THE SOILS IN LIPOVEI HILLS AND THEIR QUALITY

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Abstract: *The purpose of the researches is based on current scientific and practical discourses on the accumulation of knowledge on the spatial peculiarities of the natural frame as elements that define the quality of the soils and the possible pressures on them. The importance of the topic is derived from the fact that the relations between the soil characteristics and the main cultivated species can establish relationships of varied and complex reciprocity. So the soil properties can exert a definite influence on the development of the root system, mineral nutrition, ensuring the aerohydric and thermal regime necessary for the physiological processes and the plants (phytocoenoses) in their turn act both directly and indirectly on the soil fertility status. Considering that these considerations in the paper are presented on the basis of the research carried out during the doctoral school, respectively 28.09.2015 and so far on the subject "Research on ecopedological bases of land productivity in Lipovei Hills and possible pressures on their quality", some aspects related to the structure of edafic cover and to the particularities of the main types and associations of soils, to their quality status and some restrictive characteristics of land quality, characteristics that define their vocation for certain utilities. By its geographical location the area known as Lipovei Hills, Lipovei Piedmont or Lipova Plateau is situated in the western part of the country, between the geographical coordinates: 21º22'30'' şi 22º21'30'' eastern longitude and 45º55' şi 46º15' north latitude, as a transition unit between the Western Carpathian orogen and the low, subsidence area of the Banat-Crişana Plain, which imparts to the area specific specicities of real interest for the scientific research. The necessity of the geomorphological and pedological researches of this depression unit of Mureş de Jos (the actual piedmont complex Lipovei Hills) was also imposed for socio-economic and agricultural reasons in particular, because without knowing how the natural landscape evolved, from origins to at present, it is not possible to determine how the lands and soils will develop in the future.*

Key words: *soil, land, quality, limitations, restrictions.*

INTRODUCTION

Knowing the natural conditions of the ecological potential of land for various utilities and certain crops is of particular economic and social importance, the *soil* as an element of the land fund may favor a certain use of it through a number of specific features, defined and studied over time , such as: quantity and quality of the nutrients, edafic volume, texture, porosity, permeability, aerohydric and thermal regime, mineralogical composition, reaction, etc.

Numerous studies and researches at the national level have shown that there are relationships of interdependence between the agricultural technology systems of plant cultivation, the state of the environment, the level of the economic development and the quality of life (1,2,3,4,5,6,7, 8,9,10,11,12,13).

Considering that these considerations in the paper present some aspects related to the structure of edafic cover, the main types and subtypes of the soil, to their quality and its limiting factors and to the main improvement measures, aspects that are the result of researches carried out in 2015-2018 and are part of the doctoral program completed with a series of data from pedological studies stored in the OSPA archive from Timisoara and Arad.

MATERIAL AND METHODS

The issue addressed concerns an area of 309186 ha (Table 1) of which 181890 ha are agricultural lands and 110695 ha of forest vegetation land located in the west of Romania, which from the administrative point of view belong to 26 ATUs (Territorial aAdministrative Unit) in the counties Timiş (17) and Arad (9).

The research of 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-2003/2012)** and other normative acts updated by **Order MAAP 223/2002**, respectively **Order MADR 278/2011**, based on the pedological information accumulated in the archives of **OSPA Timisoara** and **Arad** (for more than 65 years), studies completed with some elements recently collected from the field and processed in laboratory and office.

