EVOLUTION OF SOME COMPONENTS OF LAND PRODUCTIVITY FROM BANAT PLAIN IN 2011-2012 AGRICULTURAL YEAR

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Abstract: *Research goal is to accumulate scientific data on development of components of agricultural land productivity, necessary to support of an methodology of their quality evaluation through a complex firm approach to physical and geographical conditions from Banat Plain. Research on ecometrical function of the main physical and chemical characteristics of soil have been taken by many scientists, in the country and abroad, since the beginning of last century and the German classification system was designed mainly based on soil texture in the so-called phase of its evolution (D. Teaci, 1980). As part of the soil, clay plays a role in the relations established between certain physical and chemical properties of soil and between them and the activities of organisms that inhabit it.The physical and chemical properties of soil samples (texture, pH, content of humus and NPK etc.), were analyzed in USAMVB-OSPA Timisoara Research Laboratory, after national norms and standards approved by the Standards Association from Romania (ASRO). Knowledge of these features of the soil are of special theoretical and practical importance. Theoretical, it provides to specialist the possibility to interpret the phenomena that occur in soil and to predict soil evolution in particular and the environment in general, in terms of present and future health, and practical because warns the physician as what measures should be taken to bring the soil in optimal conditions for growth and development of plants cultivated or wild. Importance, originality and timeliness of work is the need to protect the edaphic layer and environmental protection by: The accumulation of scientific data necessary to support technologies of consevative tillages and sustainable management of soil and water resources, Implementation of conservative tillages and sustainable management of physical, geographical and edaphic conditions from Banat Plain.*

Key words: *biovariety, cooperation, sustenability, monitoring.*

INTRODUCTION

Being a well-defined condition with a high variability in space and time the atmospheric, relief and edaphic factors, by their major components, are essential in characterizing certain areas of the land surface (Man, 2001).

Of course, knowledge of natural conditions and regional peculiarities of the ecological potential of land for various utilities, and some cultures have a significant economic and social importance for both large farm and small producer (Borza et al., 2001).

In this context, major directions set by the Romanian school of pedology (Dumitru şi colab. 2000, Florea 1979, 1991, 1994,1994, Munteanu şi colab. 1994, 1998, Teaci 1980,1995, Țărău şi colab. 2002) on providing a coherent framework for research with appropriate land requirements of sustainable agriculture and environmental protection will have to resolve in order to connect to the European system, in full accordance and harmony, the following specific functions of land: ecological, economic, technical, social and legal.

The research conducted are on the line of sustainable agricultural system, the main objective being to determine the quantitative and qualitative changes occurring in the agricultural ecosystem, in application to wheat and corn.

MATERIALS AND METHODS

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).

The main objective of research is establishing relations between pedological conditions and productivity of agricultural land in Plain Banat, Bega- Mures interfluve - evolving 3 years (2011-2014) with application to wheat and corn in two locations: Sanandrei and Jimbolia, on the land of OSPA Timisoara.

Soil testing and other laboratory determinations were performed in Office of Pedological and Agrochemical Studies Timisoara, the Soil and Agrochemical Research Institute Bucharest and the University of Agricultural Sciences and Veterinary Medicine of Banat, where used rules and national standards, approved by the Standardization Association in Romania (ASRO).

The biological material used was for wheat the Alex variety and for corn the hybrid PR 39 D 81.

To achieve the objectives, the research were oriented toward the observations and measurements made in the experimental field and in the validation of these observations by laboratory analysis.

Specific experimental technique works were executed in relation to their specialization, means using specific experimental technique.

