

NEW RESULTS FOR MAIZE CROPS CULTIVATED IN THE NO-TILLAGE SYSTEM AT THE “RAMIRA” AGRICULTURAL COMPANY FROM MÂRȘA, GIURGIU COUNTY

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Abstract

In Romania, maize is the main cultivated plan and maize crops are extremely important from an economic point of view. Research with the no-tillage system applied to maize crops were made in the Romanian Plain, Șarpe (1968, 1987, 2000, 2008, 2009), in Banat, Motiu (2004) and in the Flood Plain of the Danube River, Șarpe (2004, 2005, 2007, 2008). The results obtained in Romania confirm the results of the research made in other countries: Philips and Young (1973), Köller (1999), Derpsch (2001).

“Ramira” is the first agricultural company from Giurgiu County which in 2009 cultivated maize in the no-tillage system on a 200 hectares area of land, the results obtained being quite remarkable.

In the conventional system, under the weather conditions of the year 2009, the grain yield recorded from the maize crops amounted to 7,200 kg/ha, while in the no-tillage system a grain yield of 7,500 kg/ha was recorded - so the yields obtained in the technological systems were practically equal. However, there were small differences in terms of fuel consumption. For example, in the no-tillage system, a 78 litres/ha fuel consumption was recorded, while in the no-tillage system this amounted to only 25 litres/ha. Big differences were also recorded as regards the expenses in the conventional and no-tillage systems. In the conventional system, the expenses made for all the mechanical works performed from the sowing stage to the harvesting stage, these expenses amounted to RON 2,350.00 per hectare, while in the no-tillage system, they amounted to only RON 610,00 per hectare.

INTRODUCTION

The no-tillage system is the most COST-EFFICIENT farming system which, according to Derpsch (2001), is practiced on hundreds of millions of hectares in the USA, Brazil, Argentina, and even in Paraguay.

In Romania, numerous research studies regarding application of the no-tillage system to maize crops were made at Fundulea, in the Romanian Plain by Șarpe (1968, 1987, 2000, 2008, 2009), in Banat by Motiu (2004) and in the Flood Plain

of the Danube River by Șarpe and Poienaru (2004, 2005, 2007, 2008, 2009). The results obtained were quite remarkable, demonstrating the economic and practical efficiency of the no-tillage system. Based on this research, many agricultural companies from Romania are currently using the no-tillage system on large surfaces. Thus, for example, the S.C. 3 Brazi Agricultural Company uses the no-tillage system applied to maize, barley, wheat and soybean crops on approximately 45,000 hectares.

The no-tillage system presents some other economic advantages:

- reduces soil erosion - there are some 4 million hectares of eroded soil in Romania;
- diminishes the number of farming machines from 10 to only 3: sowing machine, herbicide-application equipment, and harvesting combine;
- reduces considerably the working time-and consequently labour productivity per hectare and per ton of product increases.
- the most important advantage of the no-tillage system is the diminution of the mechanical work related expenses and the considerable increase of the **PROFIT** recorded by cultivated hectare.

The results obtained at the "Ramira" agricultural company shall be a good example and reference for all the similar companies from the county of Giurgiu as well as for the neighbouring counties.

MATERIAL AND METHODS

The research activities referred to herein were carried out at the "Ramira" Agricultural Company from the Mârșa commune, Giurgiu County, situated on a brownish-reddish in different stages of podzolization, which contains 1.5-2.0% humus, 39% clay and has a 5.5 pH. The previous crops on the respective plots of land. In spring 2009, certain species of annual and perennial weeds were present in both plots of land, such as *Cirsium arvense* and *Sonchus arvensis*. For the chemical control of these species, 5 days before sowing a treatment with the Roundup herbicide was applied in doses of 4 litres/ha. The maize was sowed in the interval April 11th-14th, 2009, operation performed by means of a six-row Gaspardo sowing machine, Regina model whereas in the classical system sowing was performed by means of a SPC 8 Romanian sowing machine. The weather conditions were moderately favourable, as starting from October 2008 and until September 2009 the totally recorded rainfall amounted to 510 litres/square metre.

RESULTS AND DISCUSSION

In Table 1 we present the data regarding the selectivity and efficacy of herbicides as well as the grain yield.

