SESSION 5:
THE VARIOUS STAKEHOLDERS' POSITIONS

SUSTAINABLE AGRICULTURAL SYSTEMS AND GMOs. IS CO-EXISTENCE POSSIBLE?

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Abstract

European agriculture is characterised by a small-scale structure and by a high share of organic farmers. Traditional production systems are also preferred in conventional agriculture. The EU Regulation for organic farming no. 2092/91 forbids strictly the use of GMOs. Farmers, ecologists as well as consumers in Europe have quite a critical attitude towards genetic techniques, as they are seen as not necessary and dangerous in certain areas. In Europe, except Spain, there are no GMOs cultivated commercially. There are no long-term studies about the effects of GMOs on ecosystems. In addition, the problems of co-existence, measures to avoid contamination, liability, costs and others, have not been solved yet. On the basis of the studies published up to now, a co-existence of organic, GMO-free and GMO agriculture is not possible. Therefore, in spite of an enormous pressure on the part of the WTO and the USA, the attitude of Europe is, to prevent the cultivation of GMOs until the issues of co-existence are solved.

1. Introduction

In 1996 genetically modified plants were first commercially planted worldwide, since then the cultivation of GM crops increased rapidly.

About 51 % of the soja, 9 % of the of maize and 12 % of the oil seed rape production deriving from GMO plants, is grown mainly in USA, Argentina, Canada, China and recently in Brazil too (soja production). Spain is the only country in Europe, where GMOs (Bt-Maize, about 25.000 ha[1]) are cultivated.

In Europe farmers as well as consumers are quite sceptical towards genetic modified crops and food, the consequence of this attitude was the creation of a control system, which should prevent the authorization of GM crops up to the moment the environmental and health risks would have been clarified completely.

In June 1999 a de-facto moratorium on GM products was established. Its main task was to control the authorization and placing on the market of GM crops in Europe. The moratorium was meant to be maintained up to the revision of the Regulation 90/220[2], which mainly regulates the setting free of GMOs. In February 2001 the revised Regulation 2001/18 was adopted by the European Parliament and entered into force in October 2002. The United States joined by other states called for a removal of the moratorium within the WTO and therefore for free export possibilities of GM crops to Europe.

As far as it concerns Europe the new legislation does not regulate the GMOs problematic, also because of the completely different agricultural situation. Europe has a high share of organic farmers, as well as a small structured agriculture.

[1] Hacres.
[2] For an overview of the EU legislation quoted in the text please see paragraph 7. Legislative Framework of this paper.

The EU Regulation 2092/91 which regulates organic farming and processing systems, prohibits the use of GMOs, therefore, new EU legislation regulating the co-existence of organic, GMOs free and GMOs cultivation had become necessary.

In July 2003 the European Commission issued guidelines for co-existence, which are based mainly on the voluntary arrangements between neighbouring farmers, and try to solve the problem on national level. Therefore, the demand rose to keep up the Moratorium, up to the moment the problem of co-existence has been solved.

2. Problems of Co-Existence

2.1. Routes of contamination[3]

2.1.1. Seeds and Seedlings

The purity of purchased seeds influences remarkably the contamination level of the harvest. Although certified seed production has to meet high quality standards, it can happen that also certified seed is mixed during storage or transportation. Up to now there is very limited GM production in Europe. Therefore, the danger of seed contamination is not that high. However, the case in Upper Austria, where Maize seed was mixed with a small amount of GM seed from the US, showed that farmers always have to face the contamination problem.

2.1.2. Transfer of Modified DNA

Pollen Transport and Fertilisation
The pollen dispersal determines to a large extent the distances of vertical gene transfer. The main pollinators are wind and insects, as well as birds and mammals. For some plants water as well can play an important role in pollination. For estimation of distances climate and topography has to be taken into consideration too. For the species where GMOs are cultivated commercially the pollination is limited to wind and insects.

