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ECONOMIC ASPECTS FOR GROWING OF GENETICALLY MODIFIED RAPESEED IN LATVIA

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Abstract

Growing of genetically modified cultivated plants can be economically profitable because it provides an opportunity to gain higher yields due to resistance to conventional diseases and pests characteristic of cultivated plants, as well as to reduce the costs related to the use of plant protection means. However, there are still no commercially available disease resistant genetically modified cultivated plants, only cultivated plants that are resistant to particular pests and mainly tolerant to wide – spectrum herbicides.

Gene flow among genetically modified herbicide tolerant plants can have important organizational, economic and legal impacts on farmers because there are considerably high additional costs for growing genetically modified rapeseed. To prevent dissemination of GMO in the crops of other farms, there are informational costs, costs of elimination of distribution of genetically modified products during their pre-processing, storage and transportation, costs of marking of genetically modified products on their presence in the corresponding item, costs of laboratory sampling and analyses, additional expenses for personnel training, expenses of maintenance of the state supervising departments, expenses for insurance of crops. Growing of genetically modified cultivated plants becomes profitable in a set territory if net income gained by the producer of genetically modified cultivated crops per unit of area exceeds net income per unit of area of conventional crops.

Key words: GM rapeseed crops, economic arguments.

Introduction

Growing GM crops in Latvia would be economically beneficial for farmers when companies could offer wide ranging benefits to both farmers and consumers. Future beneficial traits could include GM crops resistant to diseases and pests, common in Latvia, especially to diseases which cause the greatest losses. At present, only a narrow range of crops and traits (herbicide tolerant (HT) varieties of rape seed and maize) are suited to Latvia. Insect resistant maize varieties are not necessary because there are no maize insects in Latvia. Sugar beets are not actually grown in Latvia any more. There is no processing industry for potatoes with optimized starch contents. This means that

herbicide tolerant rapeseed is likely to bring more problems than benefits, because the GM rapeseed genes can be spread uncontrolled in the environment by insects-pollinators and wind if the cultivated plant has wild relatives in the nature /Beckie et al., 2003/ Canadian researchers have reported that in the west of Canada, uncontrolled dissemination of HT rapeseed genes can be observed everywhere but the HT rapeseed wild populations are found most widely along the sides of highways and railroads. Unsafety of this process has to be especially emphasised because a generation of rapeseed has been already developed with multiple tolerance to the three groups of herbicides: *glyphosate*, *gluphosinate*, and *imidazolinone*. During the two-year experiments, it was found that maternal plants with the same trait of HT produce progeny with multiple tolerances /Knispel et al., 2007/. By the concept of Canadian researchers, the process actually is not controllable and the dissemination is unpredictable. This is the first report by Canadian scientists on the fact that HT trait is prevailing and can spread outside the field creating management risk to conventional and biological agriculture without special supplementary enterprises and expenses. Research done in recent years suggests that the yield of GM rapeseed is higher than that of conventional rapeseed, the profitability depends not only on GM seed, but also on farm size, education level and experience of farmers, location of a farm and marketing contract /Economic impact, 1999; Gomez-Barbero, Rodriguez-Cerezo, 2006/.

By the decision of the Committee of European Parliament, all member states of the European Union have to provide voluntary coexistence of growing of conventional, organic and genetically modified crops. Although provision of coexistence has limits because under different circumstances uncontrolled dissemination of genes could impact on apiculture, organic farming and seed production in Latvia /Mesean, Angevin, 2006/. We have to take into account that the growing process of genetically modified cultivated plants involves additional costs which are not directly connected with crop, but rather with management, monitoring and other expenses /Turka et al., 2005/. Special attention of the scientists is devoted to harvesting, transportation and storage.

The aim of the work is to get more detailed information on the profitability or loss of GM rapeseed growing in different regions of Latvia.

Materials and Methods

During the research, cultivation costs of conventional and GM rapeseed were calculated to define more precisely the profitability or unprofitability of genetically modified cultivated plants under conditions of Latvia.

Cultivation costs of conventional and GM rapeseed, service and extra costs are used for comparison. Views of experts are provided /Vanags, 2007/.

Results and Discussion

The rapeseed production area is increasing in Latvia. Spring oilseed rape accounts for 70% of the total area sown with oilseed rape. The yield of winter rapeseed in the best farms is 3000–3500 kg ha^{-1}, and spring rapeseed 2000 kg ha^{-1}. Until now Latvia has not had any experience in growing of GM rapeseed and other GM cultivated plants. With increase of areas of conventional rapeseed, expenses are going to increase for maintenance of coexistence with GM cultivated plants. In Table 1, potential gains

and losses regarding GM rapeseed growing are summarized. These studies are sometimes contradictory – ranging from the conclusion that it is possible to get higher yields to the conclusion that those benefits are not always due to higher yields, rather mainly caused by savings on herbicides and machinery /Economic impact, 1999; Gomez-Barbero, Rodriguez-Cerezo, 2006; Fredriksson, 2007; Lexmon, 2007/.

