STUDIES CONCERNING THE MECHANIZATION TECHNOLOGY OF MINIMAL TILLAGE IN MAIZE CULTURE

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Abstract: *Maize (Zea mays) is one of the most important crop plants, with multiple uses in human nutrition, animal feed and in the industry. High corn yields can be obtained by the use of high yield hybrids by using optimal technologies of cultivation of maize and of modern technology of mechanized works. Development of sustainable agriculture in Romania through the promotion of conservation technologies and, in particular, those with minimal tillage and sowing should be directly with the necessity for achieving yields of high quality, low cost and respecting the requirements relating to the preservation of soil fertility. In view of the current requirements for the development of a sustainable eco-agriculture, these technologies will require more and more in Europe, including in our country. The sowing of cereals is a particularly important work to be carried out at a time and with minimum expenses. This paper shows the optimal technology of minimal tillage mechanization in the growing of maize. The experience was located on land of Orţişoara, Timiş country. 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. The paper is based on the experience gained in the area of mechanization by the agriculture of our country and other countries. In result of studies carried out are presented the findings concerning the consumption of fuel, and indices of the mechanized works in maize culture. In the context of an increase in demand for food worldwide, is becoming increasingly important use of technology to ensure that increases production on the same land area, while preserving biodiversity and preserving the environment.*

Key words**:** *Tractors, fuel, minimal tillage, agricultural machines, economic indexes*

INTRODUCTION

For a long time, agriculture and soil works were considered synonymous. Soil works were an integral part of agriculture since the beginning and have served several important purposes: seedbed preparation, soil compaction reduction to increase aeration and better development of the root system of the plants, reducing the weeding, fertilizer incorporation and amendments, management of plant debris.

Perhaps the most profound negative effect of tillage in the world, is the soil degradation due to wind and water action. By incorporating plant debris and soil allowing discovered wind and water can move easily from soil or sediment powdered.

The need to adopt conservation agriculture has grown in importance with the rise of natural resource degradation and the need to reduce production costs to make agriculture more competitive and meet heightened demand for food globally.

Switching from conventional to conservative systems was not easy and generated a lot of questions that needed answers were relevant, scientifically substantiated. In this regard, difficult issues were related to the evaluation of the suitability of the land, soil, highlighting possible changes in soil and plant productivity and their long-term prognosis.

Today it is widely accepted that conventional agriculture and technological mistakes, had a negative impact on soil and other environmental resources.

In Romania, only at the entire area of arable plowing depth of 20-25 cm it is necessary to displace approximately 30 billion tons of soil. To accomplish this work takes about 270 million liters of diesel, which at the current price means a cost of 1.777 billion lei.

Worldwide there is a decrease in the total volume of mechanical works, but not by decreasing the degree of mechanization of agricultural crops, but the introduction of mechanization technologies based on minimal soil works which help to give up some operations of traditional technologies plant cultivation.

MATERIAL AND METHODS

The mechanization technology of minimal tillage in maize culture includes the following works: scarified, prepared the ground and sowing. The results comprised in this paper are founded on the experiments carried out on the fields from Orțișoara - Timiș County. The agricultural mechanized works were carried out with the following agricultural machines:

-chisel plows depth Maschio Artiglio Magnum 500 with John Deere 8285R tractor (figure 1);
- disc harrows Vogel & Noot Terra Disc 600 with John Deere 8285R tractor (figure 2);
- sowing machine Gaspardo MT 12 with John Deere 6190R tractor (figure 3).

Figure 1:
Chisel plows depth Artiglio Magnum 500

Figure 2:
Disc harrows Vogel & Noot Terra Disc 600

Figure 3: Tractor John Deere 6190R with sowing machine Gaspardo MT 12

RESULTS AND DISCUSSIONS

In the experimental setting we tested the following parameters, for each agricultural mechanized works: power of tractor engine, fuel consumption, working width, working depth, hourly productivity, daily productivity, payroll value, fuel value, repay value, maintenance value, direct expenditure, ancillary expenditure, total expenditure.

The results of the determinations are presented in table 1.

Table 1

Results obtained at minimal tillage in maize culture

No. crt	Parameter	Aggregate			TOTAL (lei)
		Tractor John Deere 8285R & Chisel plows depth Artiglio Magnum 500	Tractor John Deere 8285R & Disc harrows V & N Terra Disc 600	Tractor John Deere 6190R & Sowing machine Gaspardo MT12	
1	Power of engine tractor [HP]	320	320	220	-
2	Fuel consumption [liters/hour]	54	54	32	-
3	Working width [m]	5,0	6,0	8,4	-
4	Working depth [cm]	30	15	5	-
5	Hourly productivity [ha/h]	3	5	4,5	-
6	Daily productivity [ha/day]	24	40	36	-
7	Fuel consumption [liters/ha]	15	9	6	**30**
8	Payroll value [lei/ha]	3,7	3,0	3,0	9,7
9	Fuel value [lei/ha]	97,0	58,0	39,0	194
10	Repay value [lei/ha]	10,0	8,0	7,0	25
11	Maintenance value [lei/ha]	8,3	9,0	7,0	24,3
12	Direct expenditure [lei/ha]	**119**	**78**	**56**	**253**
13	Ancillary expenditure [lei/ha]	23	16	11	50
14	**Total expenditure [lei /ha]**	**142**	**94**	**67**	**303**

CONCLUSIONS

Considering the results obtained at the minimal tillage in the growing of maize the following conclusions can be drawn:

Fuel consumption for scarified work, prepared the ground and sowing is 30 liters/ha, corresponding to plowing consumption of conventional technology.

Given that the price of diesel is 6.5 lei/liter, fuel expenses are 194 lei/ha or 76% of direct costs and 64% of total expenditure.

The optimum mechanization technology consists in judicious correlation of works and agricultural aggregates to obtain the harvest with minimized labor costs and energy consumption.

The minimal tillage system relies upon the achievement of some objectives and indicators, among which we remind the following:

- the reducing of agricultural aggregates number;
- the reduction of fuel consumption;
- the reduction of human and mechanic work;
- the reducing of soil compaction.

A small number of mechanical works means from economic terms: labor economics, fewer tractors and agricultural machinery, less fuel so lower costs, reduction of erosion and loss of soil water. All these factors increase the area worked with the same staff, positioning within the optimal time work and increase profits on the product.

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