Among recent material (prepared according to MESP-1987 and SRTS-2003) in Office of Pedological and Agrochemical Studies Timisoara archives and USAMVB Timisoara we can mention: Scientific report on research results on "Testing the action of herbicides in weed control in wheat, sunflower and soya" and on "Testing the effectiveness of foliar complex fertilizers for wheat and corn," Aradul Nou, 2002 (Prodagro West Arad), Authors: N Sânea, D Țărău; Research regarding the effect of some organo – mineral fertilizers (Soil Service of Belgium), authors: D Țărău, D. Dologa, M Florea, 2003; No-till technology influence on the evolution of diseases and pests of wheat and corn, Andru Monica, Ph.D. Thesis, USAMVB Timisoara, 2004; Results of research on the evolution of quality and productivity of agro-ecosystems from Vinga high plains into no-tillage, Ed. EUROBIT Timisoara 2007, Grant CNCSIS; The evolution of soil fertility and agricultural productivity in conservative and conventional tillage, Dicu D, Ph.D. Thesis, USAMVB Timisoara, 2010.

RESULTS AND DISCUSSIONS

By the geographic location, territory considered, presents a variety of environmental conditions, due to the high variability of all factors which contribute to achieving of environment where plants grow and crops yield.

The relief is characterized by great complexity of morphological forms, from meadows and ancient deltas (with numerous relics courses and altitudes of about 86 m), the plains (overlapping large scattering cones placed in a subsidence area altitudes of 80-100 m), and piedmont plains (with alluvial deposits-proluvial or wind), the geological structure and specific developments related to the genesis of time and space of the western part of the country (Coste et al., 1997).

Following his settlement, the natural conditions (relief, lithology, hydrology, vegetation) favored the formation and evolution of the main soil types that reflect the

morphological characteristics and their geo-bio-chemical main landscape features defining and determining the growth and fruition of the main crop.

The area in which research was carried out is part of the Jimbolia -Carpinis-Biled Plain, located between courses Galaţca channel and Beregsău river, and represents the most fertile soils of the considered area. It is formed mostly in loess deposits in relatively thin layers (2 to 3-4m), superimposed on coarse deposits by fluvial origin.

This is the oldest and most complex and is located at south of Mures, west of the Lipova plateau and at north of Bega-Timis subsidence area, at west-Aranca Giucoşin subsidence area.

The geological past of the area is related to that of Banato-Crisana Plain, which actually is part, it represents one of the eastern portions of the great sedimentary basin called the Pannonian Basin. It sank on the alignment of the old north-south faults, more to the west and less towards the Carpathians, from Badenian, with a maximum during the Pannonian, then became slower.

This fragmentation has created areas of least resistance, and balance as faulted blocks, amplified by a series of tectonic events have determined advancements of marine (Thetys) or lake (Pannonian) domains.

The climate is temperate continental with oceanic and sub-mediteranean influence and tend to manifest the phenomenon of aridity. To characterize the climate condition will process and interpret data recorded at weather station Sanandrei and Clari-Vii The yearly average temperature is 10.9 ° C and precipitation of 629.9 mm at Sanandrei and 516.5 mm at Clarii Vii.

To characterize the soil were opened soil profiles of which is periodically harvested a series of samples necessary to determinations, in natural or modified settlement, after the existing standards.

At Jimbolia, the experiences are located on a typical chernozem, weak gleyed, medium clay / medium clay, dominates in the Jimbolia - Bulgăruş plain and representative for a large area of Banat low plain, as part of Mures Plain located at south of the current course of the Mures (Table 1).

