EUROPEAN COMMISSION
AGRICULTURE DIRECTORATE-GENERAL
DIRECTORATE-GENERAL JOINT RESEARCH CENTRE

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ARGUMENTAIRE ON CO-EXISTENCE OF GM CROPS

WITH CONVENTIONAL AND ORGANIC CROPS

1- WHAT DOES CO-EXISTENCE OF GENETICALLY MODIFIED, CONVENTIONAL AND ORGANIC CROPS MEAN?

Co-existence means the principle of freedom of choice for economic operators to apply different agricultural production systems. These production systems can be differentiated into conventional systems including GM crops, conventional systems using non-GM crops and organic farming systems only using non-GM crops.

Naturally, different modes of agricultural production are not compartmentalised. The cultivation and use of GMOs is strictly regulated in the Community. However, the adventitious presence of GM crops in organic or in conventional crops cannot be excluded during cultivation, harvest, transport, storage and processing.

2- WHY HAS THE COMMISSION (DG AGRI) COMMISSIONED A STUDY ON THE PROBLEM OF CO-EXISTENCE?

If GM crops increase their share in EU agriculture, the question arises as to whether adventitious presence of GM crops in organic or in conventional crops at farm and at regional level could significantly increase if current farming practices are maintained.

In Action 17 of the Communication from the Commission on “Life Sciences and Biotechnology- A strategy for Europe”, the Commission has committed itself to take “initiative to develop, in partnership with Member States, farmers and other private operators, research and pilot projects to clarify the need and possible options, for agronomic and other measures, to ensure the viability of conventional and organic farming and their sustainable co-existence with GM crops”.

This study is a first project addressing these questions and trying to evaluate the consequences of the introduction and possible increase of GM crops in order to find appropriate measures at the farm level to minimise the adventitious presence of GMOs.

The Commission commissioned the study with the following objectives:

- To identify sources and estimate levels of adventitious presence of GM crops in non-GM crops at farm level

- To explore and assess changes of farming practices that could minimise the adventitious presence of GM crops in non-GM crops below the thresholds laid down in Commission legislation (for the labelling of GM food) or discussed for future legislation on the purity criteria for seeds and in the context of the two proposals on traceability and labelling of GMOs and on GM food and feed

- To develop possible monitoring systems needed for verification.

- To estimate the costs of relevant changes in farming practices, monitoring systems and of potential insurance systems to cover possible financial losses due to adventitious presence of GM crops in non-GM crops.

3- WHAT IS THE BASIS AND SIGNIFICANCE OF THE STUDY?

The study coordinated by the JRC is a prospective study, based on assumptions needed to illustrate different scenarios. These assumptions should not be taken as an anticipation of future developments. This applies especially to the hypothetical GMO shares of 10% and 50% and the selected thresholds of 0.1%, 0.3% and 1%. An increased GMO share would certainly require a corresponding demand and would result in a different price structure. These aspects have not been included in the study. The scenarios presented are built on the actual demand and supply situation and the identified costs cannot be used to predict future prices.

To estimate on-farm levels of adventitious presence of GM crops in non-GM crops and to compare the effects of changing farming practices a combination of expert scientific opinion and computer models was used. The computer models are useful for comparisons of different farming practices. The absolute values provided by the models (e.g. when considering if a particular threshold can be respected) have to be taken with care, since the models are not yet fully validated.

A set of farming practices, referred to as current farming practices in the study, needed to be defined for each crop to estimate a “baseline” level of adventitious presence of GM crops in non-GM crops. These current farming practices are obviously a compromise given the variability existing in EU farms in this regard. Therefore, when the results indicate that changes in farming practices are needed to respect a certain threshold (and the costs of these changes are estimated), it could be that a significant number of farms are already applying the proposed or similar agronomic practices (specially in the case of seed production).

