RAMANIAN WEEDY CROP VERSUS BIOTECHOLOGY CROP

IMBURUIENAREA CULTURILOR VERSUS BIOTEHNOLOGIILE IN ROMANIA

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Abstract: *The paper investigates the Romanian farmers' capacity to pay and cultivate genetically modified maize that is tolerant to glyphosate. The glyphosate-resistant GMO maize is currently under testing in Romania.*

The research activities for this paper included a combination of documentation, field trips, data processing and analysis.

The methodology used for testing farmers' perception of glyphosate-resistant maize cultivation consisted in interviewing 22 commercial farms in the period November 2010 - April 2011, located in the southern, eastern and western part of Romania. The interviewed farmers had experience in the cultivation of glyphosate-resistant GMO soybean in the period 1999-2006. Only one farm had organized an experimental plot with glyphosate-resistant maize in the year 2010.

Another data set comes from the testing plots of the glyphosate-resistant maize from the counties: Calarasi, Braila, Galati, Teleorman and Buzau. Another data source is represented by those obtained on the experimental plot of the Research and Development Institute for Crop Protection, organized in Brăila county in the year 2010.

The data obtained by applying the questionnaire in the field were taken over by using the probit model. Following the processing of data, I could measure and analyze the socio-economic implications of using the glyphosate-resistant maize in Romania. Following the processing of data, I could measure and analyze the socio-economic implications of the utilization of the glyphosate-resistant maize in Romania.

The final conclusion of the study reveals that due to farmers' previous experience in cultivating glyphosate-resistant soybean, these are willing to cultivate glyphosate-resistant maize, although they will have to observe the present legislation on the cultivation of GMO crops.

Key words*: glyphosate-resistant maize, socio-economic implications, farmers' perception of the cultivation of glyphosate-resistant maize.*

JELClassification*: Q10, Q13, Q16, Q55, Y10*

INTRODUCTION

Genetically modified, herbicide tolerant HT (Roundup Ready) corn is currently under trial process in Romania.

The paper examines the capacity of Romanian farmers to pay a tech-fee to grow Roundup Ready corn.

The research undertaken for this paper used a combination of desk research/analysis and field research in Romania.

MATERIALS AND METHODS

We applied interviews on 22 commercial farms in the period November 2010 - April 2011, located in the southern, eastern and western areas of Romania. Twenty farms out of the 22 used to cultivate RR soybean before 2007 and had the experience in using this technology. Only one farm had organized an experimental plot with glyphosate tolerant corn.

Another data set comes from the glyphosate tolerant testing lots organized in the counties: Calarasi, Braila, Galati, Teleorman and Buzau.

The questionnaire consisted of 20 closed questions and 15 open questions. The questions were grouped into the following sections: (1) confidential data on farm identification; (2) general data on the farm and (3) data specific to the cultivation of conventional and/or genetically modified corn as well as the experience in cultivating RR soybean; (4) data referring to farmers' perception on the socio-economic, technical, administrative and environmental implications of NK603 corn cultivation.

We used the probit model for the analysis of farmers' perception of glyphosate tolerant corn cultivation.

The prices used do not include VAT and are expressed in euro, calculated on the basis of the annual exchange rate published by the Central Bank of Romania.

The obtained data were used to measure the socio-economic implications of glyphosate tolerant corn use in Romania.

RESULTS AND DISCUTIONS

Weed pressure in Romania -weeds are the main problem farmers are facing for all the arable crops in Romania. They significantly contribute to the diminution of average yields per hectare and to product quality deterioration, to their underrating, and to poor commercialization as a result of the presence of weed traces in the production for sale. There are no specialized studies on the diminution of average yields following the land infestation with weeds, but certainly the yields are much lower in Romania compared to other countries where herbicides are used in larger amounts.

The weed-related problems in Romania reflect the specific conditions (warm climate and fertile soils that favour weed growth in optimum conditions) plus very limited use of herbicides. In the last 20 years, following the shift from the command economy to the market economy, the Romanian agricultural sector experienced significant changes. Farm profitability is very low and agricultural production decreased as most farms turned into subsistence farms. As a result, few farms are able to buy quality inputs: high quality certified seeds, chemical fertilizers or chemical products for crop protection. Significant land areas were abandoned, the main form of weed control being hoeing by hand. As a result, the weed seed reserve in soil boomed after 1990, and weeds became farmers' most critical problem in arable crops. The abandoned land areas became hotbeds of weed seed reserves growth and development, difficult to control even though adequate technological conditions are applied in their vicinity.

