Co-existence of GM and non GM crops: case study of maize grown in Spain

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Executive summary
Given that GM (Bt) maize is in its sixth year of cultivation in Spain, this offers a unique (in the EU context) case study of whether approved GM, conventional and organic crops can co-exist. This paper examines the issue.

Current co-existence
Out of the current area planted to maize in Spain (about 460,000 hectares), about 32,000 ha (7%) is to GM insect resistant (Bt) varieties, less than 1,000 hectares (0.2%) is organic and the vast majority is 'conventionally produced'.

The evidence to date shows that these three types of maize production have co-existed without economic and commercial problems. This includes in regions such as Catalunya where GM (Bt) is concentrated[2]. Where non GM maize has been required in some markets, supplies have been relatively easily obtained, based on market-driven adherence to on/post farm segregation and by the purchase of maize from regions where there has been limited adoption of Bt maize (because the target pest of the Bt technology, the corn borer is not a significant problem for farmers in these regions). Isolated instances (two) of GMO adventitious presence in organic maize crops were reported in 2001.

Future co-existence
For the future, the likelihood of co-existence problems arising remains fairly limited, even if there is a significant expansion in both the areas planted to GM crops and to organic maize because:

- GM (Bt) maize is unlikely to dominate maize plantings in Spain, being concentrated in regions where there are significant (corn borer) pest problems. In other words there will continue to be regions of Spain where GM (Bt) maize will not be widely planted;
- The organic maize area is likely to continue to be a very small part of the total maize crop (even if there was a tenfold increase in plantings), with a very limited economic contribution relative to the rest of the Spanish maize crop;
- some changes to farming practices on some farms may be required. This will however, only apply where GMO maize crops are located near non GM or organic crops for which the non GM status of the crop is important (eg, where buyers do not wish to label products as being GM or derived from GM according EU labelling regulations). These changes are likely to focus on the use of separation distances and buffer crops (of non GM maize) between the GM maize crop and the 'vulnerable' non GM/organic crop.

Lastly, the organic sector can also take action to facilitate co-existence by:

- applying a more consistent, practical, proportionate and cost effective policy towards GMOs (ie, adopt the same policy as it applies to other unwanted material). This would allow it to better exploit market opportunities and to minimise the risks of publicity about

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[2] Bt maize accounts for about 15% of total maize plantings in this region

inconsistent organic definitions and derogations for the use of non organic ingredients and inputs damaging consumer confidence in all organic produce; OR

- apply the same testing principles and thresholds currently applied to GMOs to other unwanted materials (eg, apply a test-based regime for pesticide residues); AND
- accepting that if it wishes to retain a policy towards GMOs that advocates farming practices that go beyond those recommended for GMO crop stewardship (eg, buffer crops and separation distances that are more stringent than those considered to be reasonable to meet the EU labelling and traceability regulations), then the onus for implementation of such measures (and associated cost) should fall on the organic sector in the same way as current organic farmers incur costs associated with adhering to organic principles and are rewarded through the receipt of organic price premia.

1 Introduction

EU level approval for the planting of GM insect resistant (Bt) maize was given in 1998, prior to the introduction of a de facto moratorium on the regulatory approval of new GMOs in the EU.

Since 1998, the only EU country where Bt maize has been grown commercially has been Spain, where annually, about 0.25-0.3 million tonnes of Bt maize has been produced. In addition, Spain has been importing maize from Argentina (imports from Argentina have annually been between 0.6 million tonnes and 1.4 million tonnes over the last five years), much of which has been GM.

As new legislation designed to pave the way for lifting the moratorium has been agreed (ie, relating to labelling and traceability), one of the main subjects of current debate remains the economic and market implications of GM and non GM crops being grown in close proximity (ie, co-existing).

This paper examines these issues from an economic perspective, drawing on the unique case study evidence of the Spanish maize production sector, where GM maize is in its sixth year of cultivation.

