UNDER THE CIRCUMSTANCES OF THE CURRENT CRISIS THAT THE ROMANIAN AGRICULTURE IS CONFRONTED WITH, WINTER BARLEY CULTIVATION IS MORE PROFITABLE ONLY BY APPLYING THE NO-TILLAGE SYSTEM BY USING THE GASPARDO GIGANTE 600 SOWING MACHINE

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Plant cultivation in unploughed land, that is by using the system called no-tillage in English and respectively sans-labour in French, is now practised on hundreds of millions of hectares in the USA, Argentine, Brazil etc. For instance, in the USA the no-tillage system is practised on 35-40% of the entire arable surface. The no-tillage system is used first of all for purely ECONOMICAL reasons, as the ton of maize, soybean or wheat obtained by applying this system is 2 or 3 times cheaper than by using the classical system. The second major advantage of the no-tillage system is elimination of soil erosion. Even in Paraguay (a less developed country) the no-tillage system is practised on a surface of over 1,000,000 hectares.

In Romanian agriculture, especially under the circumstances of the current economic crisis, the no-tillage system can be practised in the following ten years on at least 10,000,000 hectares, just like in Paraguay, as in Romania, in the past 40 years, the maize, wheat, barley or soybean crops cultivated in the no-tillage system have been practically equal with the ones cultivated in the classical system. In the conventional system, 12-15 works are performed between the ploughing and harvesting stages, while in the no-tillage system only two works are performed: sowing and harvesting. The fuel consumption and cost of the mechanical works in the no-tillage system is 2-3 times lower in the no-tillage system as compared to the conventional system. For example, in case of the winter wheat crop, the cost of the mechanical works performed amounted to RON 4,900, while in the no-tillage system it was of only RON 1,700.

***Key words**: winter barley, no-tillage system, conventional system, Gaspardo Gigante 600 sowing machine*

During the ages, the superior plants from the spontaneous flora (savage form) such as wheat, barley, maize etc. grew on land that had never been ploughed.

Man invented various tools to labour the land before and after sowing, for two main reasons: to fight the weeds, which are big water and nutrient consumers, and to be able to incorporate the organic and mineral fertilizers.

Plant cultivation without ploughing the land is an idea that belongs to the Americans and the English and dates back in the 1930s. In England, many farmers use the no-tillage system and apply it in the following way: they treat meadows with Gramoxone and then, in autumn, they sow wheat or barley, using special sowing machines for this purpose, of course.

In Romania, the first experiments with winter wheat cultivated in unploughed land, after maize, were made at the Prodagra Agricultural Company-Arad County, in the years 1999-2001, by Andrei Ion and Nicolae Şarpe (2004), the 3-year average yield recorded being 4,320 kg/ha in the no-tillage system.

The experiments with winter wheat cultivated in the no-tillage system were continued by Nicolae Şarpe (2004) at the Chirnogi Agricultural Company from the Călăraşi County, in the specific conditions of the Flood Plain of the Danube River, the yield recorded being 4,830 kg/ha in the conventional system and respectively 4,830 kg/ha in the no-tillage system, in which the crop was sowed by means of a Gaspardo Gigante 600 sowing machine.

In the process of implementing the mechanization of agriculture on a general and intensive scale, a process which cannot be disputed, some negative effects have been also recorded in the sense that tractor and agricultural machine running repeatedly over the land leads to soil pressing down and alteration of its structure, which influences the growth of plants in a negative way and finally leads to diminution of production.

Plant cultivation in unploughed soil, namely in the no-tillage system, has been and is still being studied by numerous researchers from the USA, Brazil, Argentina, England, Germany etc.

In the USA, plant cultivation without ploughing, the so-called "no-tillage" farming became a current practice (Philips and Young, 1973). Köler (1999), a Professor at the Hohenheim University of Stuttgart, Germany, makes the following assertion: "In order to reduce the volume of work, energy and costs, it is necessary that the volume of land tilling operations be reduced to one or no more than two rounds of tractor passing over the land".

According to Derpsch (2001), who participated to the "First World Congress on Conservation Agriculture", the no-tillage system is practiced on 21 million hectares, which represents 36.6% of the total surface of cultivated land. Latin America comes second from this point of view. In this region, the no-tillage system is practiced on 27 million hectares and in the entire world it was practiced in the year 2000 on over 62 million hectares. At the moment, the no-tillage system is probably practiced on over 100 million hectares.