Diaspore Banks
The transportation of seeds has to be taken into account as well when trying to estimate gene flows. Oilseed rape can persist in soil for many years (Lutman 1993, Sauermann, 1993, Schlink 1994 and this can lead to severe volunteer problems.

Volunteer rape is a common and widespread weed in cereal rotations and field margins, roadsides and soil dumps. Therefore, volunteers can also act as a reservoir of transgenes. Feral rape populations can persist around agricultural land for up to 10 years.

Transfer of Genes from Cultivated to Wild Species
Some plant species, e.g. oilseed rape, have the capacity to build up independent populations outside the cultivated area. After feral plants have become established in various ecosystems, management measures are only sufficient to a limited extent.

[3] Contamination can be seen in this context. Conventional and/or organic crops and products can be made unsuitable for the market if mixed with GM components above certain thresholds.

Any gene that leads to an increase in fitness, such as is potentially presented by virus or insect resistance, is more likely to persist.

Horizontal Transfer
There are various uncertainties about the horizontal gene transfer from plants to soil microorganisms. Studies showed that there is an accumulation of toxin, deriving from
Bt-Maize in soil, retaining its anti-lepidopteran activity for at least 180 days (Saxena et al., 2002).

2.1.3. Harvesting and Processing

Seeds can be inadvertently moved from field to field in machinery, as well as spillage occurring along transport corridors. Oil seed rape ruderal populations for example were found along railway tracks in Lower Austria (Pascher et al., 2000).

Contamination of other crops can occur through gene flow from volunteers or from volunteers being harvested along with the crop. Potential sources for contamination are seed drills, cultivation equipment, harvesting machinery, transporting vehicles, storage, cleaning, drying facilities and packing.

In the case of processing of GM and non-GM products in the same installations there is a very high risk of contamination, since complete cleaning is not possible for dusty goods. This is also one of the main problems in feed production. Ingredients, additives and processing agents may consist of or contain GMOs as well.

2.2. Possible Measures to Avoid Contamination

2.2.1. Measures to Avoid Pollen Transfer

Security Distances
Oil seed rape presents a high risk for cross-pollination between source and recipient fields. Pollen dispersal has been recorded at up to 4km by honeybees (Ramsey at al, 1999), and to 3km by the air flow (Thompson at al., 1995).

Sugar beet presents a medium to high risk for cross-pollination both with other stands and with wild relatives. In areas producing sugar beet, seed flowering is a necessity and here the risk of cross-pollination increases accordingly. The pollen produced can be spread extensively on the airflow up to 800m (Jensen et al., 1941).

Maize presents a medium to high level of risk for cross-pollination with other maize crops as the pollen can spread on the airflow. Pollen distribution, as determined by outcrossing between different maize varieties, has been recorded at up to 800m (Jones et al. 1950). Maize also presents a medium to high risk for the inclusion of pollen into honey.

Wheat, Potato and Soja can be described as low risk for contamination from genetically modified varieties.

Much of the research published relies on small field trials (including GM trials). Evidence indicates that the extent of gene flow between GM and non-GM fields, and between GM and feral populations depends

mainly on the scale of pollen release and dispersal, and on the distances between source and recipient populations.

The potential impact (including cross pollination and inclusion in honey) of pollen from GM crops increases notably with the size and number of fields planted.

Hedges and Similar Barriers
The few studies on this issue show the uncertainty associated with the establishment of border rows or barriers to reduce gene flow (Ingram 2000, Morris et al 1994). A lot of research in this area has still to be done.

Genetic Engineering Approaches
Genetic engineering methods are also seen to provide pollen dispersal. According to Eastham and Sweet (2002) following techniques are worth considering with regard to GMOs:
- Apomixes: production of seeds without fertilisation
- Kleistogamie: self-pollination in closed blossom
- Prevention of flowering by subsequent control of flowering through application of chemical elicitors
- Male sterility: prevention of flowering and development of pollen
- Plastid transformation: Plastid DNA is transformed instead of DNA of the nucleus. In many cases, this allows to prevent transgenic pollen, as plastids are maternally inherited in most macrophytes.
- Sterility of seeds: prevention of germination of seeds

There are no indications up to what extent these possibilities are merely theoretical in nature and bring yield declines with them.