2 What is co-existence?

Co-existence as an issue relates to '*the economic consequences of adventitious presence of material from one crop in another and the principle that farmers should be able to cultivate freely the agricultural crops they choose, be it GM crops, conventional or organic crops'* (EU Commission 2003). The issue is therefore not about product/crop safety but about production and marketing of crops approved for use in the EU.

Adventitious presence of one crop with another can arise for a variety of reasons. These include seed impurities, cross pollination, volunteers (self sown plants derived from seed from a previous crop), from seed planting equipment and practices, harvesting and storage practices on-farm, transport, storage and processing post farmgate.

3 Current/recent planting of maize crops in Spain

GM (insect resistant[3]) maize (the variety *Comba CB* from Syngenta Seeds) was first planted commercially in 1998 when seed sufficient to plant 20,000-25,000 hectares was sold. Between 1998 and 2003, the area planted to Bt maize remained at this level (equal to 4%-5% of total Spanish maize plantings of about 460,000 hectares) because of a voluntary arrangement by Syngenta Seeds to limit seed availability until there was reasonable prospect of the EU wide moratorium on new GM approvals being lifted. With the passage into EU law of the new legislation on the deliberate release of GMOs (Directive 2001/18 which now forms the base of the EU regulatory approval process), the Spanish government granted approval for a further five varieties of Bt maize to be planted in March 2003, and for the 2003 crop harvest, the area planted to Bt varieties is estimated to have increased to about 32,000 hectares (about 7% of total plantings).

The main regions in which Bt maize seed has been planted are shown in Table 1. The highest concentration of use is in Huesca, Zaragosa and Lleida provinces. Overall, in provincial terms Catalunya has the highest concentration of Bt maize plantings with about 13% of total maize plantings being to GM seed.

[3] Bt

Due to the problems that many growers face with corn borer damage to crops in these regions, Bt maize has proved popular offering improved pest control, higher yields, enhanced income levels and reduced production risk (Brookes 2003).

Table 1: Main regions growing Bt maize in Spain 1998-2002

Province	Region
Huesca	Aragon (North East)
Zaragosa	Aragon (North East)
Lleida	Catalunya (North East)
Girona	Catalunya (North East)
Albacete	Castilla la Mancha (South/Central)
Badajoz	Extremadura (West)
Sevilla	Andalusia (South West)

Source: Syngenta Seeds, Spain

In relation the area planted to organic maize there is limited data available. Published data by the Spanish Ministry of Agriculture does not disaggregate below all cereals and legumes which were about 98,000 hectare in 2002. Estimates of the area of organic maize vary widely from 23 hectares to over 5,000 hectares[4], although a more robust estimate is based on data from the various regional Councils for Organic Production in Spain. This puts the total area of certified organic maize at between 100 hectares and 1,000 hectares.

4 How do the current maize crops derived from different production technologies co-exist?

4.1 GM maize

Are there any co-existence conditions or recommendations for farmers planting GM crops?
Farmers planting GM maize in Spain are advised by seed suppliers to plant some of their crops to conventional varieties to act as a refuge for the target species (corn borer) and hence to contribute to minimising the possibilities of corn borer developing resistance to the Bt trait. The planting of refuges is advised to anyone planting over 5 hectares of Bt maize, should be equal to at least 20% of the total maize crop and be planted close to the GM crop. These refuges can be in the form of strips; lateral, within or around the Bt crop, or as blocks between Bt crops.

Farmers are also advised by seed suppliers about possibilities of adventitious presence of GMOs from their crops being found in non GM crops and how best to minimise this occurring. Advice relates to siting of GM and non GM refuges to minimise possibilities of cross pollination occurring. This advice focuses on ensuring that farmers take into consideration prevailing wind directions, flowering dates of different varieties and the planting of refuges in bands between the GM crops and neighbouring non GM crops that might be destined for sale into a usage sector that specifically requires the maize to be certified as non GM or organic. At least four rows of conventional maize planted between GM crops and 'vulnerable' non GM crops are recommended.