Table 1

Selectivity, efficacy and grain yield recorded for the Rebera Pioneer hybrid S.C. “Ramira”, Marsa, Giurgiu County

Dominant weed species						
1. <i>Cirsium arvense</i>			7. <i>Chenopodium album</i>			
2. <i>Sonchus arvense</i>			8. <i>Polygonum aviculare</i>			
3. <i>Sonchus venalis</i>			9. <i>Sonchus oleraceus</i>			
4. <i>Capsella bursa pastoris</i>			10. <i>Xanthium strumarium</i>			
5. <i>Veronica hederifolia</i>			11. <i>Solanum nigrum</i>			
6. <i>Echinochloa crus-galli</i>						
Herbicides applied	Doses (l/ha)	Time of appl.	Selectivity (EWRS grades)	Weed control (%)	Yield	
					kg/ha	%
Classical system						
1. Unhoed	-	-	1.0	0.0	900	12
2. Hoed 3 times (manually and mechanically)	-	-	1.0	94.0	7200	100
No-tillage system						
3. Untreated	-	-	1.0	0.0	890	12
4. Merlin Duo + Ceredin Super	3.5	preem	1.0	98.0	7500	104
EWRS grades 1 = Without phytotoxic symptoms 9 = Totally compromised maize plants						
LSD: 0% = 180 kg/ha; 1% = 230 kg/ha; 0.1% = 310 kg/ha						

Analyzing the data presented in Table 1, we shall notice that the Pioneer Rebera hybrid tolerated very well the Merlin Duo and Ceredin Super herbicides. As regards the weed control in the classical system in a separate 10 hectare-plot, by 3 mechanical hoeing runs and 3 manual hoeing runs, a 94% weed control level was achieved. In the no-tillage system, where the Merlin Duo herbicide was applied in doses of 3.5 l/ha after sowing, and the Ceredin Super in a dose of 1 l/ha in the vegetation stage, when the maize plants had 3-5 leaves, the level of weed control amounting to 98%.

A grain yield of 7,200 kg/ha was recorded in the conventional system and respectively of 7,500 kg/ha in the no-tillage system, so the grain yields recorded in the two systems were practically equal. As regards the un-hoed variant in the conventional system, the grain yield was very small, that is only 900 kg/ha, and in the no-tillage system it was 890 kg/ha. However, there were big differences in terms of fuel consumption, as it stands out from Table 2.

Table 2

Fuel consumption in litres/hectare “Ramira” Agricultural Company, Marsa commune, Giurgiu County, 2009

CONVENTIONAL SYSTEM Mechanical and manual works	Consump. (litres/ha)	NO-TILLAGE SYSTEM Mechanical works	Consump. (litres/ha)
1. Autumn ploughing + harrowing	30.0	1. -	-
2. Teramix	8.0	2. -	-
3. Combinator	7.0	3. -	-
4. Sowing by SPC-8	6.0	4. Sowed by Gaspardo, Regina	7.0
5. 1 st mechanical hoeing	4.0	5. Appl. of herbicides before sprouting	1.5
6. 1 st manual hoeing	-	6. -	-
7. 2 nd mechanical hoeing	4.0	7. Appl. of herbicides on vegetation	1.5
8. 2 nd manual hoeing	-	8. -	-
9. 3 rd mechanical hoeing	4.0	9. -	-
10. 3 rd manual hoeing	-	10. -	-
11. Harvesting by Claas combine	15.8		15.0
TOTAL CONSUMPTION	78.0	TOTAL CONSUMPTION	25.0

As illustrated by the table above, the fuel consumption in the conventional system from the maize sowing to the maize harvesting stage amounted to 78 litres of Diesel fuel, while in the no-tillage system it was of only 25 litres per hectare.

Big differences were also recorded as regards the expenses incurred with the mechanical works in the two systems, conventional and no-tillage, as illustrated by Table 3 below.

