RESEARCH INTO THE INFLUENCE OF SOME MINIMUM TILLAGE VARIANTS COMPARED WITH THE CLASSICAL SYSTEM WORKS ON PHYSICAL SOIL PROPRIETIES AND MAIZE PRODUCTION IN THE D.S.TIMISOARA

Piloca Lorin Gabriel*. Manea Dan Nicolae. Ienciu Anişoara Aurelia

**Universitatea de Ştiinţe Agricole şi Medicină Veterinară a Banatului Timişoara*
Facultatea de Agricultură Timişoara. Calea Aradului 119
lorinpiloca@yahoo.com

Abstract

This paperwork presents the influence of working method in maize crop upon physical features and on the obtained yield.
We used two tillage systems: the classical system and the unconventional one (conservative).
Experiments were performed under the pedoclimatic conditions specific to the Banat`s Field at the Banat`s University of Agricultural Sciences and Veterinary Medicine Timişoara – the Didactic Station. during 2009 year.
Taking into account the necessity to eliminate the conventional system`s disadvantages. the elaboration of some alternative soil working technologies to assure the preservation and maintenance of its productive capacity. and also the decrease of energy intake. represents now a necessity in order to develop and strenghten a durable agriculture.

Key words: minimal tillage. physical features. yields.

INTRODUCTION

The elaboration of some alternative soil working technologies to assure the preservation and maintenance of its productive capacity. and also the decrease of energy intake per processed unit. represents now a necessity in order to develop a durable agriculture.

The classical system of processing the soil (tillage with an earth board plough) has. besides its extraordinary contributions to social progress. seriously prejudiced the environment and its vital resource – soil – leading to a steady diminution of its fertility.

The disadvantages attributed to the classical soil work system. an intensive system that includes compulsory earth board plough tillage. resulted in the appearance and rapid spread of the concept of soil conservation.

The concept of soil conservation comprises a set of activities. measures. and technologies that compete in maintaining soil's fertility without sensibly diminishing yields and with important production cost cuts.

The new technologies of mechanising soil works in the conservative system comprise several processing methods: minimum tillage. mulch tillage. ridge tillage. and no-tillage or direct drill.

MATERIAL AND METHOD

Data included in this paper are based on the experimental and production results obtained in 2009 year at the Didactic Station from Banat`s University of Agricultural Sciences and Veterinary Medicine (Timiş county).

Researches were performed on a plot located in Body I (Fig. 2.1). consisted of an area of 268 ha limited in the North by the brook Beregsău. in the South by the inner land from Timişoara. and in the East and West by the national roads DN 69 Timişoara – Arad. respectively Timişoara – Sânnicolau Mare.

The climate is specific to the Banat's Plain. more open to western winds and to the influence of the Mediterranean and Atlantic currents. which makes it moister.

Experimental plots were set on a strongly gleyied vertic chernozem. salinized and alkalised in depth (under 100 cm). extremely profound demi-carbonated on double-layer parental materials. medium fine. medium clayey argyle/medium clayey argyle.

The soil profile has the following succession: Ap -Ap -Amk -A/Cyk -CykGo - CCaGo - CcaGo–CcaGo–CcaGr

Climatic condition in 2009 were characterized by annual average temperatures between 11°C and 12.7°C. and while rainfall ranged between 395 mm and 592.5 mm.

In the experimental setting we tested the following variants:

Classical system:

V_1 – Control – Digger ploughing + disk harrowing;

Unconventional system:

V_2 – heavy disk harrowing – 2 passes;

V_3 – combined rotating harrowing – 2 passings;

V_4 – heavy disk harrowing + combined rotating harrowing;

V_5 – chisel work + combined rotating harrowing;

V_6 – cultivator work + combined rotating harrowing;

RESULTS OBTAINED

Physical. physical and mechanical. and hydro-physical features of the soil determine the limits of the physical and edaphic environment within which physical and chemical plant maintenance and nutrition occur. i.e. the porous and poly-phase environment in which both the three phases (solid. liquid. and gaseous) and the intermediary phases resulted from biological and physical and chemical activities intertwine.

Cultivation technologies influence the main physical features (apparent density Da. total porosity PT. setting degree GT) as well as yields.

Table 1

Influence of tillage system on apparent density (Da. g/cm^3)

Depth (cm)	Tillage system					
	Classical	Unconventional				
	V_1	V_2	V_3	V_4	V_5	V_6
0-10	1.18	1.21	1.31	1.30	1.27	1.30
10-20	1.32	1.33	1.36	1.37	1.39	1.35
20-40	1.44	1.37	1.41	1.46	1.44	1.41
40-60	1.42	1.44	1.45	1.47	1.43	1.46

Table 2

Influence of tillage system on total porosity (PT.%)

Depth (cm)	Tillage system					
	Classical	Unconventional				
	V_1	V_2	V_3	V_4	V_5	V_6
0-10	53	54	49	49	51	49
10-20	48	48	47	46	45	48
20-40	44	46	45	44	44	47
40-60	44	44	44	43	44	51

Table 3

Influence of tillage system upon setting degree (GT.%)

Depth (cm)	Tillage system					
	Classical	Unconventional				
	V_1	V_2	V_3	V_4	V_5	V_6
0-10	-0.58	-3.86	3.97	3.97	0.05	3.97
10-20	5.93	5.93	7.89	9.85	11.34	5.93
20-40	12.55	9.68	11.59	13.52	13.59	7.66
40-60	12.55	12.55	14.70	16.25	13.55	-3.86

The unconventional system aims at making agricultural production process efficient. at preserving and increasing soil fertility.