Relevance of condition/recommendations
To date the conditions/recommendations referred to above have been of limited practical relevance to the planting of GM (Bt) maize in Spain. This reflects the following reasons:

[4] In both cases these are based on personal communications and/or anecdotal evidence

- With the voluntary limit on the availability of GM seed until 2003, farmers wanting to use Bt varieties have effectively been subject to rationing. As a result, the average area planted to GM maize has tended to be no higher than 20%-25% of total plantings per farm. Hence, the refuge requirements for planting of non GM seed have been effectively implemented by market (rationing) forces with all users of Bt seed planting 75%-80% of their crops to non GM varieties;
- As Bt maize has largely been planted in regions of Spain where the primary use of the maize has been for feed purposes (on-farm or sale to feed compounders), the GM crop has invariably been sold through normal marketing channels, without any requirement for on-farm or post farm segregation from non GM maize. Given that the criteria for purchasing maize by the majority of the animal feed sector has not specified non GM status, GM growing farmers have not had to take into consideration factors such as possible cross pollination and adventitious presence of GM material in non GM maize on their farms, or in relation to non GM maize crops grown on the vast majority of adjacent/nearby farms. In addition, farmers have not had to store GM and non GM crops separately.

4.2 Conventional maize

Are there any co-existence conditions or recommendations for farmers planting conventional maize crops?
Spanish farmers of non GM, conventional maize are not generally given any advice or recommendations about the siting of their maize crops relative to GM or organic crops. However, where maize produced is sold to some users in the human food sector (notably starch manufacturers) these buyers usually require supplies to be certified as non GM (ie, that any presence of GM material is below the 0.9% threshold for labelling products as produced from GMOs).

Relevance of condition/recommendations
Co-existence of GM and non GM maize in Spain has, to date, only been an issue of relevance to farmers where their crops are/have been sold into the human food sector. This accounts for about 20% of total maize used. This non GM market has been serviced mainly through the purchase of maize from regions of Spain (and imports) where Bt maize is either not grown or where there are very low levels of plantings (ie, regions with low levels of corn borer problems). At the farm level, servicing of this market has essentially been through the planting of non GM varieties and, where relevant, agreeing to only plant and supply non GM maize for sale via farmer co-operatives (where maize is mixed in central storage facilities prior to sale). The starch industry currently requires non GM maize and tests all loads before intake at processing plants. No problems of GMO adventitious presence above their required threshold (0.9%) have been reported. The only example where problems have been reported relates to a snack foods manufacturer which indicated that 5% of supplies have been rejected due to adventitious presence of GMOs. The origin of the adventitious presence is thought to come from either cross pollination and/or (the more likely source) poor segregation of crops on/post farm[5].

[5] Seed used is tested before planting, so seed impurities are not the source

4.3 Organic maize

Are there any co-existence conditions or recommendations for farmers planting organic maize crops?

Organic certification is currently based on adherence to farming principles such as only using selected pesticides. Baseline requirements are set at an EU level although each organic certification body may set its own principles and conditions that may be stricter than the legal baseline. In Spain each of the 17 autonomous regional authorities is responsible for standard setting and interpretation. Some undertake the certification tasks themselves, others have established semi-public (independent) certification bodies and in two regions (Castilla La Mancha and Andalusia), private certification bodies have been authorised.

In relation to the adventitious presence of GMOs, the base EU Regulation covering organic agriculture (2092/91) states 'there is no place for GMOs in organic agriculture' and that '(organic) products are produced without the use of GMOs and/or any products derived from such organisms'. As this legislation does not provide further definition or clarification, the *de minimis* statements have been, and are open to interpretation. Since it is possible to test organic crops for the presence of GMOs, some certification bodies have implemented testing of some organic produce. This testing has been to a threshold of 0.1%, the limits of reliable detection compared to the recently agreed legal threshold for GMO content labelling of 0.9%. Spanish certification bodies also currently provide some information to growers about possible adventitious presence of GMOs in organic crops and how to minimise this (eg, using only organic seed or conventional seed that has first been tested for GMOs). A guide on minimising the scope for adventitious presence of GMOs is understood to be in the process of translation into Spanish, based on material from the Organic Research Institute in Switzerland (FIBL).