This prospective study is based on computer modelling and expert opinion. Overall the interpretation of the data has to be done with care because of the limited on-the-field evidence available and the consequently limited validation of the modelling methods employed. The basic hypotheses and the consequent quantitative results should also be tested on experimental fields of adequate size before drawing more general conclusions.

The unique feature of the study is the multi-step approach of identifying the sources and levels of adventitious presence of GMOs, proposing suitable changes of agricultural

management practices to comply with defined thresholds, and the subsequent calculation of associated costs. Thus, the study addresses socio-economic implications rather than simply estimating risks of adventitious presence of GM crops in semi-quantitative terms.

4- WHAT ARE THE IMPLICATIONS OF THE RESULTS OF THE STUDY FOR PRODUCTION OF CONVENTIONAL FARMING AND FOR ORGANIC FARMING ?

Three arable crops were selected as case studies representing different biological characteristics but also the likelihood of a future introduction of their GM varieties in the EU: oilseed rape for seed production, grain maize used for feed production and potato for direct consumption and food processing.

Several farm types (both organic and conventional) were defined to cover the variability present in EU farming infrastructure. For all crop-farm combinations, a hypothetical share of GM crops of 10% or 50% in the region was considered. A share of 50% mimics the situation in countries that have already adopted GM crops (for example the share of GM oilseed rape in Canada is currently 54%), while the 10% figure represents a scenario of slow adoption of GM crops.

The estimated levels of adventitious presence of GM crops do not change dramatically between the two scenarios of GM crop share (10% or 50%). A practical consequence is that measures to prevent adventitious presence of GM crops may have to be implemented in the early stages of adoption.

On the other hand, the estimated levels of adventitious presence of GM crops in non-GM crops - assuming current farming practices - vary significantly depending on the crop and farm type (for example, as much as 2.2% for a conventional intensive maize farm or as low as 0.1% for an organic potato farm). In general there is a trend to expect lower levels of adventitious presence of GM crops on organic farms, because of segregation systems already in place, but there are notable exceptions. In seed production of rape, organic farms will face higher probability of adventitious presence of GM crops due to problems in controlling volunteers with organic practices.

Sources of adventitious presence of GM crops are well known, and can be divided into four main origins (seed impurities, cross-pollination, volunteers and harvesting-storage practices). The relative importance of each source for the final level depends on the crop and farm type. Volunteers are a key source of adventitious presence of GM crops for rape seed farms (especially organic) but are of low importance in maize farms, where seed impurities and cross-pollination account for most of the adventitious presence of GM maize.

5- WHAT ARE THE IMPLICATIONS OF THE RESULTS OF THE STUDY FOR PRODUCTION OF NON-GM SEEDS?

The report examines only the case of oilseed rape for seed production. Out of more than 2 million ha devoted to oilseed rape production in Europe, only about 3000 ha are dedicated to seed production. Cultivation of oilseed rape dedicated to seed production is done under completely different conditions: certified seed producers are assumed to grow seeds according to certified production standards (e.g. for hybrid seed: isolation distance

of 300 m and a 6 year rotation; careful post-harvest segregation). Farms using farm-saved seeds are assumed to be about three times larger. The conventional farm applies a short three-year rotation, exchanges seeds and shares machinery with its neighbours or uses contractors.

The computer model GENESYS was used as well as experts opinions for estimations of adventitious presence of GM seed crops. GENESYS has been developed by INRA (Institut National de la Recherche Agronomique) in France to rank cropping systems according to their probability of gene flow from herbicide tolerant winter oilseed rape to rape oilseed volunteers both in time via seeds and in space via pollen and seeds. The model integrates various input variables: field plan of a region, crop rotations, cultivation techniques for each crop, type of the transgene, etc. It is suitable for both seed and crop production.

Applying current practices, levels of adventitious presence of GM crops are estimated to range from 0.42% to 1.05% depending on the farm type in the case of the 50% GM oilseed rape for seed production scenario. All farm types, organic as well as conventional, could achieve a hypothetical 0.3% threshold for GMOs in seed production by changing farming practices. For farms using farm-saved seeds costs would however be disproportionately high. These farms would most likely stop saving seeds and instead use certified seeds.

