



Possible GMO impact on farms profitability in Poland

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Summary

The paper analyzes the use of genetically modified organisms (GMO) – and considers it under the *ceteris paribus* regime in relation to the overall profitability of agriculture in Poland. The modeling results are used to confront the opinions of Polish farmers on GMO impact on their farms.

Key words: GMO, coexistence, farm profitability, farm model, Polish agriculture, farmers opinions

1. Introduction

Growing concerns are observable in Poland over the coexistence of genetically modified (GM) organisms and non-modified organisms - both conventional and organic (non GM). Recently, the GMO prohibition in Poland might be lifted by the amended Legal act on genetically modified organisms. Due to the Polish government the cultivation of GMO crops should be maximally limited (Proposal of amendment ..., 2007). The opponents of GMO introduction point out the possible risk to environment, health or food safety. The supporters advocate that biotech based agriculture could significantly increase yields, reduce costs and has many other positive impacts.

2. Methods

In this paper an exhaustive investigation has been completed comparing the situations on 252 representative farms covering app. 90% of Polish farms, with introduced or constrained GMO crops using a linear programming optimization technique. The applied farm model uses over 80 decision variables and over 200 constraints. Model parameters have been derived from farm surveys. Each of farm models optimize Net Farm Income (NFI) in a comparative static approach. There has been assumed two scenarios: “nonGMO” taking into account restrictions for GMO crops introduction and “GMO” assuming unlimited coexistence of GMO and nonGMO crops, i.e. no buffer zones. Data for GMO scenario has been estimated base on research done by Aniol and Brooks (2005) and PG Economics (2003). Additionally, in 2004 there has been executed by PBS DGA company for Polish Federation of Biotechnology a survey on the representative sample of 1042 Polish farmers in order to verify their knowledge and opinions on application of GMO plants (PFB, 2007). Over 50% of farmers is on the position that GMO plants will increase the Net Farm Income of their farms, 20% had opposite opinion and 25% did not have any opinion on this issue.

3. Results

The introduction of GMO crops resulted in the increase of overall Net Farm Income. In the year 2006 it reached 4,5%. The calculated models show that extensive farms increased their NFI due to GMO by 4,2% and the intensive ones by 4,8%. The results show much stronger differentiation of economic effects of GMO implementation in case of farms specialization. The highest increase of NFI is observed in case of arable farms (9,5%). It could be explained by higher share of crop production, which might be influenced by GMO crops, in total production. Farms types specialized in animal productions also gain from GMO introduction, but due to limited share of crop production in the production structure, the NFI increase is lower (pigs 4,1%, cattle 4,9%). Slightly better situation in case of cattle farms could be explained by utilization of potential of GMO fodder maize. The results of model calculated for farm types differentiated by the soil quality shows essential disparities in economic effects of GMO introduction. Models of farms located on the best soils shows possibilities of highest NFI growth due to application of GMO, i.e. by 7%. However at the intensive arable farms operating on good soils the NFI gains from GMO introduction might reach even 14%, which would be considered promptly by farmers. Opposite to those limited yield growth potential together with relatively high costs of new technology do not create favorable conditions of applying GMO crops on the farms with poor soils.

4. Conclusions

The modeling results have confirmed the opinion of Polish farmers that GMO crops will have the influence on economic performance of their farms. It has been proved that from economic point of view possibility of use the GMO crops is likely to cause increase of Net Farm Income. However the impact is not very crucial. The average income of farms in conditions of unrestricted availability of GMO technology is only 4,5% higher according the results of modeling as compared to the GMO free strategy. It depends significantly on the intensity of production, the soil conditions, and the type of production. All these three factors are connected to the character of plant production.

References

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- Proposal of amendment of Legal act of 22.06.2001 on genetically modified organisms accepted by the Council of Ministers of Poland and send to the Parliament on 02 February 2007. Warsaw.

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POSSIBLE GMO IMPACT ON FARMS PROFITABILITY IN POLAND

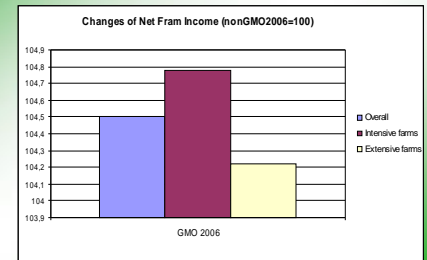
Objectives of the analyze

Will GMO introduction increase profits of Polish farms?

- To build up and aggregate the impacts of individual farm responses on GMO introduction.
- To confront modelling results with opinions of Polish farmers.

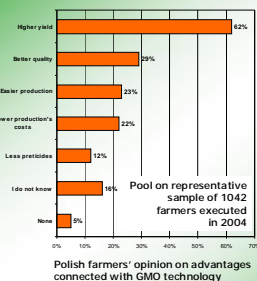


GMO impact in the short term perspective - FARM INTENSITY



Opinion of Polish farmers on GMO

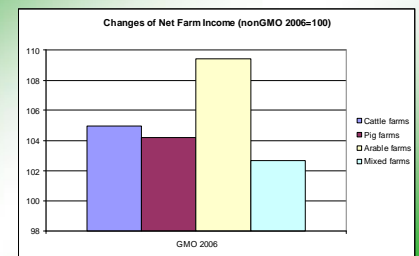
source: Polish Federation of Biotechnology, 2007



55% of farmers think that GMO introduction will increase the profitability of their farms.



GMO impact in the short term perspective - FARM SPECIALIZATION



Methodology

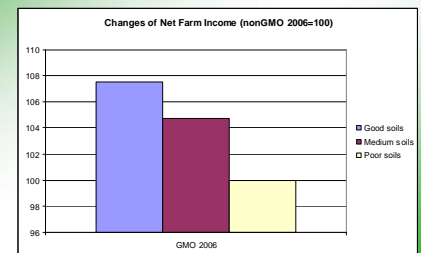
Assumption: CETERIS PARIBUS		Policy options	
		Non GMO	GMO
Time horizon	Short term 2006	2006 nonGMO	2006 GMO

Financial performance →

- LP optimisation model – Net Farm Income as the objective function
- 252 farm types representing approximately 90% of the sector
- 80 decision variables, 200 constrains
- Excel with Solver function



GMO impact in the short term perspective - FARM SOIL TYPE



CONCLUSIONS

- Ø GMO crops would have the influence for economic performance of Polish farms.
- Ø From economic point of view possibility of use the GMO crops is likely to cause increase of Net Farm Income by 4,5% on average comparing to GMO free technology.
- Ø The influence of GMO for Polish farms profitability depends significantly on the intensity of production, the soil conditions, and the type of production.