Relevance of condition/recommendations

The relevance of the organic sector's current policy towards GMOs can be examined from three main perspectives:

- The extent to which organic maize crops have been or are subject to routine testing for the adventitious presence of GMOs and the outcome of any such tests;
- The context of organic maize within the Spanish maize sector (see section 3);
- Possible sources of GMO adventitious presence (ie, the movement of seed or pollen flow from GM crops into organic crops: see section 5.3 below).

To date the only reported incidences of adventitious presence of GMOs having been found in organic maize crops grown in Spain were cited in a recent report by Greenpeace/Friends of the Earth[6]. This report claimed that two instances of adventitious presence of GMOs had been found in organic maize grown in the Navarra region of Spain in 2001. However, there is a lack of additional, relevant detail provided in the Greenpeace/FOE report to assist in assessing how representative these incidences are. Further enquiries made with the Spanish organic and seed sectors identified limited additional information:

- Organic maize crops are not subject to systematic testing for adventitious presence of GMOs although the regional certification authorities are thought to undertake some tests each year according to their perceptions of where there could be risk of adventitious presence occurring. It is therefore not possible to draw conclusions about how

[6] FOE/Greenpeace (2003) The impact of GM corn in Spain

representative the test result claims are relative to the total number of tests conducted[7]. The lack of additional publicly reported findings of positive GMO presence tests suggests that these two incidents may be isolated instances, although this might equally reflect limited additional testing having taken place;

- There is little information available about the tests. Each positive test is reported to have been verified in two separate testing laboratories but beyond this, there is no information available about what was the level of GMO presence, the number of test samples taken, the method of testing or the materials sampled (grain or plant material);
- The two farms in question are reported to have planted between 2 and 4 hectares of organic maize each, although no information is available about how close their crops were to a GM crop. It is also not known if these farms planted organic maize in subsequent years and whether or not such crops were tested;
- In both cases, the organic crop is reported to have lost its organic status. The full implications of this are not known because there is a lack of information about whether the maize was used on farm for livestock feed or sold. If sold, it was sold as conventional maize. In terms of price differentials between organic and conventional maize, there is very little publicly available data. Due to the very small level of organic maize production and trade, prices are not publicly reported. One source (organic section of a farmers union, COAG) indicated that organic maize had a price of about €350/tonne compared to the price of €120-€140/tonne for conventional maize in 2002;
- Seed industry sources perceive that the GM events identified in the test results were, one of the BT 176 event (the event found in commercially planted crops of 2001, and which accounted for about 2% of the maize crop grown in Navarra in 2001) and one of the Mon 810 event which was not commercially available in 2001. In both cases, any adventitious presence of GMOs found in the organic crops are perceived, by industry sources, to have occurred via the presence of low levels of GMO presence in conventional seed used by the organic farmers in question (see below for further discussion of seed production). Other sources consulted in the organic sector indicated that the origin of the adventitious presence was not known.

Drawing on this (limited) information and, placing this within the context of the low area planted to organic maize in Spain (between 100 and 500 hectares), it is probable that the incidence of adventitious presence of GMOs in organic maize to date has been very low and of negligible economic consequence. It should also be noted that the organic farms that may have experienced positive GMO presence test results were probably not implementing measures recommended by the organic sector for minimising the chances of adventitious presence of GMOs occurring (ie, use of organic seed or conventional seed that has been tested for GMOs).

4.4 Maize seed production

Are there any co-existence conditions or recommendations for farmers planting maize for seed crops?

