), Ştiinţa solului XXXIV, nr. 2,

RAUTA C., 1997, Agricultura durabilă în România,Ştiinţa Solului,vol.XXXI, nr. 1,

ROGOBETE, GH., ȚĂRĂU, D., 1997 - Solurile şi ameliorarea lor. Harta solurilor Banatului, Ed. Marineasa, Timişoara,

RUSU I., ȘTEFAN V., NIȚĂ L., MAZĂRE V., CHIȘ S., DUMA COPCEA ANIȘOARA, MIHUȚ CASIANA, STROIA M., LAȚO K., APETREI D., Cercetări cu privire la capacitatea de producţie a solurilor din judeţul Timiş, Editura Eurobit Timişoara, 2004,

TEACI D., 1980, Bonitarea terenurilor agricole, Ed. Ceres, Bucureşti,

ȚĂRĂU D, ROGOBETE GH.,NIȚĂ L.,DICU D.,CLARA TUDOR,RĂDUICĂ C., 2017**,** The role of pedologic information in definining land productivity in the mountain area of southern Banat,Știința Solului,

ȚĂRĂU D., ROGOBETE GH., ADIA GROZAV, DICU D.,2018, Solurile din sud-vestul României,Ed. Eurobit Timișoara,

*** ARHIVA O.S.P.A. TIMIŞOARA – *Studii pedologice şi agrochimice,*

*** SRTS-2012.

*** Metodologia elaborării studiilor pedologice, vol. I, II şi III, Redacţia de propagandă agricolă, Bucureşti,