Table 1

Land Fund Situation (ha/%)

Nr crt	Locality	Arable	Pastures	Meadows	Vineyards	Orchards	Total agricultural	Foresty	Waters	Other categories	Grand total
1	Balinţ*	3601	1160	103	0	71	4935	242	93	290	5560
2	Bara*	2193	2350	708	0	444	5695	823	336	213	7067
3	Bethausen*	4764	2066	318	0	107	7255	1265	139	368	9027
4	Bogda*	2005	1384	770	1	138	4298	3416	24	130	7868
5	Brestovăţ*	2595	2754	1365	0	31	6745	3384	28	158	10315
6	Făget*	4780	3547	920	1	68	9316	4828	84	859	15087
7	Ghizela**	3199	1389	819	0	29	5436	3056	95	620	9207
8	Giarmata**	4860	834	121	173	305	6293	16	87	754	7150
9	Margina*	1821	1844	1223	0	62	4950	7931	63	341	13285
10	Maşloc (Fibiş)**	9090	1390	917	24	319	11740	1042	44	774	13600
11	Mănăştur*	1830	1038	180	0	52	3100	878	40	168	4186
12	Ohaba Lungă*	2208	1948	737	4	53	4950	5256	21	252	10479
13	Pişchia**	6676	1293	586	272	466	9293	1963	188	917	12361
14	Recaş*	12121	4736	968	1680	230	19735	1810	403	1040	22988
15	Remetea Mare**	7257	1221	199	0	14	8961	875	241	734	10541
16	Secaş**	1752	2492	593	0	117	4954	607	20	186	5767
17	Topolovăţu M*	6772	1688	212	28	228	8928	342	237	481	9988
	Total TM	77524	33134	10739	2183	2734	126314	37734	2143	8285	174476
1	Bata*	2204	902	415	0	1	3522	4006	125	381	8034
2	Birchiş*	2599	1651	1127	0	0	5377	4385	108	358	10228
3	Bîrzava*	2232	2591	2332	0	50	7205	17646	326	466	25643
4	Conop -/Chelmac/	2405	2497	404	0	81	5387	13025	222	353	18987
5	Lipova*	3023	1498	142	5	1917	6585	5299	296	1220	13400
6	Săvârşin*	2045	3167	2293	0	40	7545	12528	321	410	20804
7	Şiştarovăţ*	1129	3446	793	0	72	5440	6395	12	446	12293
8	Ususău-Dorgoş*	2504	2197	602	0	139	5442	7712	77	312	13543
9	Zăbrani*	6803	1455	221	0	594	9073	1965	184	556	11778
	Total AR	24944	19404	8329	5	2894	55576	77961	1671	4502	134710
	Lipovei Hills	**102468**	**52538**	**19068**	**2188**	**5628**	**181890**	**110695**	**3814**	**12787**	**309186**
	%	33,14	16,99	6,17	0,71	1,82	58,83	35,80	1,23	4,14	100
	%	56,34	28,88	10,48	1,21	3,09	100	-	-	-	-

*OJCPI Timişoara and Arad / date extracted from the statistical report on the situation of the land fund on 31.12.2006.

** OSPA Timişoara/ date extracted from pedology studies performed between 2005 and 2013

RESULTS AND DISCUSSIONS

The geographical area known as the Lipova Plateau is a stretched hill area between Mureş to the north and Bega to the south, connected to the Poiana Ruscăi Mountains through the oldest Mureş drainage convoy and gradually descending to the Vinga Plain to the Valley of Beregsău .

Under morphological considerations, the space taken into account is a succession of slightly inclined steps that slightly descend from an altitude of over 400 m (in the east), the whole region being eroded, the hydrographic basins being increasingly developed to the west .

The soil cover has the same staging arrangement from east to west as relief or climate so that in close correlation with the diversity of relief forms with the variability of climatic and vegetation conditions with the evolution over time under the various anthropic soil soils within (according to **SRTS-2012**) 8 classes and 12 types (tab. 2), with the separation of numerous subtypes and land units that differ distinctly by their properties, productive capacity and measures to maintain and increase fertility.