Almost all seed used by commercial maize growers is hybrid seed (grown by specialist contract producers for seed companies) purchased from seed suppliers each year. Farm saving of maize seed is negligible because of the significantly higher yields, consistently obtained from using purchased hybrid seed.

Against this background, certified seed production systems for all crops, including maize recognise different standards of seed according to various purity levels. These operate to

[7] One source in the organic sector thought that additional positive tests had been found but that these had not been made public. Not surprisingly it has not been possible to verify this claim

threshold levels for the presence of non pure seed. They are based on specified seed separation distances and time intervals between the seed crop and any other crop of the same species grown on a plot, backed up by seed inspection and testing agencies. Failure to meet the purity standards results in seed not being certified and the relevant seed premium being lost to the grower (ie, the crop has to be sold as a non seed crop).

In relation to maize seed production, the main factor considered to affect purity levels is the extent to which cross pollination from adjacent (non seed) maize crops may occur. As such a separation distance of 200 metres is typically applied to ensure maintenance of purity standards[8].

Relevance of condition/recommendations
As seed production systems have been established for many years, the conditions applied (eg, a 200 metre separation distance) generally deliver seed to the purity standards required. This is deemed sufficient to maintain inbred lines at 99.9% purity[9]. A few instances have arisen in recent years where adventitious presence of GMO material has been found in non GM maize seed sold in the EU (eg, Italy in 2003). The main effect of these instances has been a) re-evaluation of conditions and procedures by seed producers to reduce the likelihood of adventitious presence occurring and b) the development of EU level proposals for legislation on threshold levels for labelling seed as derived from GMOs (0.5% for maize). These proposed thresholds for seed should allow commercial crops (ie, not seed crops) to meet the 0.9% GMO labelling threshold recently agreed.

5 Co-existence of GM, conventional and organic maize in the future
In the future (eg, next 5-10 years), the possible wider adoption of GM maize in Spain may lead to co-existence issues becoming more important. This section examines this possibility.

5.1 Possible GM technology use in the Spanish maize sector
The extent to which GM technology may be adopted by growers of maize in Spain will depend on several factors including the level of demand (for non GM maize and hence the extent to which there is a market for GM-derived maize), the price of the technology to farmers and the benefits to farmers (eg, possible increases in yields, reductions in costs, additional convenience, reduction in production risks). As such, adoption is unlikely to be universal, with take-up concentrated in regions and farms that suffer the greatest problems that a specific GM trait targets. Drawing on the example of Bt maize and corn borer problems in Spain, estimates of the maximum uptake of GM insect resistant (Bt) maize in Spain are about 36% of the total crops (Brookes 2002), concentrated in regions that traditionally suffer medium to high levels of corn borer infestations. This suggests that:

- a significant proportion of non GM (and organic) maize grown in Spain will therefore continue to be grown in regions with low levels of corn borer infestation and little, if any adoption of GM (Bt) maize;
- sectors where there is currently a demand for non GM maize (eg, starch manufacturing) should be able to continue to source non GM maize relatively easily from regions where GM maize is not grown widely and hence risks of adventitious presence of GM material being found in non GM supplies should be low and within the 0.9% labelling threshold.

[8] This highlights that the issue of co-existence is not new. Different agricultural product production systems have evolved ways of successfully co-existing for many years
[9] Ingram (2000)

5.2 Future context of organic maize production

The certified organic maize production area in Spain is currently very low (100-1,000 hectares). Should there be a major expansion in this area (eg, a tenfold increase to 1,000-10,000 hectares), the total area would continue to be fairly small relative to the size of the total maize crop (0.2%-2%). As a consequence, the likelihood of organic maize crops being grown near to GM maize crops (and hence risking possibilities of adventitious presence of GM material being found in organic maize) is very small.