GMO Free Areas
The establishment of GMO free areas is one of the efficient measures to avoid contamination. The determination of protection goals is here of central importance. Some of these evaluation criteria could be:
- protected areas for preservation of biodiversity (e.g. Natura 2000)
- areas for organic farming
- areas of the enhanced in-situ (on-farm) preservation of plant-genetic resources under GMO-free conditions (Art.8 of the CBD)
- development or "transition" areas for sustainable agricultural development
- mountain areas, whose ecological sensitivity merits special consideration following Agenda 21,Capt.13

3. Thresholds

Each farmer should have the possibility to choose the agricultural systems, most appropriate to him. This freedom of choice needs a legal basis, such as strict threshold values. Organic certification works on the basis of the traceability principle. Testing of the end product is a complementary tool to confirm that the control system is sufficient, but can never be the main goal. Therefore, threshold levels can only indicate the maximum tolerance for exceptional and unforeseeable contamination events but not for permanent levels of contamination.

The following thresholds were established for Austria:

Threshold	Valid for	Reference
0,1	Seed of the following species: • Swede (Brassica napus L. var. napobrassica) • Maize (Zea mays) • Oilseed rape (Brassica napus) • Turnip rape (Brassica rapa) • Soybean (Glycine max) • Turnip (Brassica L. var. rapa) • Tomato (Lycopersicon lycopersicum) as processing varieties • Chicory (Cichorium intybus L.)	BMLFUW 2001w
0,1	Threshold values for exceptional and unforeseeable contamination with GMOs and derivates for products deriving from organic agriculture: for food ingredients and food processing aids, feed ingredients and feed processing aids, fertilisers and soil improvers	BMSG 2001

Recently the EU Regulation 1829/2003 on genetically modified food and feed had been published. Food and feed that contains more than 0,9% GMOs or derivates related to the different ingredients, has to be labelled, irrespective of the detectability of transgenic DNA or protein. Until now there are no threshold values for organic products established by the EU. A threshold value of 0,9% is not compatible with organic standards. The threshold should be based on the detection limit, which is now 0,1%, also in order to meet consumers interpretation of organic or GMOs free products. The planned fixing of threshold values for seed on EU level had been recently postponed because of inconsistency between member states. Austria as well as Italy stands up for values on the detection limit. In the case of commercial cultivation of GMOs a thresholds of 0,1% seems to be extremely difficult to achieve (Bock et al, 2002).

4. Liability

If adventitious presence of GM crops in non-GM crops occurs above a set threshold a reduction in income could be expected. Organic farmers could also loose their subsidies. Therefore, a clear liability program has to be in place before GM cultivation starts.

In addition to the strict liability regime, IFOAM[1] proposes also the establishment of a compensation fund, paid for by the GMOs industry. The fund would use the contributions from all who benefit financially from GMOs to compensate those who suffer financial loss through genetic contamination. It would also cover any environmental damage (IFOAM, 2003)

5. Agricultural Structure in Austria

Austria is characterised by small structured agriculture, the average farm size is between 10 and 20 ha and by a very high percentage of organic farmers.

[1] IFOAM stands for: International Federation of Organic Agriculture Movements (www.ifoam.org).

The organic movement in Austria originated in 1980, when 200 farmers decided to cultivate their farms according to organic methods. The development had its largest growth up to the end of the nineties; in 1999 it reached its peak with 19,733 farms.

The most important factors for this enormous increase have been:

- the early addition of guidelines for organic crop production and animal husbandry to the Austrian Codex Alimentarius;
- the government support for organic farms during and after conversion through compensatory payments;
- favourable market conditions through the entrance of supermarket chains and
- an active policy of the organic associations (mainly BIO ERNTE AUSTRIA, with a share of nearly 65% of all organic farmers).