Table 2

The main types and associations of soils in Lipovei Hills (adaptation after OSPA Timiş ha, % from agricultural area)

Nr crt	**SRTS 2012**	***SRCS 1980***	**FAO/UNESCO 1988**	D. Lipovei	
				Ha	%
1	Regosol	Regosol	Regosol	925	0.51
2	Aluviosol	Protosol aluvial Sol aluvial Coluvisol	Fluvisol	21675	11.92
	Protisoluri			**22600**	**12,43**
3	Faeoziom	Cernoziom argiloiluvial Sol negru clinohidromorf	Phaeozem	267	0.15
	Cernisoluri			**267**	**0,15**
4	Eutricambosol	Solu brun eumezobazice Sol roşu-tera rosa	Eutric Cambisol	32691	17.98
5	Districambosol	Sol brun acid	Distric Cambisol	6130	3,37
	Cambisoluri			**38821**	**21,35**
6	Preluvosol	Sol brun roşcat Sol brun argiloiluvial	Haplic Luvisol Calcic Luvisol	60207	33.10
7	Luvosol	Sol brun roşcat luvic Sol brun luvic Luvisol albic	Luvisol (pp) Podzol Luvisol (pp)	27524	15.13
8	Planosol	Planosol	Planosol	114	0.06
	Luvisoluri			**87845**	**48,29**
9	Vertosol	Vertisol	Vertisol	7026	3.86
10	Pelosol			3166	1.74
	Vertisoluri			**10192**	**5,60**
11	Stagnosol	Sol pseudogleic	Stagnic Luvisol	3461	1.90
12	Gleiosol	Lăcovişti Sol gleic	Gleysol	5643	3.10
	Hidrisoluri			**9104**	**5,00**
13	Antrosol	Faze puternic erodate Sol desfundat Protosol antropic	Anthrosol	8718	4.79
	Antrisoluri			**8718**	**4,79**
14	**Associations**			**4343**	**2.39**
	T O T A L			**181890**	**100**

The peculiarities of the soil cover in the studied area are determined by the natural conditions, local factors and local pedogenetic processes that have manifested and manifested in varying time and space, for which the soil and ground units were characterized according to **The Romanian Soil Taxonomy System (SRTS-2012),** and Methodology for the Development of Pedological Studies, using the 23 benchmarking indicators, indicators that represent more important, more significant, more precise and measurable characters and attributes that can be found usually in pedological mapping works, developed after 1987 by the territorial **OSPA** under the methodological guidance of **ICPA Bucharest.**

Depending on the values of these indicators and the specific behavior, for each of the main categories of use existing at the time of the cartography, bonuses were calculated, on the basis of which the lands were classified in quality classes, from I to V **(Order MADR 278 / 2011),** grouping the scores from 20 to 20 points, the arable area of 102468 ha (representing 56.34% of the agricultural area of 181890 ha) of the investigated area being 40.60% owned by the third quality class (Table 3).

Table 3

Quality classes for category of use – „Arable

Nr.crt	Territorial Administrative Unit	Arable	Class I (81-100 pct.) ha	Class II (61-80 pct.) ha	Class III (41-60 pct.) ha	Class IV (21-40 pct.) ha	Clasa V (0-20pct.) ha	Note weighted average
1	Balinț*	3601	52	755	627	1329	838	36
2	Bara*	2193	0	6	1128	76	838	3
3	Bethausen*	4764	0	502	1325	2553	834	39
4	Bogda*	2005	0	0	268	1191	546	33
5	Brestovăț*	2595	0	0	991	1345	259	31
6	Făget*	4780	0	28	1781	2022	949	34
7	Ghizela**	3199	0	16	1339	1188	509	35
8	Giarmata**	4860	128	914	2853	849	116	50
9	Margina*	1821	0	25	706	796	294	37
10	Maşloc (Fibiş)**	9090	98	1743	4461	2240	548	49
11	Mănăştur*	1830	0	102	45	926	350	33
12	Ohaba Lungă*	2208	0	209	619	845	535	35
13	Pişchia**	6676	157	2977	1800	1389	353	54
14	Recaş*	12121	0	199	4984	3865	1313	42
15	Remetea Mare**	7257	138	2653	3165	946	355	54
16	Secaş**	1752	0	34	408	988	322	32
17	Topolovăţu M*	6772	34	288	2707	1186	457	44
	Total TM	77524	607	14458	29614	24334	8511	
1	Bata*	2204	-	10	1064	780	350	44
2	Birchiş*	2599	-	20	12030	860	489	42
3	Bîrzava*	2232	-	8	1361	575	288	46
4	Conop -Chelmac*	2405	-	25	1061	964	355	43
5	Lipova*	3023	-	77	1264	902	780	53
6	Săvârşin*	2045		15	860	790	380	49
7	Şiştarovăţ*	1129		20	454	330	325	30
8	Ususău/(Dorgoş)/	2504	18	386	1017	782	301	42
9	Zăbrani*	6803	125	790	3677	1686	525	48
	Total AR	24944	125	965	10971	6887	3492	
	Lipovei Hills	**102468**	750	15809	41602	32003	12304	
	%	**100**	0,73	15,43	40,60	31,23	12,01	

