A COMPARATIVE STUDY REGARDING THE TECHNOLOGIES OF SOIL TILLAGE FROM MAIZE CROP UNDER THE WESTERN ROMANIAN'S CONDITIONS

D. POPA, R. ILEA, S. BUNGESCU, Alexandra BECHERESCU
Banat´s University of Agricultural Science and Veterinary Medicine „King Michael I of Romania" from Timisoara
popadaniel67@yahoo.com

Abstract. *Present economic constraints lead to finding new solutions of tillage. This is not about changing soil tillage practices for the simple satisfaction of doing things differently than others, but rather to improve the practices of tillage and sowing to reduce the costs involved and the time needed for that. One way to achieve this goal is to reduce the number of passes on the ground, which may lead to an infiltration increase and also eliminate the need for primary works of the soil. Traffic control can reduce the cost of fuel for the establishment of cereal crops by 40%, allowing these operations to be completed with less powerful tractors while maintaining the yields at the same level. The current trend, particular to an agriculture with low environmental impact and costs of production, is to adopt cultivation techniques that preserve or improve soil characteristics in a conservative tillage. This paper aims to present research conducted over several years on land DS Timisoara regarding the influence the tillage technology has, particularly agricultural machine tractor unit used on some of the soil's physical properties such as bulk density, porosity and the degree of compaction, with production tracking obtained from maize grains and fuel consumption resulted for each variant. At the same time there were tested 3 types of technologies: conventional technology (with mouldboards ploughing and using disk harrow to prepare the seedbed), the minimum tillage technology (soil processing with a disk harrow used in combination with rotary harrow or vibro-cultivator) and direct sowing (unprocessed field sowing), using for this purpose for processing specific soil aggregates. The final results highlights the significant production differences which have to be correlated with both production costs and the long-term effects on the soil's regenerative capacity.*

Key words: *soil, tillage, yield, fuel consumption*

INTRODUCTION

The large number of works applied in conventional technologies comes along with a high energy usage , in terms of raw materials and energy crisis faced by the entire world, aggravates the increasingly difficult agriculture. Recently, UN estimated that our oil reserves will last us for about 30 years, natural gas and coal from 80-100 years to 200 years. Power expenses in mechanization refer to both power consumed in producing and repairing agricultural machines, and power necessary to exploit them.

Power consumption in exploiting the equipment is two times higher than the power necessary for their manufacturing. Research data show that if we want to increase agricultural production by 1% we need to increase power consumption under the form of fuel by 2.5%.

The minimal work method is a concept that has gained popularity in a shorter period of time than the time that was needed to adopt maize hybrids 50 years ago. Direct sowing is one of the most important methods of saving power and of preserving the soil's production capacity. Due to the small ratio between production costs and sale price of agricultural products, more and more farmers have started using different minimum tillage and no-tillage methods as means of diminishing work force, agricultural machines usage and fuel expenses while also cultivating more.

MATERIAL AND METHODS

At the Didactic Station Timisoara, the researches have been taken to a plot installed in Body I, adjacent at North by the stream Beregsau, at South by the territory belonging to the city Timisoara, and at East and West by the national highways DN 69 Timisoara – Arad, respectively DN 6 Timisoara – Sannicolau Mare.

The researcher's aim regarding energetic intake and soil physical features, in the case of the minimum and no tillage systems compared to classical systems, in maize crop, may be synthesized as follows: the highlight of some methods of determination for the no tillage influence upon some soil physical features under the Western Romanian's conditions and the establishment of a system of indicators for energetic intake assessment and of some determination methods for the energy exchanges within the aggregate tractor – direct seeding machine;

The experimental device for studies upon the no-tillage influence upon soil physical features, identical in the two researched areas, was organized as a stationary experience with the following variants:

V_1 (control): tillage with the plough with a mouldboard + disk harrow

V_2: disk harrow + combined rotating harrow

V_3: disk harrow + vibro-cultivator

V_4: no tillage

Within this experimental device we have supervised the influence exerted by the researched tillage system on maize yield and fuel intake.

RESULTS AND DISCUSSION

The production results obtained by applying the four variants of tillage are summarized in Table 1, it is observed that from version control tillage (tillage with mouldboard the plow with a disk harrow +) resulted in the highest yield of maize, the lowest production was achieved in the variant in which direct sowing was applied.

Table 1

Influence of tillage system on maize yield

Nr.crt.	Specification	Tillage system			
		V_1	V_2	V_3	V_4
		plough + disk harrow	disk harrow + combined rotating harrow	disk harrow+ vibro-cultivator	no tillage
1	Standard grain production (kg/ha)	4700	4270	4380	4120
2	Relative production (%)	100,00	90,85	93,19	87,66
3	Difference in production (kg/ha)	-	- 430	- 320	- 580
4	Significance of differences	Mt	-	-	0

DL 5% = 551 Kg/ha DL 1% = 834 Kg/ha DL 0,1% = 1341 Kg/ha

Preliminary conclusions show that the usage of direct sowing tillage leads to significant negative differences compared to the results achieved in version control (tillage with plough + disk harrow) .Production numbers obtained in the other two types of tested

tillage methods V2 (harrow + combined rotating disk harrow) and V3 (disk harrow + vibro-cultivator) have no relevance in relation with V1.

The analysis of the impact of fuel consumption on maize crop (Table 2) shows differences between the trial variants we used.

Table 2

Impact of soil work system on fuel consumption in maize crops (l/ha)

Fuel consumption per technological operation (l/ha)		Soil work variant			
		V1 Plough + Disk harrow	V4 Disk harrow + Combined rotating harrow	V5 Disk harrow + Vibrocultor	V6 No tillage
Basic work		31,25	37,50	41.50	
Preparing the germination bed + Applying herbicides		24,50			
Sowing + Fertilizing		8,15	8,15	8,15	45.80
Maintaining the crop (fertilizing and applying herbicides)		14,75	14,75	14,75	
Harvesting		21,75	21,75	21,75	21,75
Other consumptions		10,00	10,00	10,00	10,00
TOTAL	l/ha	110,4	92,15	96,15	77,55
	%	100 (Mt)	83,47	87,09	70,24

The Table 2 shows the share of fuel consumption per agricultural work in the trial variants. The highest fuel consumption was observed in the classical soil work system variant – plough + disk harrow, in which were used 110,4 l/ha (Table 2), no tillage technology needing a consumption of 77,55 l/ha, representing 70,14 % compared to the control variant.

CONCLUSIONS

1. Production analysis show that the control variants, to which the conventional technology weas applied (tillage using mouldboard plough) , followed by disking led to the highest yield of maize obtained (4700 kg / ha).With the minimal tillage variants V2 and V3 were obtained close production numbers, (4270 kg / ha and 4380 kg / ha), while the lowest production (4120 kg / ha) was obtained in the direct sowing case.

2. The total fuel consumption for each tested variant shows that in version control it is the highest (110.4 l / ha) and for direct sowing it is the lowest 77.55 l / ha, while in the other two cases in which the minimal works have been experimented, have showed close intermediate total fuel consumptions of 92.15 l / ha and 96.15 l / ha.

3. The final conclusion is that tillage after direct sowing technology may be a variant that can be used in production, with the immediate advantage of consumption spending cuts while also maintaining values in maize production close to those obtained in situation using conventional technology or minimal work technology.

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