In Romania, the first experiments with maize cultivated in the no-tillage system date back in the year 1965, and the first experiment with winter barley was made in 1999 (Şarpe, 1989, 2004). At the Prodagra Agricultural Company, Arad County, winter barley cultivation in the no-tillage system was made after maize

cultivation. On the average, in 3 years (1999-2001), the yields obtained in the conventional system went up to 4,320 kg/ha, and in the no-tillage system to 4,380 kg/ha, so the results in the two technological systems were practically the same.

The experiments with winter barley cultivated in the no-tillage system were continued by Șarpe (2004) at the Agro Chirnogy Company in the Flood Plain of the Danube River, the results obtained in the conventional system amounting to 4,530 kg/ha and those recorded in the no-tillage, where the Gaspardo Gigante 600 sowing machine was used, amounted to 4,810 kg/ha.

In the years 2007-2009, the experiments with winter barley cultivated in the no-tillage system were continued at the „Agrofam Holding" from Fetesti, Ialomita County

MATERIAL AND METHOD

The experiment with winter barley cultivated in the no-tillage system in comparison with the conventional system was made at the "Agrofam Holding" Agricultural Company from Fetesti, Ialomita County, in the specific conditions of the Flood Plain of the Danube River. The soil is alluvial and it contains in the arable layer 3.0-3,5% humus and over 38% clay.

In the no-tillage system and conventional system, the winter barley was cultivated after genetically modified soybean. In the no-tillage system, the winter berley was sowed directly in the genetically soybean stubble field, after the soybean had been harvested, by using a Gaspardo Gigante 600 sowing machine. In the conventional system, after the soybean had been harvested, the land was ploughed and harrowed. Two disking rounds were applied to the soil after ploughing until October. Before sowing, the land was also tilled by one combinatory round.

As all the tilling works, sowing and harvesting by Class combine were performed mechanically, the experiment was displayed according to the linear method, in 3 repetitions, the land plots having a surface of 10,000 m^2. The barley used all these years was the "Florina" variety, created by the National Institute for Agricultural Research from Fundulea, Calarasi County. During all these years, in both systems, the "Florina" wheat variety was treated in spring, at the end of the offshooting phase, by applying the combined herbicide Ceredin Super, which contains 100 g/l dicamba + 300 g/l 2.4-D acid.

RESULTS AND DISCUSSIONS

In *table 1* hereinbelow we present the average results obtained in the years 2007-2009 at the "Agrofam Holding" Agricultural Company from Fetesti.

Analyzing the data listed in *table 1*, we can notice that the "Florina" barley variety tolerated very well the Ceredin Super herbicide. At the same time, the Ceredin Super proved a very good control upon the annual and perennial weed species, the level of weed control amounting to 99-100%. The 3-year average barley yield recorded in the two systems, conventional and no-tillage, amounted to 4,680 kg/ha, respectively 4,690 kg/ha – they were practically the same.

Table 1

Selectivity, efficacy and barley yield S.C. "Agrofam Holding", Fetesti, 2007-2009

Dominant weed species *1. Cirsium arvense* *2. Senecio vernalis* *3. Polygonum amphibium* *4. Sonchus arvensis*		*5. Sonchus oleracea* *6. Polygonum convulvulus* *7. Convolvulus arvensis* *8. Capsella bursa pastoris*			
Applied herbicides	Rates l/ha	Selectivity EWRS grades	Weed control %	Grain yield	
				Kg/ha	%
CONVENTIONAL SYSTEM					
1. Untreated	-	1.0	0	4,050	100
2. Ceredin Super	1.0	1.0	99	4,680	115
NO-TILLAGE SYSTEM					
3. Untreated	-	1.0	0	4,100	100
4. Ceredin Super	1.0	1.0	100	4,690	114

Nevertheless, there have been big differences between the two systems in terms of fuel consumption. Analyzing the data in *table 2*, we can notice that by using the no-tillage system, the fuel consumption recorded in the no-tillage system was 59 l/ha smaller than in the conventional system.