Glyphosate a necessary herbicide in Romania ? Since 1978 until 1985 Romania has used glyphosate in agriculture, according with Fundulea Institute of Crop Research. First time the glyphosate was used to control the wide range emerged weeds in Danube Delta and Big Island of Braila were the weeds have been exceeding 1200 plants/square meter. There glyphosate was used to spray more than 76 thousand hectares. Also glyphosate was used as desiccant for wheat, corn and sunflower at that time. It was the most efficient herbicide used in Romania at the time. It was used as well with good results in vineyards and orchards.

After 1990 the glyphosate started being used again in Romanian agriculture, industrial and urban areas. In Romania the weeds have been expanding in number and types per square meter, due to the land

abandonment or not used the herbicide to control weeds. As a result, for an efficient control of the weeds it is necessary to use a non-selective herbicide or a large number of selective herbicides.

For an economic point of view it is more convenient to use a non-selective herbicide once per year.

Commercial farms used the glyphosate as part of a yearly weeds control systems. Usually farmer used glyphosate as a post-harvest herbicide to destroy the weeds seed stock. In the wet years it could be used as a pre-harvest herbicide or as harvest desiccant. For example: in 2010, farmers needed to spray the rapeseed crop for avoid increase costs (with fuel, drying, buy new harvest combine parts) or lose yield due to delaying the harvest time.

Due to the lack of data regarding glyphosate quantities used and stock in the Romanian market we make estimations based on available data and story's collected during the farms interviews.

According to the input from the company data, 89% of the produced glyphosate is used in the agriculture.

Biotechnology crop - In Romania, the glyphosate tolerant corn is in the testing stage.

Glyphosate tolerant corn was cultivated in the year 2010 on one of the 22 interviewed farms on an area of 0.3 ha. This farm is in a very low zone, with high weed infestation; the ground water is found at small depth; the migratory birds come here in spring and in autumn, and the surplus of water from rainfall flows directly into the Danube, directly affecting the water fauna. The farm has experience in RR soybean cultivation (see details in Annex 1). In the years when RR soybean was cultivated as well as glyphosate tolerant corn, no incidents were signaled out with regard to water fauna and flora and to migratory birds.

Another data set on glyphosate tolerant corn cultivation comes from the testing plots organized in 5 different locations: Calarasi, Braila, Galati, Teleorman and Buzau.

In the table below we summarized the data referring to the production costs related to conventional corn cultivation, on the 22 interviewed farms. A wide range of costs per hectare can be noticed, as well as by different items. We must specify that the obtained average yield is much over the national average. The gross margin can increase up to three

times in the conditions when: (1) the production costs increase more than twice; (2) the costs of planting seeds increase 1.5 times; (3) and the crop herbicidation costs increase 3 times.
On the individual farms, according to experts, the costs begin from 100 euro/ha (when mechanized plugging, disking and planting are used, and also commercial seed for planting is used), yet own labor is not quantified and most often corn is used for household self-consumption, mainly as feed.

The results regarding conventional corn cultivation versus glyphosate tolerant corn show that an additional profit of 48 euro/ha can be obtained, in the conditions in which the seed costs increased by 14 euro/ha, while the herbicide costs decreased by 110 euro/ha. It must be specified that the farm on which glyphosate tolerant corn was tested uses glyphosate as post-emergent herbicide under the yearly crop herbicidation scheme. The yield increased by 4%.

Table 1

Structure of costs of conventional corn and glyphosate tolerant corn cultivation in the same location, in the year 2010, euro/ha

Structure of costs	Conventional corn	Glyphosate tolarant	Differences +/- Glyphosate tolarant /conventional corn
Cultivated area – hectares	331	0.3	
Average yield - kg/hectare	8.0	8.3	4 %
Total costs per hectare	874	779	-95
Mechanical works	80	75	-5
Manual labor	9	7	-2
Seeds	86	101	14
Herbicides	125	15	-110
Irrigation of crop	32	32	0
Crop insurance	4	4	0
Total incomes per hectare	1056	1096	40
Gross margin per hectare	182	317	135

Source: Data obtained on the interviews conducted in the period November 2010 -April 2011, the prices in euro were calculated on the basis of the average exchange rate published by the Central Bank of Romania for the year 2010; €1 = 4.2099 RON

The glyphosate tolerant corn tests conducted by State Institute for Variety Testing and Registration carried out in 5 different locations in the period 2008-2010 revealed that yields increased by 3 - 34%. It was used as witness a different hybrids from the same precocity group were used (300/400 FAO), and the same technology was used.