Table 1. Parameters of costs of conventional rapeseed growing, service and extra expenses

Growing, service and extra parameters	Some figures from trial data in EU
Profitability per hectare	1) +/− equal [4]; 2) + 4–8% [3]; 3) – ? Possibly lower selling price compared to non-GM crop [2, 4].
Growing costs	
Seed	− 37 EUR
Fertilisers, insecticides, fungicides	+/− equal
Herbicides	+ 34 EUR
Service costs	
Application of mineral fertilisers and pre- sowing tillage	+/− equal
Herbicide applications (machinery) 1–2 times less	+
Threshing, transportation, seed cleaning, seeds desiccation	− ? Extra costs – vehicles washing, individually by possibilities of farm
Extra costs	
• Coexistence costs for guarantee no more than 0.9% GMO in neighbouring fields	− ? Coexistence costs for maize 84 EUR/ha, for rapeseed it will be higher
• Identity preservation for GM / non-GM rapeseed	− 6–8% of the price or 10–13 EUR/t
• Costs of lab analyses regarding controlling of uncontrolled distribution of GM cultivated plants	− PCR 100–300 EUR/test − ELISA 10 EUR/test
• Destruction of seedling growth rapeseed along fields and road sides	− ?

The price of GM rapeseed seeds can be 20–30% higher than that of conventional rapeseed seeds. Consumption of mineral fertilisers in the crops of cultivated plants in the same agroecological conditions would not change. This means that there are no differences between the costs of mineral fertilisers for GM and conventional cultivated plants. Specific costs per unit of area are decreasing because herbicide costs are diminishing on GM crops. There are definite differences also in service because machines have to be used less.

The most important increase in costs is connected with extra costs predicted by the coexistence requirements.

The most important factor of farm income is sales price of the production. The following aspects have to be considered: possible lowest price – the expected sales price

of GM cultivated crops can be at least 10–15% lower than the sales price of conventional crops.

The amount of potential losses will have to be adjusted if supplementary and more complete information on the features and environmental influence of GM a cultivated plants is made accessible to the public (Table 2).

Table 2. View of experts on the amount of losses

Subjects of risk	Sector	Amount of losses
Biological farms	Biological farming, certification, support	Not less than 7–10% of the gained income
Seed production farms	Branch of seeds cultivation	Essential losses, even to 100%, if seeds of biologically endangered cultivated plants are grown
Farms growing rape seed	Growing of rape seed	Not less than 25–30% of the gained income
Apiculture farms	Apiculture	Not less than 50–70% of the gained income

Source – information by the branches experts.

The calculation of potential losses is included in Table 3 and is based on the assumption that in the case of invasion of genetically modified organisms, the usage of rapeseed in food will largely decrease. Therefore rapeseed with the presence of GMO will have to be utilized for the production of biofuel, which will diminish the price of conventional seed. Besides, rapeseed cake with biological contamination will not be used as forage if there is alternative supply. Therefore it is assumed that actual losses of growing GM HT rapeseed can decrease income for rapeseed growers by at least 30%. Also the region is taken into account where the potential rapeseed farm is situated.

Table 3. Potential losses of conventional rapeseed growing farms

Region	Calculation of losses / year 2007/			
	Area of rapeseed ha	Average income LVL/ha	Lost part %	Potential losses thousand LVL
Vidzeme	14 600	700	30	3 066
Kurzeme	13 800	900	20	2 484
Latgale	9 800	500	30	1 470
Zemgale	43 700	900	5	1 967
Riga region	9 300	700	10	651
Total	91 200	x	x	9 638

1 € – 0.7028 LVL

Source – data by Ministry of Agriculture and calculations by the authors.

Potential losses of apiculture farms

Favourable climate conditions and traditions promote a rapid increase in the number of bee colonies in the Republic of Latvia. According to the information provided by the Apiculture Association, almost each farm has a few beehives in Latvia.

During the recent year, the number of bee colonies has increased from 43 to 62 thousand. More than 150 organic farms also keep bees and this sets higher requirements to the quality of the production. In the case of pollution of genetically modified organisms over the level 0.9%, serious problems could arise regarding marketing of the production for appropriate prices. After counselling with apiculture experts, it was assumed that the price of honey with the presence of GMO is going to decrease by at least 50% (Table 4) because consumers prefer honey free of GMO.

Table 4. Potential losses of apiculture farms

Region	Calculation of losses /year 2007/		
	Number of bee colonies	Average income (LVL/ per apiary)	Potential losses = 50% (thousand LVL)
Vidzeme	14 600	80	583.3
Kurzeme	14 500	100	725.6
Latgale	12 300	60	370.0
Zemgale	10 600	70	372.8
Riga region	10 200	80	404.9
Total	62 200	x	2 456.6

1 € – 0.7028 LVL

Source – Association of Apiculture and calculations by the authors.

As it can be seen from the calculation results in Table 4, the predicted losses of apiculture farms are as high as 2.5 million lats.

Conclusions

1. Potentially little economic benefit is expected from growing rapeseed with tolerance to one herbicide in Latvia.
2. In the conditions of Latvia, GM cultivated plants could be economically important only in the future when disease and insect resistant GM rapeseed, potatoes and cereals are available in the country.
3. Potential costs of GM rapeseed growing exceed the potential income.
4. Since consumer preference is for honey free of GMO pollen, the price of honey and its products with GMO might decrease by at least 50%.
5. Growers of conventional rapeseed can potentially lose about 30% of the income if food rapeseed has to be used for biofuel.

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