A 0.1% threshold would be more difficult to reach. Theoretically, levels of adventitious presence of GM crops could be reduced to very low levels (< 0.1%) by reinforcing the changes in farming practices. The only exception would be conventional farms using farm-saved seed, where achieving such low levels seems not to be feasible without changing the post-harvest farming strategy completely.

6- WHAT ARE THE POSSIBILITIES FOR REDUCTION OF THE ADVENTITIOUS PRESENCE OF GMOs IN CONVENTIONAL OR ORGANIC CROPS?

The different possibilities depend on the farm-crop combination. The theoretical thresholds used in the analysis are similar to those being discussed in respect to future regulations. These are 0.3% for seed production of allogamous species (rape) and 1% for maize and potato crops (for food-feed uses). All farm types producing oilseed rape seed or conventional maize will need significant changes to meet their thresholds. In some cases (dependent on farm type) changing farming practices at the individual farm level will be insufficient. In these cases changes may involve co-operation between neighbouring farms. Examples are the introduction of flowering time differences between GM and non-GM varieties, or region-wide border management. In contrast, all potato farm types and some maize farm types (organic) could meet these thresholds with current farming practices (with all the reservations for the value of absolute figures).

The possibility of changing practices to meet very low thresholds for all crops, near the analytical limit of quantification (~ 0.1%) is also considered in the report. This reflects the situation in organic farming where the use of GM varieties is not permitted (Council Regulation (EC) 1804/1999), setting a *de facto* threshold. The report concludes that a 0.1% limit will be extremely difficult to meet for any farm-crop combination in the scenarios considered (10% and 50% GMOs in the region), even with significant changes

in farming practices. Perhaps some farm types producing seed of oilseed rape could approach such thresholds, but only with significant changes of farming practices.

7- WHAT ARE THE IMPLICATIONS FOR THE 1% THRESHOLD CURRENTLY IN PLACE IN EU FOOD LEGISLATION?

Compliance with the 1% threshold is possible, however in some cases only through changes in farming practices. This also means setting up monitoring systems as well as insurance needs. It may result in additional costs of 1 to 10% of current product price for the farm-crop combinations studied (in the 50% scenario of GM crops in a region). Costs reductions might be possible with segregation becoming an integrated part of agricultural practices and with decreasing costs of GMO analysis. Generally, organic farms face higher costs, especially indicative insurance cost, than conventional farms. However, when relating costs to product prices, the price premium for organic crops may reduce this difference in percentage terms.

Cultivation of GM and conventional or organic crops on the same farm might be an unrealistic scenario, even for larger farms.

8- WHAT FUTURE WORK IS NEEDED/ENVISAGED?

The study gives the first results on the important issue of co-existence. The Commission wants to see the work carried on by the JRC. This has already been expressed and has been taken into consideration in the JRC future work programme.

One of the conclusions of the study is that regarding the probability of adventitious presence of GM crops in non-GM crops, additional research is necessary to provide experimental data on gene flow for oilseed rape, maize, potato and other crops not taken into account in this study.

More information on actual levels of seed impurities in the lots marketed in the EU is essential for simulations like the ones presented in this study. It is also necessary to undertake the same work for maize seed, to better understand how co-existence will impact on seed production and to provide information for an adaptation of seed production standards.

Regarding economic data, the study lacks the cost estimation of some of the proposed agricultural changing practices. To estimate the real costs of for example introducing large isolation distances, the alternative use of agricultural land has also to be analysed. Changing post-harvest management could include changes of the logistics at the next step of the supply chain, again making a very complex analysis necessary. This points out the need for further studies concentrating on the economic aspects and probably going into more detail with a reduced number of cases and considering the complete economic structure of a farm.