Table 3

**Cost of maize cultivation mechanical and manual works “Ramira”
Agricultural Company, Marsa Commune, Giurgiu County, 2009**

CONVENTIONAL SYSTEM Mechanical and manual works	Cost (RON/ha)	NO-TILLAGE SYSTEM Mechanical works	Cost (RON/ha)
1. Autumn ploughing + harrowing	270	1. -	-
2. Teramix	90	2. -	-
3. Combinator	40	3. -	-
4. Sowing by SPC-8	60	4. Sowed by Gaspardo, Regina	70
5. 1 st mechanical hoeing	170	5. Appl. of herbicides before sprouting	120
6. 1 st manual hoeing	360	6. -	-
7. 2 nd mechanical hoeing	170	7. Appl. of herbicides on vegetation	120
8. 2 nd manual hoeing	360	8. -	-
9. 3 rd mechanical hoeing	170	9. -	-
10. 3 rd manual hoeing	360	10. -	-
11. Harvesting by Claas combine	300		300
TOTAL RON	2,350	TOTAL RON	610

According to the data presented in Table 3 above, maize cultivation costs from the ploughing to the harvesting stage amounted to RON 2,350 in the conventional system and to only RON 610 in the no-tillage system.

The most important results from a cost-efficiency perspective are the ones presented in Table 4, in which we analysed the profit of a hectare of maize cultivated in the conventional and respectively no-tillage system.

Table 4

Profit in ron-hectare of maize cultivation in the conventional and no-tillage systems “Ramira” Agricultural Company, Marsa Commune, Giurgiu County, 2009

Maize yield (kg/ha)	Maize cost (RON/kg)	Maize value (RON/ha)	Cost of materials and mechanical works/1 ha	PROFIT in RON for 1 maize crop hectare
CONVENTIONAL SYSTEM				
4,000	0.54	2,000	3,480	-1,480
4,500	0.54	2,250	3,480	-1,230
5,000	0.54	2,500	3,480	-980
5,500	0.54	2,750	3,480	-730
6,000	0.54	3,000	3,480	-480
6,500	0.54	3,250	3,480	-230
7,000	0.54	3,500	3,480	+20
NO-TILLAGE SYSTEM				
4,000	0,54	2,000	1,610	+ 390
4,500	0,50	2,250	1,610	+ 640
5,000	0,54	2,500	1,610	+ 870
5,500	0,54	2,750	1,610	+ 1,140
6,000	0,54	3,000	1,610	+ 1,390
6,500	0,54	3,250	1,610	+ 1,640
7,000	0,54	3,500	1,610	1,830
Note: The price of maize franco-warehouse is ranged between RON 0.495 and RON 0.595 per kg (an average of RON 0.545/kg). Agricultural Profit, issue No. 33 of September 2009				

Based on the relevant results obtained at the “Ramira” Agricultural Company we have elaborated the following Strategy for the control of annual and perennial weeds.

STRATEGY

For the control of annual and perennial weeds in maize crops cultivated in the no-tillage system

This strategy is valid only for the farmers which use the no-tillage system and cultivate various types of maize hybrids.

In spring, time will be allowed to annual and perennial weeds such as *Cirsium arvense*, *Sonchus arvensis*, *Taraxacum officinale affinale* and *Convolvulus arvensis* to spring in mass. The plot must be then treated by glyphosate-based herbicides such as Roundup, Cosmic, Dacglisat 50WL6, Dominator, Gallup, Glialua 36 CE, Glisocig 360, Glifotim, Elyfas, Glyphogan 480, Glyphostock Kawasate, Sanglypho and Rocco. All these herbicides contain 360 g/l glyphosate active substance.

Glyphosate-based herbicides must be applied 1-7 days before the maize is sowed or within 5 days after it has been sowed in a dose of 4.5-6.0 litres per hectare.

Application of glyphosate-based herbicide is strictly forbidden after the maize has sprung, because the crop will be “burnt” by these herbicides.

One of the following herbicides shall be applied together (tankmix) with the glyphosate-based herbicides:

Merlin Duo in a dose of 3-5 litres/ha

Gardoprim Plus Gold 500 SC in a dose of 5-7 litres/ha

Dual Gold 960 EC in a dose of 2-3 litres/ha

Frontier Forte in a dose of 2-3 litres/ha

Proponit 720 EC in a dose of 4-5 litres/ha

After the maize has sprung, when plants have 3-5 or maximum 7 leaves and the annual and perennial weeds are 5-10 cm tall and even 15-20 cm tall, the Ceredin Super in a dose of 1 l/ha shall be applied - this herbicide being able to destroy over 700 species of annual and perennial dicotyledonous weed species which infest maize crops from Romania and Europe.

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