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# Monitoring and inspection problems of GM crops situated potentially close to organic and beekeeping farms

I. Turka

Latvia University of Agriculture, 2 Liela, Jelgava, LV 3001,
phone: +3713021998, e-mail: Inara.Turka@llu.lv

**Abstract.** Precise information is essential to carry out qualitative inspections and monitoring that would help prevent the presence of the undesirable admixture of a GMO in organic and apicultural products. In order to be sure that coexistence is possible, theoretical investigation has been carried out on the basis of field blocks of institutions, on the basis of EU support. One of the most important coexistence requirements is a separation distance of 4000 m for fully fertile GM rapeseed from its organic congeners. The distance of 4000 m was scientifically defined taking into consideration the rather fragmented manner of crop production in Latvia. Regulations for restricted areas around the field blocks were determined in Latvia.

**Key words:** inspections, monitoring, GM crops

## INTRODUCTION

Latvia as an EU member country with an open market economy supports development of modern biotechnologies and their safe usage. However, with GM crops entering the environment, risks are also expected to appear for organic and beekeeping farms. The total farming area and number of organic farms have increased in recent years. According to the data available from the Ministry of Agriculture, within a period of 10 years, the number of organic farms has increased from 39 farms in 1998 to 4120 farms in 2007 (The situation in agriculture and rural area in Latvia, 2007). In general, GMO's are not wanted in organic farming and by definition organic farmers do not want to rely on GMO in their production. Pollen of some species, such as oilseed rape, beet and maize, can, to some extent, disperse by wind or bees to distances from 1– 4 km (Kjellson et al., 2003). Oilseed rape is an especially problematic species because hybrids between rape and field cabbage or wild radish easily establish, are quite common and may become sources for further dispersal of GM-traits. Seeds of oilseed rape can survive for 5 to perhaps 20 years, therefore, crop rotation has to be compulsorily observed (Eastham & Sweet, 2002). Latvian regulations stated that the isolation distance for oil rapeseed should not be less than 3–4 km. However, although this will greatly reduce the extent, it will not completely prevent dispersal by pollen. GM oilseed rape pollen can get into certified organic honey, causing losses to organic bee farms. It is not yet possible to accurately predict the spread of GM oilseed rape pollen by bees, wind, and birds, on fields of the conventional and organic farms. However, by mapping this spread, it can be concluded that after a few years, the spread of GM genes will be imminent in major areas (Turkaet al., 2005 a, 2005 b). It should

be noted that in Latvia there are relatively small fields and opportunities for GM pollen transfer are greater than using large rural areas for sowings. Small farms and non-specialized production make it difficult to arrange buffer zones and limit possibilities of coexistence (Messean et al., 2006).

Bees can simultaneously fly out in different directions: the actual distance of pollen transfer by bees can be up to 4 km, the possible transfer distance - from 8–10 km. The bumblebee flying range is different for each species and may range from 0.25–3 km (Turka et al., 2005a, 2005b; Vanags & Turka, 2008).

Currently, GM crops are not grown in Latvia and one of the most significant measures in the risk assessment would be extraction of the base information on the situation in the ecosystem before the spread of GM crops in the environment.

**The aim of the research** is to examine in a timely manner the number and opportunities for the future inspection and monitoring procedure of undesirable GMO spread on the neighboring organic farms, especially in the case of the potential GM oilseed rape cultivation, at the level of the farm and beyond.

## MATERIALS AND METHODS

For the research of GM oilseed rape quality inspection and monitoring performance, data on the field blocks of the LUA Training and Research farm "Vecauce" are used; these have been declared for EU support. In the field blocks, the conventional rape occupies 290 ha of land with field sizes ranging from 4–102 ha in 2007 and from 6–79 ha in 2008 (Figs 1–2). Bee farms are located around the perimeter of the farm. In the neighboring parishes bordering Lithuania there are also conventional oilseed rape fields that have been declared for EU support.

**Fig. 1.** Location of the simulation research in Latvia.


**Fig. 2.** Land blocks declared for EU support by LUA Training and Research Farm "Vecauce."

## RESULTS AND DISCUSSION

From the point of view of the potential entry of the GM rape into the environment, the greatest interest is paid to the cultivation sites and areas of the conventional rape as there will be a wish to grow GM oilseed rape in suitable soils. It will be difficult or impossible to find coexistence possibilities with GM oilseed rape in areas with highly developed organic farming and beekeeping if the conventional oilseed rape is replaced by GM oilseed rape.