Table 2

Average yields – 5 different locations - glyphosate tolerant corn in the year 2010, tons/ha

Structure of costs	Location 1	Location 2	Location 3	Location 4	Location 5
Conventional corn	8.338	7.257	8.281	7.777	8.074
Glyphosate tolerant	9.005	8.515	8.515	10.392	9.527
Yield gain %	8	17	3	34	18

Source: data from The State Institute for Variety Testing and Registration

The herbicides used for glyphosate tolerant corn were 2 applications of glyphosate (2 + 3 liters) in the 1-3 leaves stage and the second in the stage up to 8 leaves.

In the case of conventional corn, 29 herbicidation schemes were used, with a total number of 56 active substances. The main active substances were the following: nicosulfuron (used in 8 cases), isoxaflutole + terbuthylazine (used in 7 cases), acetochlor (used in 7 cases), 2,4 D (used in 6 cases). The herbicide costs on the farm rather reveal the farm financial power than the weed infestation of crop. The better the financial situation of farms, the stronger the tendency to use herbicides based on 2 or even 3 active substances in a single application to fight against a wide range of weeds, and in this case the herbicide costs are higher as last generation herbicides are used.

We can notice that a different number of herbicides are used, a different number of applications, as well as different costs associated to them.

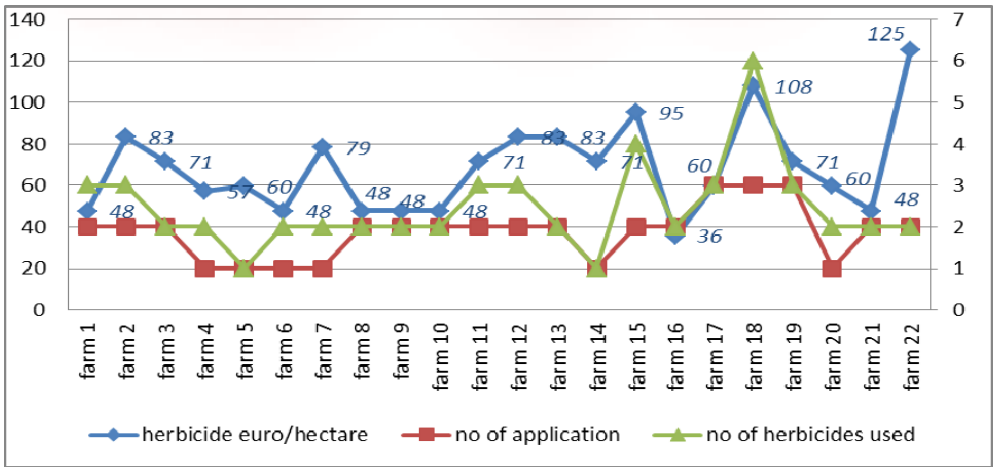


Figure 1: Herbicides: cost, number and applications

Source : data collected on interviews

CONCLUSIONS

Romania is situated on the first place concerning the surface on which corn is cultivated, but as for the production of corn Romania is situated only on the 7th place in UE 27.

The coexistence of modern farming with subsistence farms has generated quite a big problem concerning the high weeds density hard to handle.

The method of using herbicides for combating weeds is used on almost 3 million hectares, and if we take into consideration that the big farms apply this method 2-3 times a year we can see that on at least 1/3 of the arable area herbicides are used. Romanian farmers averagely use pesticides worth 15 euro per hectare, while in Hungary; the average cost per hectare is 32 euro. This happens due to a tight budget.

Romanian farmers already have an experience with the cultivation on genetically modified soy and together with the economic performances they have obtained they are eager to try this kind of technology.

The glyphosate tolerant is still in a testing stage in Romania.

The results obtained from the cultivation of glyphosate tolerant show us that we can get a supplementary 40 euro/ha, gross margin goes up to 135 euro/ha, and the expenses with the seed go up only by 14 euro/ha.

The average yield in the case of glyphosate tolerant corn is with 3-34% higher than in the case of conventional corn.

We conclude that the farmers seem to be eager to try the glyphosate tolerant in favor of the conventional corn.

Not using glyphosate will result in severe losses for commercial farms and for Romania's agriculture and environment.

REFERENCES

1. **BROOKES G**, (2007) *The Farm Level Impact of Using Roundup Ready Soybeans in Romania*. Brookes West, Canterbury (2003). [Online]. Available: http://www.pgeconomics.co.uk/pdf/GM soybeans Romania.pdf [22 March 2007].
2. **POPESCU, A. AND COLAB**, (2009)*New Combined Herbicides in Annual Weeds Controlling from Maize*, I.N.C.D.A. Fundulea, vol. LXXVII
3. **KLEFFMAN& PARTNER ROMANIA –AMIS** ®crop protection 2008- maize/p 20-21
4. **SANDOIU,D.I. POIENARU,S,. GHITA V.G**.(2005),*Cartarea buruienilor in Balta Borcea,* Bucharest, Editura Elisavaros