5.3 Possibility of adventitious presence occurring and measures to minimise this

Whilst the context of future GM and organic maize cropping examined above suggests a very low likelihood of adventitious presence of GM material in non GM or organic maize crops being found[10], it is possible that some instances could arise. Research literature examined identified the following points of relevance:

- To the extent that levels of adventitious presence of GM material occur in non GM crops, these mainly derive from cross pollination. The level of possible cross pollination occurring depends on plot sizes and isolation distances, with a rapid decline in the level of cross pollination occurring as the distance between a GM and non GM maize field increases. Maize pollen is also heavy and does not travel far[11]. Roughly half of all pollen travels no further than 4 metres and between 99% and 99.5% travels no further than 50 metres[12]. Viability of pollen to cross pollinate also falls rapidly with distance. This suggests that provided vulnerable non GM or organic crops have a non GM buffer crop between themselves and the GM crop, there is unlikely to be any incidence of adventitious presence of GMO material. If separation distances of over 50 metres are applied the chances of adventitious presence of GMOs being found are very low and, if found, would probably be below 0.5%[13], well below the new EU labelling threshold of 0.9%[14];
- The key to minimising possibilities of adventitious presence occurring is the depth of the (conventional) maize crop barrier or refuge used. The first five rows of such a barrier are the most effective method of minimising adventitious presence because this is where the vast majority of GM pollen will disperse. Also pollen from the non GM crop used in the barrier tends to 'flood' adjacent crops and hence acts to 'crowd out' any GM pollen that may have travelled beyond the refuge/barrier crop (and hence minimise the scope for introgression occurring);
- For conventional maize crop producers, post harvest handling could also represent an additional source of adventitious presence if maize from GM and non GM growing farms is dried, cleaned and stored in central (often co-operative) facilities. As indicated in sections 4 and 5.1, this has not been, or is expected to be an important source of possible adventitious presence occurring;

[10] This refers to presence of GMO material being found that may impact economically on the grower. In other words, GMO material may be found in non GM maize grown on adjacent land to a GM crop, but is not of relevance to the non GM farmer if the market the maize is sold into (or its use) is indifferent to whether it is GMO derived or not, or the level of GMO presence is below the 0.9% labelling threshold

[11] Defra (2003) Review and knowledge of the potential impacts of GMOs on organic agriculture

[12] The furthest recorded (isolated) instances of cross pollination occurring identified are 305 metres (Colarado State University (2003)) and 800 metres (cited in JRC 2001, based on Salamov (1940)). The distance at which pollination is zero is however impossible to determine with accuracy (Defra 2003)

[13] Research into pollen flow from GM maize is also currently being undertaken in Spain by the Department of Agriculture, Fisheries and Livestock of the Catalonian government

[14] Recent research in the UK by Henry et al (2003) suggests that an isolation distance of 24.4 metres is sufficient to meet the 0.9% EU threshold and an 80 metre separation distance would be sufficient to meet a threshold of 0.3%

- Seed purity can affect the levels of adventitious presence, the higher the purity level (eg, 0.1% adventitious presence) the lower the 'knock-on' level in the final product;
- Impact simulation work undertaken by the JRC (2002) suggests that all farms could achieve a hypothetical 1% (or 0.9%) threshold for GMO content. This would require some farmers to change their farming practices, notably the use of non GM crop barriers and separation distances. The simulation work also suggested that very low levels of adventitious presence might, however occur in a few cases;
- organic producers using organic seed with high purity and not growing any GM maize (and separating their organic production from conventional production) could meet a 0.9% threshold without changing current farming practices;
- 'the mere presence of GM pollen, whether dead or alive may make it difficult to achieve a zero transgenic DNA content in an organic crop or product. Modern methods of DNA analysis (eg, PCR) are capable of detecting minute amounts of pollen from a GM crop whether it is from the same crop or different. This makes zero GM content difficult to achieve. Also, many of the transgene DNA sequences used in GM molecular detection are already present in nature (eg, Bt) and are likely to complicate/confuse analysis for the detection of minute levels of transgene DNA' (DEFRA 2003).