Referring to the land use category of 2525 ha and 28,88% of the agricultural area of the investigated area, the situation is slightly different from the arable area in the sense that the share of the areas is 39,06% (20520ha) in the third grade quality (tab.4).

Table 4

Quality classes for category of use ″PASTURE″ (ha)

Nr.crt	Territorial Administrative Unit	Pasture	Class I (81-100 pct.) ha	Class II (61-80 pct.) ha	Class III (41-60 pct.) ha	Class IV (21-40 pct.) ha	Class V (0-20pct.) ha	Note weighted average
1	Balinţ*	1160	48	98	644	264	106	42
2	Bara*	2350	123	483	915	665	164	49
3	Bethausen*	2066	288	461	722	381	214	54
4	Bogda*	1384	33	31	941	285	94	44
5	Brestovăţ*	2754	222	384	933	887	328	46
6	Făget*	3547	241	454	2052	701	99	54
7	Ghizela**	1389	84	123	1102	80	0	53
8	Giarmata**	834	58	422	353	1	0	64
9	Margina*	1844	289	249	938	337	31	56
10	Maşloc (Fibiş)**	1390	70	289	648	383	0	51
11	Mănăştur*	1038	98	178	467	246	49	45
12	Ohaba Lungă*	1948	177	334	884	338	215	50
13	Pişchia**	1293	69	219	664	280	61	50
14	Recaş*	4736	388	1050	2756	310	232	57
15	Remetea Mare**	1221	195	406	385	173	62	59
16	Secaş**	2492	39	800	1318	335	0	55
17	Topolovăţu M*	1688	266	108	556	504	254	59
	Total T M	33134	2688	6089	16278	6170	1909	
1	Bata*	902	20	92	250	375	165	32
2	Birchiş*	1651	91	225	66	615	354	32
3	Bîrzava*	2591	112	416	517	987	559	33
4	Conop - Chelmac*	2497	98	386	496	1005	512	35
5	Lipova*	1498	89	212	414	485	298	37
6	Săvârşin*	3167	164	565	518	1332	588	32
7	Şiştarovăţ*	3446	186	586	543	1502	629	31
8	Ususău/(Dorgoş)	2197	154	379	858	578	228	32
9	Zăbrani*	1455	78	135	280	762	200	37
	Total AR	19404	992	2996	4242	7641	3533	
	Lipovei Hills	**52538**	**3680**	**9085**	**20520**	**13811**	**5442**	
	%	**100**	7,00	17,29	39,06	26,29	10,36	

The operation of classifying agricultural land in quality classes based on the rating notes has 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), reserve humus, soil reaction, degree of compaction or compactness, excess humidity, the analysis of which results in a series of requirements and ameliorative measures and / or mandatory uses, as well as requirements and measures to prevent

degradation and preserve soil fertility - depending on the nature and intensity of restrictions on arable use being grouped as follows:

1. *Land without limitations or restrictions* (with scoring marks between 81-100 points), represented by eutricambosoils (low and moderate gutters) with medium texture, neutral reaction, occupying 0.73% of the area, respectively 750 ha .