Getting even yields or yields diminished with 5-10% compared to the classical system is considered more profitable. due firstly to the diminution of expenses on tillage. which has the greatest share in the classical system.

The soil working system and climate conditions have influenced yields in maize (Table 4).

Table 4

Influence of tillage system on maize production

No.	Specificatie	Tillage system					
		Classical	Unconventional				
		V_1	V_2	V_3	V_4	V_5	V_6
1	Standard grain production (kg/ha)	8700 (Mt)	8870	8190	8350	8450	8400
2	Relative production (%)	100.00	101.95	94.13	95.97	97.12	96.55
3	Difference in production (kg/ha)	100.00	+170	-510	-350	-232	-300
4	Significance of differences	-	-	-	-	-	-

LSD 5% = 506.37 kg/ha; LSD 1% = 682.61 kg/ha; LSD 0.1% = 906.01 kg/ha.

CONCLUSIONS

1. Working the superficial layer (0-12 cm) with a heavy disk harrow and with a rotating harrow leads to values of apparent density almost equal to those in the classical system. Measurements confirm that minimal soil work and no-tillage result in a more set soil that did not influence negatively crop development.

2. Total porosity in all variants is within optimal values for the type of soil in the experimental field. significant differences being recorded only in the superficial layer (0-10 cm).

3. Values in setting degree confirm moderate setting of the soil correlated with physical features of the soil without becoming a limiting factor of the development in the case of plant root system.

4. Grain maize yield has values between 8.190-8.450 kg/ha in minimal work variants. and 8.400 kg/ha in no tillage. Compared to the classical system (8.700 kg/ha in the control), yields are lower (94.13-97.12%) in the variants with minimal work. and 96.55% in no tillage variants.

REFERENCES

1. Canarache A.. 1990. Fizica solurilor agricole. Ed. Ceres. Bucureşti;
2. Canarache A.. 1997 – Însuşirile fizice ale solurilor agricole din Banat. Lucrări ştiinţifice ale SNRSS. Timişoara;
3. Ciulca S.. 2003. Tehnică experimentală. Ed.Agroprint. Timişoara;
4. Guş P.. 1983. Agrotehnică şi tehnică experimnetală. Tipo Agronomia Cluj-Napoca;
5. Guş P.. 1997. Influenţa lucrărilor solului asupra producţiei şi a unor însuşiri ale solului. În "Alternative de lucrare a solului" . Cluj-Napoca. vol. 2. pag 151-155;
6. Guş P.. Rusu T.. 1999. Cercetări privind impactul sistemului de lucrare a solului asupra porozităţii şi structurii solului. În simpozionul "Sisteme de lucrări minime ale solului". USAMV Cluj – Napoca. pag. 143-149;
7. Ionescu Siseşti Gh.. Ir. Staicu. 1958. Agrotehnica. vol.I şi II. Ed. Agrosilvică de Stat . Bucureşti;
8. Jităreanu G.. 1997. Influenţa sistemului de lucrare asupra unor proprietăţi fizice ale solului. În Simpozionul"Lucrările solului– prezent şi viitor". Cluj-Napoca. vol.II.;
9. Lăzureanu A.. 1994. Agrotehnica. Ed. Helicon Banat. Timişoara
10. Lăzureanu A.. Manea D.. Cârciu Gh.. 1997. Influenţa lucrărilor solului şi fertilizării chimice asupra producţiei de porumb boabe cultivat la la Staţiunea Didactică Timişoara. În "Alternative de lucrare a solului". pag.23-30. vol. I. 9-10 oct..Cluj-Napoca.
11. Manea D.. 2006 – Agrotehnică şi herbologie. Ed. Eurobit. Timişoara;
12. Şarpe N.. Segărceanu O.. Mate S.. Vlăduţiu I.. 1966. Noua tehnologie a culturii porumbului cu minimum de lucrări şi erbicide. Revista Gospodării Agricole de Stat. Bucureşti. nr. 3. p.10-14.
13. Şarpe N. 1980. Rezultate şi perspective privind cultivarea porumbului fără arătură în condiţiile solurilor cernoziomice din România. Pr. Agrofit. Teor. Aplic.. 2pag.. 119-131.
14. Şarpe N. 1992. Cultivarea porumbului fără arătură după metoda "minimum şi no-tillage" pe cernoziomul de la Fundulea în condiţiile unei monoculturi de 25 ani. Al VII-lea Simpozion Naţional de Herbologie. Călimăneşti – Vîlcea. pag. 21-31.