In 2001 an "Action Plan for Organic Agriculture in Austria" was developed. This plan is scheduled to increase the organically treated area to 50% until 2006 (BMLFUW, 2003b).

In 2002 17.891 farmers cultivated 12% of the agriculturally used area (BMLFUW, 2003a).

Moreover, a high percentage of Austria belongs to ecological sensible areas like the Alps or Natura 2000 areas.

Because of the characteristics mentioned above and also because the clear attitude of consumers and farmers against genetic techniques in food and feed production, Austria tried to establish (national or regional) regulation to forbid the cultivation of GMOs.

The national law from Upper Austria, creating a GMO free zone Upper Austria, was rejected by the European Commission following the assessment of the European Food Safety Agency (see EU press release IP/03/1194). The reason for this rejection was the lack of scientific evidence, confirming that Upper Austria has extraordinary topographic and ecological characteristics.

6. Conclusion and Recommendations

Based on the European Commission recommendations on co-existence there is a strong need to regulate co-existence of organic, GMO-free and GMO farming systems on all levels, from farm level to management at the neighbourhood level and measures with region-wide dimension. All effective and necessary measures to avoid contaminations are extremely expensive and need time consuming planning phases. Therefore, questions concerning liability must be solved completely before GM commercial cultivation is possible in Europe.

If organic farming as well as certified GMO-free production are going to continue and if consumers expectations and preferences in the long term have to be met, there is a strong need for additional protective measures for the organic production system. Particularly, defined areas are required which can be used to build up and maintain a separate, GM-free branch of seed breeding and propagation.

7. Legislative framework

EU Legislation:

- Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC 23 April 2003 (OJ L117,08/03/1990 p. 15) - Commission Declaration

- Regulation (EC) No 1829/2003 of the European Parliament and of the Council of 22 September 2003 (OJ L268 18/10/2003 p.1) on genetically modified food and feed (Text with EEA relevance)

- Regulation (EC) No 1830/2003 of the European Parliament and of the Council of 22 September 2003 (OJ L268 18/10/2003 p.24) concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms and amending Directive 2001/18/EC

- Council Regulation (EEC) No 2092/91 of 24 June 1991 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs

- Commission Recommendation 2003/556/EC of 23July 2003 (OJ L189 29/07/2003 p.36) on the guidelines for the development of national strategies and best practices to ensure the co-existence of genetically modified crops with conventional and organic farming.

- Commission Regulation (EC) No 49/2000 of 10 January 2000 amending Council Regulation (EC) No 1139/98 concerning the compulsory indication on the labelling of certain foodstuffs produced from genetically modified organisms of particulars other than those provided for in Directive 79/112/EEC

- Corrigendum to Commission Regulation (EC) No 50/2000 of 10 January 2000 (OJ L 6 11/1/2000 p.) on the labelling of foodstuffs and food ingredients containing additives and flavourings that have been genetically modified or have been produced from genetically modified organisms

Austrian Regulations:

- BMLFUW, 2001: Verordnung 478 des Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft über die Verunreinigung von Saatgut mit gentechnisch veränderten Organismen und die Kennzeichnung von GVO-Sorten und Saatgut von GVO-Sorten (Saatgut-Gentechnik-Verordnung).BGBl II/478/2001.

- BMSG, 2001: Beschluss betreffend "Festlegung von Schwellenwerten für zufällige, unvermeidbare Verunreinigungen mit gentechnisch veränderten Organismen und deren Derivaten" zur Verordnung (EG) Nr. 2092/91, Biologische Landwirtschaft. GZ.32.046/72-IX/B/1b/01.

Private Standards:

- IFOAM Position Paper, IFOAM EU Group, 2003: Position Paper: Co-existence between GM and non-GM crops, Necessary anti-contamination and liability measures. http://www.ifoam.org/pospap/ge_position_0205.html

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