Table 2

Fuel consumption – litres per hectare S.C. "Agrofam Holding", Fetesti, 2007-2009

CONVENTIONAL SYSTEM		NO-TILLAGE SYSTEM	
Mechanical works performed	Consumption litres/ha	Mechanical works performed	Consumption litres/ha
1. Autumn ploughing + harrowing	30.0	1. ----------	—
2. Autumn disking and harrowing	13.0	2. ----------	—
3. Autumn disking and harrowing	12.0	3. ----------	—
4. Laboured by combinator	5.0	4. ----------	—
5. Sowed by SUP 29	4.0	5. Sowed by Accord	5.0
6. Application of Ceredin Super	1.5	6. Application of Ceredin Super	1,5
7. Harvesting by Class combine	16.0	7. Harvesting by Class combine	16.0
TOTAL CONSUMPTION	**81.5**	**TOTAL CONSUMPTION**	**22.5**

In *table 3* we present the economic efficiency, analyzing the cost of the mechanical works performed in the conventional and no-tillage system. We thus find out that the average costs for a 3-year period amounted to RON 4,900.0 per hectare in the conventional system and to only RON 1,700.0 per hectare in the no-tillage system.

Table 3

Cost of mechanical works performed at the two systems: conventional and no-tillage S.C. "Agrofam Holding", Fetesti, 2007-2009

CONVENTIONAL SYSTEM		NO-TILLAGE SYSTEM	
Mechanical works performed	Ron/ha	Mechanical works performed	RON/ha
1. Autumn ploughing + harrowing	2,300	1. ----------	–
2. Autumn disking and harrowing	390	2. ----------	–
3. Autumn disking and harrowing	370	3. ----------	–
4. Laboured by combinator	150	4. ----------	–
5. Sowed by SUP 29	240	5. Sowed by Gigante 600	250
6. Application of Icedin Super	150	6. Application of Icedin Super	150
7. Harvested by Class combine	1,300	7. Harvested by Class combine	1,300
TOTAL EXPENSES	4,900	TOTAL EXPENSES	1,700

Strategies recommended for chemical weed control in winter barley crops

As far as winter barley cultivation is concerned, the Strategy applied is much simpler than the one applied in case of maize cultivation. Winter barley cultivation by applying the no-tillage system will be made by using the best herbicides synthesized in the world.

Strategy No. 1

It is recommended for winter barley crops infested by annual and perennial dicotyledonous weed species.

Herbicides	Rate l,g/ha	Time of application
1. CEREDIN SUPER (100 g/l dicamba + 290 g/l acid 2.4-D)	1.0	Postemergent
2. ICEDIN SUPER (100 g/l dicamba + 300 g/l acid 2.4-D)	1.0	Postemergent
3. PREMIANT (100 g/l dicamba + 300 g/l acid 2.4-D)	1.0	Postemergent
4. ARIL SUPER SL (100 g/l dicamba + 300 g/l acid 2.4-D)	1.0	Postemergent
5. DIALEN SUPER 464 SL (100 g/l dicamba + 300 g/l acid 2.4-D)	0.9	Postemergent
6. LINTUR 70WG (65.9% g/l dicamba + 4.1% triasulfuron)	150 g	Postemergent
7. CAMBIO (90 g/l dicamba + 320 g/l bentazon)	2.5	Postemergent
8. MUSTANG (6.25 g/l flurosulam + 300 g/l acid 2.4-D)	0.6	Postemergent
9. CALAM (60 g/l dicamba + 125 g/l triasulfuron)	0.4	Postemergent
10. ARRAT (50% dicamba + 25% tritosulfuron)	150 g	Postemergent

All the herbicides listed in the table hereinabove will be applied when the dicotyledonous weeds (annual and perennial) have sprung massively and the barley plants are in the offshooting phase until the first internode is formed, and, in extreme cases (when the treatment could not be applied because of the rain), the treatment can be continued until the phase when the second internode is about to be formed.

CONCLUSIONS

1. The herbicide Ceredin Super was tolerated very well by the "Florina" barley variety and a very good rate of annual and perennial weed control was recorded by its application, namely a rate of 99-100%.

2. The average barley yield obtained in the said 3-year period amounted to 4,680 kg/ha in the conventional system and respectively 4,890 kg/ha in the no-tillage system, so in both technological systems the yields obtained were practically the same.

3. Nevertheless, there have been big differences in terms of fuel consumption. In the conventional system, for all the mechanical works performed, harvesting by combine included, the fuel consumption amounted to 81 l/ha, while in the no-tillage system the consumption recorded was of only 22 l/ha.

4. Consequently, there have also been big differences as regards the costs of the mechanical works. These costs amounted to RON 4,900 in the conventional system, while they were of only RON 1,700 in the no-tillage system.

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