ON THE IMPACT OF SOIL TYPE AND OF TECHNOLOGICAL WORKS ON MAIZE YIELD AT COLUMIROM S.R.L.

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Abstract: *Maize is the most surprising system of nature accumulating energy. A seed weighing around 1/3 of a gram sprouts and produces in about 9 weeks a plant 2-3 m tall, producing, in the following 8 weeks, 600-1,000 grains. The explanation of this process is firstly, that maize is an extraordinary laboratory turning solar energy into organic matter and, secondly, that it stores a large amount of energy into a very concentrated produce – the maize grain. In this study, we monitored the way in which the soil type and fertilisation impact yield level. Nitrogen plays a pivotal role in several physiological processes inside the plant. It is fundamental to establish the plant's photosynthetic capacity (Hageman & Below, 1984); it prolongs the effective leaf area duration, delaying senescence (Earl & Tollenaar, 1997); it is important for ear and kernel initiation, contributing to define maize sink capacity (Tollenaar et al., 1994); and it helps to maintain functional kernels throughout grain filling, influencing the number of developed kernels and kernel final size (Huber etal., 1994; Jones et al., 1996). Research was carried out over three years (2007-2009) at the Columirom S.R.L. Company (Comloşu Mare, Timis County) and it is the basis of the author's Graduation Diploma Paper. In the soil and climate conditions at Comloşu Mare, maize crops can rely on all the factors allowing high yields in several maturity hybrid groups. Results show the impact of soil type and of cultivation technology on yield (particularly the fertilisation level, the quality of the seeding material, and the soil working system). Numerous field trials around the world have shown that, with fertilization according to crop requirement and site-specific conditions, substantial yield increases can be achieved. Balanced fertilization is important for crop yield, quality and stress resistance The study was acknowledged by the management of the Columirom S.R.L. Company who financed the study and whom I thank for their kindness, support, and professional counselling.*

Key words*: maize, cultivation technology, soil type*

INTRODUCTION

The Columirom S.R.L. Company in Comloşu Mare, where the present study was carried out, cultivates annually on an area between 150 and 350 ha.

The land cultivated by the Columirom S.R.L. Company covers all dominating soil types in the area. The zoning of the land plots can be done depending on the soil type:

- Zone A – chernozem soils
- Zone B – sandy soils
- Zone C – marshy lands
- Zone D – vertosoils

MATERIAL AND RESEARCH EMTHOD

The goal of the present study was the behaviour of the Pioneer maize hybrids cultivated on two types of soil (chernozem and vertosoil) representing 80% of the soil structure of the Columirom S.R.L. Company.

During the three trial years, the cultivation technology we applied consisted of the following:

- winter wheat was the pre-emergent crop;
- fertilisation was done with:
- 120 kg of 12-52-0 (MAP) complex fertilisers upon sowing, as a starter;
- 100 kg of ammonia nitrate (NH_4NO_3) upon weeding;
- preparing the land was done by ploughing right after the pre-emergent crop and by passing the combinator two times before sowing;
- sowing was done between March 31 and April 11, 70 cm deep in the soil, between rows, and with a plant density of 64,000 germinating grains per ha;
- weed control was done by mechanical weeding and herbicide application, as shown in Table 1.

Table 1.

Weed control works

Application type	Name of herbicide	Active substance in the herbicide	Amount/ha	Area (ha)	Problem weeds
Pre-emergent	Tropy	Acetoclor-762 g/l Diclomid-862 g/l	2 l/ha	140	
Post-emergent	Esteron	600 g/l acid 2.,4D din EHE	0.8 l/ha	110	
Post-emergent	Mustang	Florasulam 6.25 g/l + 2,4 D EHE 300 g/l	0.6 l/ha	30	*Galium aparine* *Convolvulus arvensis*
Post-emergent	Mistral	Nicosulfuron 40g/l	1 l/ha	45	*Sorgum halepense*
			0.8 l/ha	25	*Echinocloa crusgalli* *Digitaria sanguinalis*

In a separate trial, we monitored the effect of the soil work type on maize yield.

The cultivation technology consisted of the following:

- fertilisation:
- 200 kg of urea;
- 180 kg of 20-20-0 (NPK);
- discing the entire area;
- passing the combinator to prepare the germination bed;
- sowing 65,000 grains/ha of the maize hybrid DKC 5170.

RESULTS AND DISCUSSION

The study shows that the level and dynamics of the maize yield depended on the following:

- land quality;
- the level of maize cultivation technology, including seed quality;
- meteorological conditions.

Among these steps, maize cultivator can impact directly only the cultivation technology.

In the soil and climate conditions in Comloşu Mare, maize crops meets all factors favourable to high yields for several hybrid maturity groups.

Table 2.