Table 1

The physical and chemical properties of the typical chernozem from Jimbolia

Analitical indices	Depth (cm)							
	0-20	-35	-55	-75	-100	-120	-160	-200
Coarse sand (2.0 – 0.2 mm)	0.3	0.2	0.1	0.1	0.1	0.1	0.4	1.1
Fine sand (0.2 – 0.02)	41.3	41.2	45.1	42.7	43.1	44.9	46.3	46.0
Silt (I + II) (0.02-0.002 mm)	25.1	25.1	24.9	24.5	24.0	22.8	23.3	23.7
Coloidal clay (sub 0.002)	33.3	33.5	33.5	32.7	32.8	32.2	30.1	29.2
Phisical clay (praf II +arg col)	45.7	45.6	44.8	43.4	43.6	41.9	39.5	39.0
TEXTURE	TT	TT	TT	TT				
Specific Density (Ds)	2.56	2.56	2.58	2.59				
Aparent density (Da)	1.15	1.42	1.38	1.20				
Total phorosity (PT)	55.10	44.60	46.60	53.70				
Aeration phorosity (Pa)	28.42	11.51	14.38	25.38				
Higroscopical coefficient(CH)	-9.2	1.16	7.6	-6.6				
Fadind coefficient (CO)	7.81	7.85	7.85	7.66				
Field capacity (CC)	11.71	11.78	11.78	11.50				
Total capacity (CT)	23.20	23.30	23.35	23.60				
Utile water capacity (CU)	11.49	11.52	11.57	12.10				
pH in water	7.78	7.99	8.18	8.26	8.54	8.68	8.84	8.84
Carbonates ($CaCO_3$)	9.05	9.69	18.1	23.1	23.3	25.0	20.9	16.2
Humus	4.25	2.57	1.80					

Humus reserve t/ha	97.75	54.74	37.26	**189.75**				
Mobile phosphorous (ppm)	44.5	21.9	8.3					
Mobile potasium (ppm)	191	88	50					

At Sanandrei the experiences are placed on a haplic luvisol, medium clay loamy / medium clay loamy predominates in the Vinga Plain and representative of a significant surface in Banato-Crisana plain (Table 2).

Table 2

The physical and chemical properties of the haplic luvisol from Sanandrei

Analitical indices	Depth (cm)							
	0-17	17-30	30-47	47-65	65-90	90-120	120-150	150-200
Coarse sand (2.0 – 0.2 mm)	0.6	0.7	0.5	0.7	0.7	1.3	1.2	1.1
Fine sand (0.2 – 0.02)	36.9	36.9	34.9	36.0	37.3	34.7	34.2	35.1
Silt (I + II) (0.02-0.002 mm)	27.9	25.2	25.2	25.6	25.0	23.9	21.2	21.7
Coloidal clay (sub 0.002)	34.6	34.5	39.4	37.7	37.0	40.1	43.4	42.1
Phisical clay (praf II +arg col)	46.5	47.5	50.7	49.8	49.5	52.3	51.3	52.0
TEXTURE	TT	TT	TT	TT	TT	TT	TT	TT
Specific Density (Ds)	2.56	2.57	2.59	2.59	2.60			
Aparent density (Da)	1.45	1.64	1.61	1.59	1.66			
Total phorosity (PT)	43.36	36.19	37.84	38.61	36.15			
Aeration phorosity (Pa)	9.47	-2.12	-0.27	1.15	-2.89			
Higroscopical coefficient(CH)	14.38	28.51	26.51	24.52	29.16			
Fadind coefficient (CO)	8.11	8.09	8.23	8.83	8.67			
Field capacity (CC)	12.16	12.13	13.84	13.25	13.00			
Total capacity (CT)	23.37	23.36	23.67	23.56	23.52			
Utile water capacity (CU)	11.21	11.23	9.83	10.31	10.52			
pH in water	5.46	5.87	6.15	6.77	6.95	8.13	8.22	8.16
Carbonates ($CaCO_3$)						5.67	6.09	3.57
Humus	2.28	1.59	1.41	0.42				
Humus reserve t/ha	56.20	33.90	38.59	2.00	**130.69**			
Mobile phosphorous (ppm)	15.0	13.4	12.0	10.9				
Mobile potasium (ppm)	131.8	87.8	74.7	72.9				

Regarding the evolution of soil moisture, the observations (by soil sampling and laboratory determinations) in the two locations revealed a number of issues on how to fulfill the ecological functions of soil in ecosystems, namely those related to major hydro-physical features (determined by morphological, physical, chemical and mineralogical properties) integrated under the concept of ecopedological profile, defined as the soil horizons which provide food and water for biomass production.

Therefore, the actual effect of rainfall on crops is influenced by soil characteristics (texture, porosity, permeability, useful water capacity) and the landscape, features that may facilitate the accumulation, storage and disposal of water from precipitation.