Overall, this suggests that it is very unlikely that cases of adventitious presence of GM maize will be found in non GM maize to levels that cause economic disadvantage (to non GM crop growers), provided that maize crop barriers and separation distances (see above) are adhered to in the small number of cases where a GM crop may be sited near to a 'sensitive' non GM or organic crop[15].

5.4 Can the organic maize sector co-exist with GM maize production?

The analysis above suggests that the number and frequency of co-existence problems occurring for Spanish organic maize growers vis a vis GM maize crops is likely to be very small. This does, however imply that some problems could arise. The questions to ask here are:

- *can measures be taken to reduce further the chances of problems occurring?*
- *given the context of organic maize production and the very low probability of GM adventitious presence, what is proportionate and reasonable[16]?.*

Answers to these questions can be found within the organic sector. Specifically by adopting principles and practices towards GMOs that are consistent with other organic principles and practices, any residual 'problem' over co-existence could be largely eliminated. More specifically:

- *testing of organic produce for the presence of GMOs*. Organic certification is based on certifying the production method rather than giving an end product guarantee as to the product's freedom from unwanted material such as GMOs or pesticide residues. Adventitious presence of such unwanted material can occur from circumstances beyond the reasonable control of the organic producer and therefore, the identification of unwanted material (via end product testing) is not used to de-certify organic status on produce provided growers can demonstrate their adherence to the organic farming practices and rules. Whilst this pragmatic principle should apply to possible adventitious presence of GMOs (see for example IFOAM position paper on genetic engineering and GMOs; www.ifoam.org, page 2), practice applied in Spain (and other EU countries) tends to be to undertake some testing for GMO presence, with all crops found to have

[15] Sensitive refers to a crop sold into markets where the certified non GM status of the crop is important

[16] Also, bearing in mind that co-existence is about the existence of approved (safe) crop products

detectible GMO presence de-certified. This practice is both inconsistent with the treatment of other unwanted material (eg, pesticide residues) and may be unfairly penalising organic farmers whose crops are found to contain very low levels of GMOs through no fault of their own. Furthermore it is possible that positive GMO presence in an organic crop might even be of naturally occurring DNA or GM plant material that has not introgressed with the organic crop (eg, pollen on the surface which is similar to a pesticide residue on the surface of a crop);

- *adoption of a de facto threshold for the presence of GMOs of 0.1%.* Against a background of no legal threshold existing for the presence of GMOs in organic produce (other than the 0.9% labelling threshold applicable to GMO presence in any product), this is inconsistent with other thresholds and derogations operated in the organic sector. For example, organic standards allow thresholds[17] of up to 5% for the presence of non organic ingredients in some processed foods, buyers of organic produce invariably operate to the same thresholds as apply to conventionally produced crops in respect of the presence of foreign material (eg, 2% in maize), there are derogations for the use of some pesticides (eg, copper-based fungicides on potatoes), non organic seed can be used (this derogation was set to finish at the end of 2003 but will be extended further (Regulation 1452/2003)) and up to 10% of ingredients used in organic animal feed can be derived from non organic ingredients[18]. Furthermore, some ingredients derived from GMOs may be allowed by certification bodies because of the lack of availability of non GM derived alternatives; this relates to possible use of some GM derived processing aids in some food products and veterinary products.

Some in the organic sector seek to justify the practice of testing for GMO presence in organic produce to a 0.1% threshold as being necessary to maintain organic product integrity and consumer confidence. However, the inconsistency of this practice and the operation of wider tolerances and derogations for the use of non organic inputs/ingredients, undermines this consumer confidence argument. The more consumers are made aware of these 'allowances' for the use of non organic ingredients and inputs, the greater the potential for loss of confidence in the integrity of all organic products.