On these lands it is only necessary to apply an agrotechnic corresponding to the assortment of cultivated planes, related to the characteristics of the relief, and to strictly observe them.

2. *Areas with limited or small restrictions* (with scoring marks between 61-80 points) due to the soft-sandy texture, weak acid and alkaline reaction, excess periodic humidity, occupying 15.43% of the area, respectively 15809 ha, represented by aluviosols, eutricambosols and preluvosols.

Requires work to prevent and combat excess humidity periodically (pluvially or phreatically) application of semi-fermented organic fertilizers and green fertilizers at short intervals of 1-2 years, finishing with limestone and dolomite, depending on the values of the agrochemical indices.

3. *Areas with limited or moderate restrictions* (with scoring marks between 41-60 points) representing 40.60% and 41602 ha respectively, represented by preluvosoils, luvosoils and vertosoils with moderate and strongly acidic reaction with periodically stagnant water regime of rainfall or impaired erosion from mild to moderate, presenting a risk of rapid acidification of the soil, probability of nutrition depletion with nitrogen and phosphorus in cold spring probability of toxicity with aluminum in most plants.

It requires finishing with limestone and dolomite at doses established on the basis of agrochemical indexes with a 5-7 year recovery interval, semi-fermented organic fertilizers at intervals of 3-4 years, fertilizations with N., P., K., improvement of the regime aero-hydric with adequate pedohydraulic works (ditches, gutters, coastal channels, drainage, drainage, etc.)

4. *Areas with high limitations and restrictions* (with bonuses between 21-40 points) representing 31.23% and 32003 ha respectively and include soils with unfavorable physical, hydrophysical and physico-chemical features such as districambosols, vertosols, pelosols, luvosoluri, planosoluri being mandatory to apply a complex of characteristic improvement measures: drainage, drainage, periodic calcification.

5. *Fields with severe limitations and restrictions*, (with grades of 1-20 points) that include soils of the class of Hidrisols (stagnosols, gliiosol) unfavorable for their use as arable, as well as soils affected by strong and excessive erosion (erodic anodes and , respectively slides, representing 12.01% and 12304 ha respectively of the arable area of the researched area.

CONCLUSIONS

Its geographical location, the territory taken into account, located in the middle of the northern hemisphere, presents a great diversity of ecological conditions, determined by the variability of factors (cosmico-atmospheric and telurico-edafic) that contribute to the achievement of the environment in which plants grow and harvest.

The correct knowledge and expression of land production capacity, its limiting factors, involves a laborious process of thinking, multi-faceted modeling and modeling assumptions (chemical, physical, economic, etc.) to find the most appropriate means of

expressing the notions in their entire complexity, the natural result of the co-habitation between biocenosis and the biotope.

In this context, the appropriation of the soil to contribute to the harvest (the productive potential or its fertility) must be regarded as being made up of two components: an intrinsic part of the soil which is given by its productive potential determined by a number of its properties (the state of supply of nutrients, the salt content, the state of affluence), as well as the way of manifestation of the other environmental factors from the plant, starting with the cosmic-atmospheric ones (light, heat, precipitation, etc.), continuing then with the geomorphological and hydrological ones and a relative and subjective component, related to the favorability for different plant species, of this potential, which depends to a great extent on the different requirements of the species towards the soil-environment component.

The paper provides basic knowledge and methodological elements for the assessment and characterization of natural and man-made resources in the hope that the information presented will raise the interest of the decision maker so that in the near future the agricultural research and practice together with the protection of the environment will strive to develop interdisciplinary studies, not being able to talk about a healthy environment without healthy soil.

Man's means of action can be varied, ranging from simple or cultural works, to pedohydraulics, or by restructuring and re-casting some categories of use, or by introducing into culture new species, actions that are applied in the complex can lead to increasing land production capacity and improving the quality of land.

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