Periodic measurements of soil moisture in the studied area is on line that concerns the field, in both nationally and globally tendencies, in the context of climate change from the last decades.

Based on measurements made, was noticed that the water reserve on range 0-125 cm compared with values of field capacity (CC mm) recorded values below the field capacity (Table 3) with one exception these values are exceeded by 44.00 mm (Table 4).

This is due largely brothers intake, since the experience of Jimbolia is located on a typical phreatic wet chernozem, with the underground water level between 3.1 and 5.0 m (about seasonal fluctuations 1.5 m) and only a little part due rainfall fell at the beginning of the cold period of the agricultural year.

The soil moisture for the range 0-10 cm, compared with values of field capacity (CC), can see that it is below the field capacity, with some exceptions +5.63 mm in 3.5.2012 (table 3) and 6.05 mm and 6.02 mm at the same time, in the 24.10.2011 (table 4).

Table 3

Water reserve from soil at Sanandrei (mm) compared with values of field capacity(CC)

Location		Water reserve (mm)	CC (mm)	Difference (mm)	Water reserve (mm)	CC (mm)	Difference (mm)	Water reserve (mm)	CC (mm)	Difference (mm)
		0-10 cm interval			0-25 cm interval			0-50 cm interval		
Sânandrei (Barley)	24.10.2011	32.18	35.55	-3.37	67.07	91.01	-23.94	129.96	183.26	-53.30
	15.11.2011	19.19	35.55	-16.36	47.74	91.01	-43.27	101.74	183.26	-81.52
	21.12.2011	28.58	35.55	-6.97	60.36	91.01	-30.65	114.51	183.26	-68.75
	13.01.2012	31.89	35.55	-3.66	78.18	91.01	-12.83	144.93	183.26	-38.33
	05.03.2012	41.18	35.55	+5.63	92.71	91.01	+1.70	177.99	183.26	-5.27
	04.05.2012	31.52	35,55	-4.03	85.29	91,01	-5.72	160.70	183,26	-22.56
	06.06.2012	20.58	35.55	-14.97	51.70	91.01	-39.31	115.23	183.26	-68.03
	29.06.2012	9.51	35,55	-26.04	25.94	91,01	-65.07	71.02	183,26	-112.24
	23.07.2012	10.07	35.55	-25.48	30.40	91.01	-60.61	77.80	183.26	-105.46
	21.08.2012	15.69	35,55	-19.86	47.51	91,01	-43.50	103.65	183,26	-79.61
	18.09.2012	14.03	35.55	-21.52	40.87	91.01	-50.14	94.91	183.26	-88.35
Sânandrei (plowing field)	24.10.2011	34.15	35.55	-1.40	68.05	91.01	-22.96	130.87	183.26	-52.39
