DYNAMICS OF SOME COMPONENTS FROM AGRO-SYSTEM IN CONSERVATION AND CONVENTIONAL TILLAGE OF SOIL

DINAMICA UNOR COMPONENTE ALE AGROECOSISTEMELOR ÎN SISTEM DE LUCRARE CONSERVATIVĂ ŞI CONVENȚIONALĂ

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Abstract: *The researches are inscribed on line of substantiation of durable agricultural system, having main objective the prominence of quantitative and qualitative modifications made on agro-system level under the effect of no-tillage system for wheat, maize and soybeans. The research upon the ecological conditions was made according to the Methodology of Elaborating Pedology Studies (vol. I, II, III) elaborated by ICPA Bucharest in 1987, completed with specific elements from the Romanian System of Soil Taxonomy (SRTS – 2003).*

Rezumat*: Cercetările efectuate se înscriu pe linia fundamentării unor sistem de agricultură durabilă propunându-şi ca obiectiv principal evidențierea modificărilor de ordin cantitativ şi calitativ care se produc la nivelul ecosistemului agricol sub efectul sistemului de cultură No-Till în aplicație la grâu, porumb şi soia. Cercetarea condițiilor ecopedologice a fost făcută în conformitate cu „Metodologia Elaborării Studiilor Pedologice „ (vol I, II, III) elaborată de ICPA Bucureşti în 1987, completată cu elemente specifice din Sistemul Român de Taxonomie a Solurilor (SRTS – 2003).*

Keywords: *plant culture, system, influence, component, agroecosystem*
Cuvinte cheie: *cultură, sistem, influență, componentă, agroecosistem*

INTRODUCTION

Appeared in the Mesolithic Era as a way of producing the needs for everyday life by cultivating plants and husbandry, agriculture became at the same time with the evolution of humans and society a branch of the material production, which involves all the works and methods used for obtaining alimentary products and some prime matters by using the soil in this purpose. The culture technology no-till belongs to the agricultural systems that have to role to conserve the soil, being known in the modern agriculture from the 1950s when on the American continent were settled up the technologies with minimum works in order to find some practical methods for reducing and stopping the soil erosion, a phenomenon that was more and more aggressive on the fields cultivated as an conventional system.

MATERIAL AND METHOD

The experimental field is placed on a cambic chernozem, with a medium content of clay, dominant in the Prodagro West Arad agro-centre and representative for a large surface in the Banat-Crisana Plain. The experiment has three factors, being of the type 2x2x3, with subdivided parcels into 4 repetitions (144 parcels). The surface of one plot is of 27 sm (3x9), the total surface of the experiment being of 3888 sm.

The experimental factors are: Factor A – the technological system (A1 – without deep soil working, A2 – with deep soil working), Factor B- the culture system (B1- classic culture system, B2- No-till culture system), Factor C- fertilizers doses (C1- N_0 P_0 K_0, C2- N_{80} P_{80} K_{80}, C3- N_{160} P_{80} K_{80}).

RESULTS AND DISCUSSIONS

The area where the experiment was placed is in the North-Western part of the High Plain of Vinga, above the 3rd terrace of Mures River, on the alignment New Tisa, Felnac, Secusigiu, at 100 -120 m height and it has an aspect of tabular plain with cvasi-horizontal surfaces on which there are many small micro depressions and valleys.

Hydrographically, the perimeter where the experiment is placed belongs to the hydrographic basin of Mures river which flows at about 2-3 km north from this. The pedo-phreatic levels are at 5,1 – 10 m depth (they don't interfere in the pedo-genesis processes) in flat areas and between 1,5 – 3,0 m depth in the valleys.

The climate is a temperate-continental one with Mediterranean influences, the medium multi-annual temperature being of 10,4 C and the medium multi-annual rainfall 593,5 mm.