If the organic sector was to move to a more consistent approach towards the adventitious presence of GMOs (ie, adopting a more practical, cost effective threshold), which is proportionate to the health and environmental risk attached to the use of allowed organic inputs (eg, synthetic and natural pesticides), and treated GMO presence in the same way as other unwanted materials (eg, pesticide residues) are treated, this would potentially overcome the current 'perceived' co-existence problem. This is also unlikely to compromise the integrity of organic products with consumers[19]. Alternatively, the organic sector could apply the same testing principles and thresholds currently applied to GMOs to other unwanted materials (eg, introduce pesticide residue testing and apply a 0.1% threshold as the limit for acceptance of other unwanted materials).

6 Conclusions

The evidence to date shows that GM, conventional and organic maize crops in Spain have co-existed without economic and commercial problems. This includes in regions like Catalunya

[17] There is also no requirement to label for the presence of these 'allowed' non organic ingredients/products, provided the thresholds are met

[18] This is a common threshold used by certification bodies. The legal maximum for the use of non organic ingredients can be higher (eg, 20%)

[19] Conversely, adherence to a test-based regime for GMOs to a 0.1% threshold may well open up the organic sector to potentially damaging publicity about organic definitions and the use of non organic ingredients and inputs

where GM (Bt) is concentrated[20]. Where non GM maize has been required in some markets, supplies have been relatively easily obtained, based on market-driven adherence to on/post farm segregation and by the purchase of maize from regions where there has been limited adoption of Bt maize (because the target pest of the Bt technology, the corn borer is not a significant problem for farmers in these regions). Isolated instances (two) of GMO adventitious presence in organic maize crops were reported in 2001.

For the future, the likelihood of co-existence problems arising remains fairly limited, even if there is a significant expansion in both the areas planted to GM crops and to organic maize because:

- GM (Bt) maize is unlikely to dominate maize plantings in Spain, being concentrated in regions where there are significant (corn borer) pest problems. In other words there will continue to be regions of Spain where GM (Bt) maize will not be widely planted;
- The organic maize area is likely to continue to be a very small part of the total maize crop (even if there was a tenfold increase in plantings), with a very limited economic contribution relative to the rest of the Spanish maize crop;
- some changes to farming practices on some farms may be required. This will however, only apply where GM maize crops are located near non GM or organic crops for which the non GM status of the crop is important (eg, where buyers do not wish to label products as being GM or derived from GM according EU labelling regulations). These changes are likely to focus on the use of separation distances and buffer crops (of non GM maize) between the GM maize crop and the 'vulnerable' non GM/organic crop. GM crop planting farmers are already made aware of these practices as part of recommendations for growing GM maize in Spain (co-existence and refuge requirements: see section 4.1) provided by seed suppliers in their 'GM crop stewardship programmes'. Few GM planting farmers have however, found themselves located near to 'vulnerable' non GM/organic crops to date and hence the need to apply these guidelines has been very limited. In the future, if for example, the areas planted to Bt maize and/or organic maize were to increase significantly, it is possible that more (GM planting) farmers will need to apply these guidelines.

Lastly, the organic sector can also take action to facilitate co-existence by:

- applying a more consistent, practical, proportionate and cost effective policy towards GMOs (ie, adopt the same policy as it applies to other unwanted material). This would allow it to better exploit market opportunities and to minimise the risks of publicity about inconsistent organic definitions and derogations for the use of non organic ingredients and inputs damaging consumer confidence in all organic produce; OR
- apply the same testing principles and thresholds currently applied to GMOs to other unwanted materials (eg, apply a test-based regime for pesticide residues); AND
- accepting that if it wishes to retain a policy towards GMOs that advocates farming practices that go beyond those recommended for GM crop stewardship (eg, buffer crops and separation distances that are more stringent than those considered to be reasonable to meet the EU labelling and traceability regulations), then the onus for implementation of such measures (and associated cost) should fall on the organic sector in the same way as current organic farmers incur costs associated with adhering to organic principles and are rewarded through the receipt of organic price premia.

21-10-2003

[20] Bt maize accounts for about 15% of total maize plantings in this region

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