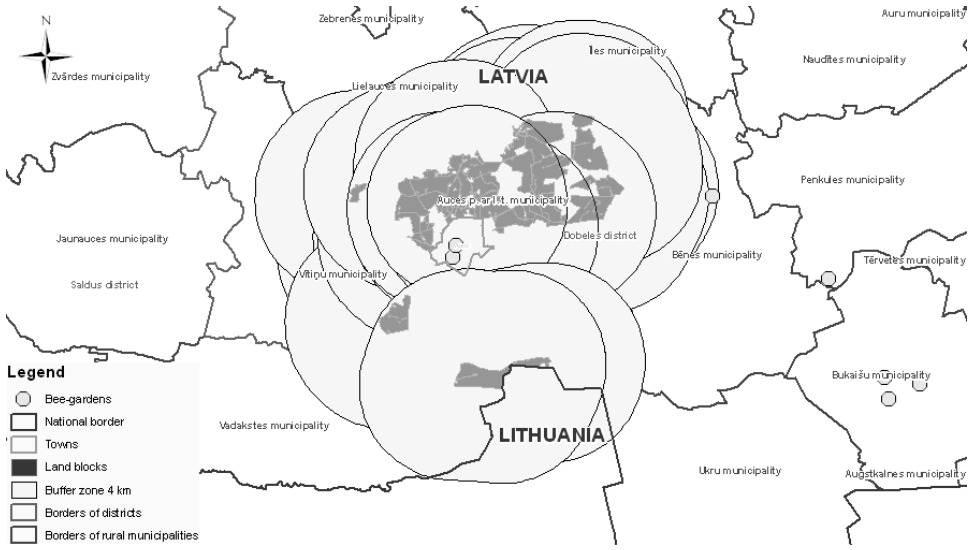


**Fig. 3.** Land blocks and bee gardens with 4 km buffer zone from one farm.

In the land block, under optimum crop rotation there will always be an oilseed rape field or another other crop of the mustard family. It should be recognized that in Latvia there are both declared beehives and bee hobby farms which extend over the entire country. If we mark the buffer zones around the actual bee farms and the actual land blocks where one of the crops is oilseed rape, we can obtain the picture given in Fig. 3. The buffer zones in these cases extend into the territory of other districts and other countries. It should be noted that cross-border agreements on sharing and monitoring information have not yet been concluded.

Describing the actual conventional oilseed rape fields which are declared for EU support and their buffer zones (Fig.4), it can be clearly seen that it is not possible for the given farm and its surroundings to include genetically modified oilseed rape within the required buffer zones. It should be noted that information on actual fields is not publicly available, which makes planning of monitoring and operational inspections more difficult.

Taking into account the available information on the land blocks, bee apiaries, nectar plants, all the territories overlap and it is impossible to trace them separately. Although organic farms are not included in the available model, it is easy to conclude that under these rules their location would not be possible, therefore the introduction or coexistence of economic management (Fig.5) is limited.


**Fig. 4.** Rape fields with 4 km buffer zone, 2008.

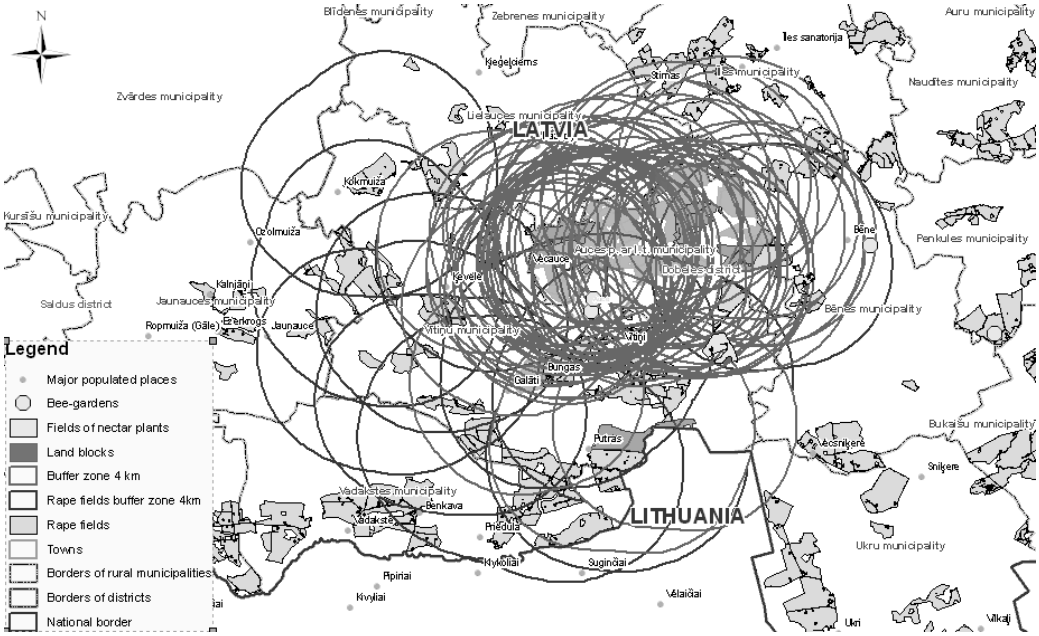


**Fig. 5.** Land blocks, rape fields with 4 km buffer zone, fields of nectar plants and bee gardens, 2008.

In turn, by examining the information on the actual location of the conventional oilseed rape fields in the adjacent areas outside the borders of a single holding (the oilseed rape fields outside the defined buffer zones) it can be concluded that a completely opaque situation is given to the inspector. So far, coordination of the potential buffer zones along the borders of the neighboring countries remains unsolved.

But in real life objective information has to be obtained, especially if disputes arise. Before growing GM crops, a huge amount of organizational work on the exchange of information will have to be carried out.

## CONCLUSIONS

Coexistence of biologically farmed and GM crops is a complex situation where coexistence of the different types of production primarily depends on the organizational, technical and legal issues and information widely available to the general public. The potential for buffer zones along the borders of the neighboring countries remains unsolved.

In Latvia various farming systems are located in a relatively small area. It should be noted that information on actual fields is not publicly available, which makes planning of monitoring and operational inspections more difficult.

Monitoring and inspections of undesirable and advantageous GMO spread from conventional to organic farms will be an extremely difficult and expensive process because buffer zones overlap.

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