The analyzed soil has an acid reaction (5,9 – 6,8) in the first 80 cm of the soil profile, neutral between 80- 125 cm and low alkaline between 125 – 200 cm depth. The mobile phosphorus content (P) in the worked soil (Ap) has medium values (35,0 ppm) at the limit of alert threshold (concerning the nutrition lack) the mobile potassium supply (K) having medium values (153 ppm), values which are lower on with the profile. The humus reserve in the first 50 cm is high, and the natrium index (I.N.) has medium values in the worked layer (Ap) and also in the 0 – 45 cm layer. Soil's texture, a very stable physical feature, is medium clay on the whole profile. The Apparent Density (DA) has medium values in the worked layer from the classic system, high in the first 10 cm in no-till system and very high in the middling third of the soil profile in the two systems. The Total Porosity (PT) has low values in the 0 – 33 cm interval, and also in the 45 – 96 cm one. The aeration porosity, which represents all the pores occupied with air when the soil is in optimum humidity conditions, has very low values, excepting the worked layer from the classic system, where it has low values and the first 10 cm depth in No-till system where the values are very low.

The technical setting of the three cultures is:

Wheat: Monsum variety, having maize as pre-plant, was seeded on 17.10.2007, being used 200 kg/ha seeds. In 15 March there was used Buctril Universal 1 l/ha herbicide, 350 l of water/ha, and in 16 May there was made a foliar treatment using Calypso 480 SC insecticide. It was harvested on 28 June 2008.

Maize: PR W05 hybrid, having soybeans as pre-plant, was seeded on 20.04.2008, being used 20 kg/ha seeds. Before seeding, on 31.03.2008 there was used Roundup 2 l/ha as herbicide, and on 02.05.2008 Esteron herbicide, 1 l/ha. It was harvested on 27.09.2008.

Soybeans: Balcan variety was seeded on 22.04.2008, using 100 kg/ha seeds treated with Nitragin. Before seeding, on 31.03.2008 the plot was treated with Roundup herbicide 2 l/ha, and on 02.05.2008 with Pantera herbicide1 l/ha. On 21.05.2008 there was made a foliar treatment using Kelthane 18,5 EC. It was harvested on 11.10.2008.

After establishing the cultures, among the specific maintaining works there were made a series of observations in order to identify and stock take the main damaging species from the vegetal or pathogen flora and fauna, which frequently populate the wheat, maize and soybeans agro-ecosystems. The field cultivated as No-Till system is exposed to a higher degree of weeding compared to the classic one. The plants that developed in the wheat, maize and soybeans cultures had an easy progress, especially those which multiplicate vegetative or by seeds (*Cyrsium arvense* L., *Convolvulus arvensis* L., *Sonchus arvensis* L., *Cynodon dactylon* L., *Sorghum halepense* L., *Rubus caesius* L.) or with small seeds and surface germination (*Stellaria media* L., *Capsella bursa pastoris* L., *Lamium purpureum* L.) and infesting those that develop widely in the stubble (*Setaria* sp., *Polygonum convolvulus* L., *Matricaria inodora* L., *Rubus caesius* L).

Considering the evolution of soil humidity, the observations made monthly (by taking soil samples and laboratory determinations) for the three cultures showed that in the no-till system, there are more uniform values in the soil profile, and in the variants where the deep work of soil was made it could be observed a low increase of the water volume in the soil.

About the productions obtained from the three cultures, there can be remarked the followings:

For wheat, the production was between 3475-4579 kg/ha, the highest production of 4579 kg/ha, being registered in the no-till system with no deep work of soil, in N_{160} P_{80} K_{80} dose and the lowest of 3475 kg/ha in the classic system with the deep work of soil, in N_0 P_0 K_0 dose .

Table 1

Influence of the no-till crop system on to the wheat crop on the cambium chernozem medium clayey earth/ medium clayey earth from Aradul Nou.