Yield results in maize between 2007 and 2010 in Comloşu Mare

Factor A: Soil type	Factor B : Cultivated hybrid		Averages of Factor A			
	PR36K67	PR35P12	Yield (kg/ha)	%	Difference (kg/ha)	Significance
Chernozem	7590	7600	8895	100		
Vertosoil	6950	7570	8073	91	-822	00

DL 5% = 453 kg/ha; DL 1% = 637 kg/ha; DL 0.1% = 868 kg/ha.

Averages of the Factor B

Specification	PR36K67	PR35P12
Yield (kg/ha)	8415	8553
%	100	102
Difference (kg/ha)		138
Significance		

DL 5% = 270 kg/ha; DL 1% = 370 kg/ha; DL 0.1% = 468 kg/ha.

IMPACT OF TECHNOLOGICAL WORKS ON MAIZE

A plot of 43 ha, characterised by a vertosoil, and an area of 23 ha were cultivated with monocultural maize for 2 years. Due to the high degree of weeding, we took the decision of making the following soil works:

Table 3.

Soil works (disc harrow or combinator)

Nr.	**Weedened plot**	**Normal plot**
1	Making technological paths using a disc harrow for M.A. and M.E.T.	Making technological paths using a disc harrow for M.A. and M.E.T.
2	Applying herbicides – Roundup – 3 l/ha	Applying herbicides – Roundup – 3 l/ha
3	Pausing for 2 weeks	Pausing for 2 weeks
4	Applying herbicides: - 200 kg of urea - 180 kg of 20-20-0 (NPK)	Applying herbicides: - 200 kg of urea -1 80 kg of 20-20-0 (NPK)
5	Working the land using the disc harrow	Working the land using the combinator
6	Working the land using the combinator	Working the land using the combinator
7	Sowing density: 65,000 germinating grains/ha	Sowing density: 65,000 germinating grains/ha
8	Maize hybrid DKC 5170	Maize hybrid DKC 5170

Table 4.

Comparative results concerning plant density and yield depending on land work type

Nr.		Plot 1 Disc harrowing	Plot 2 Using the combinator
1	Sowing density on April 9, 2008	65,000 germinating grains/ha	65,000 germinating grains/ha
2	Plant density on April 28, 2008	37,000 plants/ha	52,000 plants/ha
3	Yield	5,065 kg/ha	7,935 kg/ha
		Yield difference	**+2,870 kg/ha**

Due to prolonged drought, using the disc harrow resulted in a water loss in the worked soil which hindered plant sprouting, thus resulting in a sprouting gap of 20 days between the 2 plots.

At the same time, due to the period of time the seeds stayed in the soil, pest attacks increased in intensity.

The plants sprouted randomly so that on April 28 there were, within the same plot, plants at different development stages, i.e. plants with 7 completely developed leaves and plants with 3 leaves.

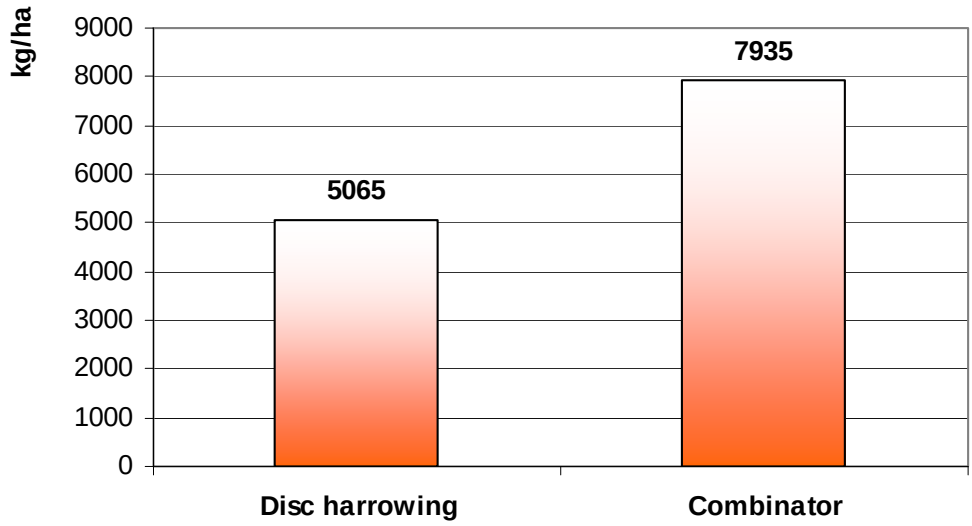

Figure 1. Yield depending on land work type

CONCLUSIONS

The study shows that the level and the dynamics of maize yield depended on the following:

- land quality;
- the level of maize cultivation technology, including seed quality;
- meteorological conditions.

Among these steps, maize cultivator can impact directly only the cultivation technology.

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