	15.11.2011	17.85	35.55	-17.70	44.92	91.01	-46.09	88.20	183.26	-95.06
	21.12.2011	32.04	35.55	-3.51	76.97	91.01	-14.04	148.00	183.26	-35.26
	13.01.2012	37.38	35.55	+1.83	88.72	91.01	-22.90	165.75	183.26	-17.51
	26.03.2012	31.61	35.55	-3.94	75.77	91.01	-15.24	-	-	-
disc work	26.03.2012	32.66	35.55	-2.90	78.92	91.01	-12.09	-	-	-
Maize	04.05.2012	33,74	35,55	-1,81	84,73	91,01	-6,28	165,77	183,26	-17,49
	06.06.2012	22,79	35,55	12,76	60.32	91,01	-30,69	138.10	183,26	-45,16
	29.06.2012	17.37	35,55	-18.18	46.46	91,01	-44.55	115.69	183,26	-67.57
	23.07.2012	11.25	35,55	-24.30	28.82	91,01	-62.19	70.75	183,26	-112.51
	21.08.2012	15.48	35,55	-20.07	37.13	91,01	-53.88	91.69	183,26	-91.57
	18.09.2012	13.07	35,55	-22.48	32.84	91,01	-58.17	70.57	183.26	112.69
		0-100 cm interval			0-125 cm interval			50-100 cm interval		
Sânandrei (Barley)	24.10.2011	265.8	365.66	-99.86	337.96	456.86	-118.9	135.84	183.45	-47.61
	15.11.2011	231.98	365.66	-133.68	293.54	456.86	-163.32	130.24	183.45	-53.21
	21.12.2011	227.55	365.66	-138.11	287.27	456.86	-169.59	113.04	183.45	-70.41
	13.01.2012	275.25	365.66	-90.41	410.34	456.86	-46.52	154.35	183.45	-29.1
	05.03.2012	348.31	365.66	-17.35	424.39	456.86	-32.47	170.32	183.45	-13.13
	04.05.2012	322.62	365.66	-43.04	402.90	456.86	-53.96	161.92	183.45	-21.53
	06.06.2012	259.11	365.66	-106.55	342.95	456.86	-113.91	143.88	183.45	-39.57
	29.06.2012	241.34	365.66	-124,32	324.50	456.86	-132.36	170.32	183.45	-13.13
	23.07.2012	177.28	365.66	-188,38	227.92	456.86	-228.94	99.48	183.45	-83.97
	21.08.2012	228.37	365.66	-137,29	292.77	456.86	-164.09	124.72	183.45	-58.73
	18.09.2012	196.11	365.66	-169,55	258.11	456.86	-198.75	101.20	183.45	-82.25
Sânandrei (plowing field)	24.10.2011	215.67	365.66	-149.99	274.31	456.86	-182.55	121.10	182.4	-61.3
	15.11.2011	223.24	365.66	-142.42	289.6	456.86	-167.26	135.04	182.4	-47.36
	21.12.2011	291.56	365.66	-74.1	363	456.86	-93.86	143.56	182.4	-38.84
	13.01.2012	323.98	365.66	-41.68	410.34	456.86	-46.52	158.24	182.4	-24.16
Maize	04.05.2012	328.33	365.66	-37,33	407.17	456.86	-49,69	162.56	182.4	-19,84
	06.06.2012	313.22	365.66	-52,44	396.21	456.86	-60,68	175.12	182.4	-7,28