	Culture system	Fertilization	Production	%	Differences Kg/ha	Signification
Without deep soil working	Classic	N_0 P_0 K_0	4230	100	-	
		N_{80} P_{80} K_{80}	4471	106	241	
		N_{160} P_{80} K_{80}	4535	107	305	*
	No-till	N_0 P_0 K_0	4100	97	-130	
		N_{80} P_{80} K_{80}	4374	103	144	
		N_{160} P_{80} K_{80}	4579	108	349	*
With deep soil working	Classic	N_0 P_0 K_0	3475	82	-755	000
		N_{80} P_{80} K_{80}	3761	89	-469	00
		N_{160} P_{80} K_{80}	3890	92	-340	
	No-till	N_0 P_0 K_0	3522	83	-708	000
		N_{80} P_{80} K_{80}	3912	92	-318	0
		N_{160} P_{80} K_{80}	4025	95	-205	

DL 5% 272.21
1% 370.00
0,1% 495.54

For maize the obtained production had values of 3415-5749kg/ha, the highest production of 5749 kg/ha , being registered in no-till system without deep work of soil, in N_{160} P_{80} K_{80}, and the lowest of 3415 kg/ha in classic system with deep work of soil, in N_0 P_0 K_0.

Table 2

Influence of the no-till crop system on to the maize crop on the cambium chernozem medium clayey earth/ medium clayey earth from Aradul Nou

	Culture system	Fertilization	Production	%	Differences Kg/ha	Signification
Without deep soil working	Classic	N_0 P_0 K_0	5402	100	-	
		N_{80} P_{80} K_{80}	5353	99	-49	
		N_{160} P_{80} K_{80}	5749	106	347	*
	No-till	N_0 P_0 K_0	5193	96	-209	
		N_{80} P_{80} K_{80}	5405	100	+3	
		N_{160} P_{80} K_{80}	5601	104	199	
With deep soil working	Classic	N_0 P_0 K_0	4574	85	-828	000
		N_{80} P_{80} K_{80}	4935	91	-467	00
		N_{160} P_{80} K_{80}	5204	96	-198	
	No-till	N_0 P_0 K_0	3415	63	-1987	000
		N_{80} P_{80} K_{80}	4250	79	-1152	000
		N_{160} P_{80} K_{80}	4338	80	-1064	000

DL 5% 275.17
1% 374.02
0,1% 500.92

For soybeans the production was 918-1988 kg/ha, the highest production of 1988 kg/ha , being registered in the classic system without deep working of soil, in N_{160} P_{80} K_{80}, and the lowest of 880 kg/ha in the no-till system with the deep work of soil, in N_0 P_0 K_0.

Table 3

Influence of the no-till crop system on to the soy crop on the cambium chernozem medium clayey earth/ medium clayey earth from Aradul Nou.

	Culture system	Fertilization	Production	%	Differences Kg/ha	Signification
Without deep soil working	Classic	N_0 P_0 K_0	1258	100	-	
		N_{40} P_{80} K_{80}	1923	153	665	***
		N_{80} P_{80} K_{80}	1987	158	730	***
	No-till	N_0 P_0 K_0	1243	99	-15	
		N_{40} P_{80} K_{80}	1878	149	620	***
		N_{80} P_{80} K_{80}	1910	152	652	***
With deep soil working	Classic	N_0 P_0 K_0	1043	83	-215	000
		N_{40} P_{80} K_{80}	1123	89	-135	000
		N_{80} P_{80} K_{80}	1138	90	-120	000
	No-till	N_0 P_0 K_0	918	73	-340	000
		N_{40} P_{80} K_{80}	955	76	303	000
		N_{80} P_{80} K_{80}	963	77	-295	000

DL 5% 46.48
1% 63.17
0,1% 84.61

CONCLUSIONS

Even if the productions obtained in the classic system are superior than those obtained in the no-till system, considering the economical costs for establishing a culture in the no-till system are lower, the same as the pressure made upon the soil (by reducing the number of passes with the agricultural machines and installations), than the classic system.

The obtained production results can not give a recommendation for one of the two experimented culture systems, but they are valuable data (concerning the evaluation of the natural and manmade resources) by the studies made in the field and laboratory, for the fundament in the future of some adequate technologies for the climatic and soils conditions of the area where the research was made and also for other similar areas.

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