	29.06.2012	333.01	365.66	-32.65	424.37	456.86	-32.49	217.32	182.4	+34.92
	23.07.2012	159.03	365.66	-206.93	205.15	456.86	-251.71	188.28	182.4	+5.88
	21.08.2012	210.49	365.66	-155.17	285.49	456.86	-171.37	118.80	182.4	-63.60
	18.09.2012	184.29	365.66	-181.37	252.77	456.86	-204.09	113.72	182.4	-68.68

Table 4

Water reserve from soil at Jimbolia (mm) compared with values of field capacity (CC)

Location		Water reserve (mm)	CC (mm)	Difference (mm)	Water reserve (mm)	CC (mm)	Difference (mm)	Water reserve (mm)	CC (mm)	Difference (mm)
		0-10 cm interval			0-25 cm interval			0-50 cm interval		
Jimbolia (Wheat)	24.10.2011	32.72	26.68	+6.02	70.61	76.10	-5.49	130.95	156.49	-25.54
	23.11.2011	20.30	26.68	-6.38	59.90	76.10	-16.20	125.93	156.49	-30.56
	22.12.2011	24.07	26.68	-2.61	69.99	76.10	-6.11	146.68	156.49	-9.81
	12.01.2012	32.73	26.68	+6.05	80.44	76.10	+4.34	160.31	156.49	+3.82
	05.03.2012	26.09	26.68	-0.60	73.42	76.10	-2.68	165.36	156.49	+8.87
	26.03.2012	19.90	26.68	-6.78	56.20	76.10	-19.90	-	-	-
	04.05.2012	26.75	26,68	+0.07	72.48	76,10	-3.62	142.10	156,49	-14.39
	08.06.2012	17.76	26,68	-8.92	48.28	76,10	-27.82	102.79	156,49	-53.70
	16.07.2012	11.79	26.68	-14.89	31.75	76.10	-44.35	75.36	156,49	-81,13
	21.08.2012	16.79	26.68	-9.89	47.59	76.10	-28.51	58.03	156,49	-98,46
	18.09.2012	11.51	26,68	-15.17	33.79	76,10	-42.31	73.50	156,49	-82,99
Jimbolia Maize	04.05.2012	23.39	26.68	-3.29	68.61	76.10	-7.49	142.10	156.49	-14.39
	08.06.2012	20.10	26.68	-6.58	57.14	76.10	-18.96	134.59	156.49	-21.90
	16.07.2012	11.94	26.68	-14.74	27.87	76.10	-48.23	77.00	156.49	-79.49
	21.08.2012	11.29	26.68	-15.39	26.14	76.10	-49.96	66.06	156.49	-90.43
	18.09.2012	11.32	26.68	-15.36	29.55	76.10	-46.55	60.95	156.49	-95.54
		0-100 cm interval			0-125 cm interval			50-100 cm interval		
Jimbolia (Wheat)	24.10.2011	264.71	310.84	-46.13	346.61	398.22	-51.61	133.76	154.36	-20.6
	23.11.2011	252.19	310.84	-58.65	334.28	398.22	-63.94	126.26	154.36	-28.1
	22.12.2011	302.55	310.84	-8.29	394.73	398.22	-3.49	155.87	154.36	+1.51
	12.01.2012	302.17	310.84	-8.67	386.28	398.22	-11.94	150.29	154.36	-4.07
	05.03.2012	344.16	310.84	+33.32	442.22	398.22	+ 44.00	178.8	154.36	+24.44
	04.05.2012	274.17	310.84	-36.67	342.61	398.22	-55.61	132.07	154.36	-22.29
	08.06.2012	229.01	310.84	-81.83	307.05	398.22	-91.17	126.22	154.36	-28.14
	16.07.2012	162.77	310.84	-148.07	227.91	398.22	-170.31	87.41	154.36	-66.95
	21.08.2012	208.27	310.84	-102.57	278.55	398.22	-119.67	102.65	154.36	-51.71
	18.09.2012	178.63	310.84	-132.21	245.83	398.22	-152.39	105.13	154.36	-49.23
Maize	04.05.2012	280.11	310.85	-30.74	351.96	398.23	-46.27	138.01	154.36	-16.35
	08.06.2012	292.42	310.85	-18.43	384.86	398.23	-13.37	157.83	154.36	+3.47
	16.07.2012	170.09	310.85	-140.76	223.27	398.23	-174.96	93.09	154.36	-61.27
	21.08.2012	139.73	310.85	-171.12	181.17	398.23	-217.06	73.67	154.36	-80.69
	18.09.2012	142.56	310.85	-168.29	191.09	398.23	-207.14	72.75	154.36	-81.61

CONCLUSIONS

Knowledge in terms of quantity and quality of the land, within a geographic area with different agricultural use, especially the development of components of their productivity, lies at the core of human existence.

In land resources domain, the natural phenomena and the entire complex of socio-economic activities are in a continues changing: the properties are always changing, the land characteristics keeps changing, so it need for ongoing maintenance and technical reambulating and accurate records in CF.

Long-awaited accession, especially integration, at the European Community requests from institutions, organizations or businesses and from each Romanian citizen efforts to reform, harmonization and compatibility of economic and social activities in the generally accepted by an open society to the free movement of ideas, values and goods.

The research have the main objective to establishing relations between ecopedological conditions, financing and productivity of agricultural land in Banat Plain, Mures-Bega interfluve, in application to wheat and corn in two locations: Sanandrei and Jimbolia, on OSPA Timisoara land and in representative systems of the agricultural area of Banat, namely: SCDA – Lovrin, SC COMAGRA SRL Beregsăul Mare, SC TEHNOLAND SRL Jimbolia.

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