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The impact of GM corn in Spain

A report by Greenpeace and Friends of the Earth

August 2003

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This report is the translation of the original in Spanish that contains graphic information, pictures of Spanish corn, statements by Spanish farmers unions, background information of GM dangers for nature, health, agriculture and socio-economy, and a collection of articles about green revolution and genetic basics.



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Introduction

Spain is presently the only country in the EU that tolerates the commercial release of GM crops, although the acreage grown is relatively small (20.000-25.000 hectares according to unofficial data). Since 1998, one variety of insect resistant corn, commercially known as *Compa CB* and sold by Syngenta Seeds^a, is planted in Spain.

This corn contains a genetic construct called Bt 176, consisting of a gene from the soil bacteria *Bacillus thuringiensis* that encodes an insecticidal toxin able to kill Corn Borers and other lepidoptera insects (moths & butterflies)^b. It also has a gene that confers increased tolerance to the herbicide glufosinate-ammonium and a gene conferring resistance to the antibiotic ampicillin^c.

Bt 176 varieties were amongst the first to be registered for commercial growing in the USA in 1995 (the authorization was not re-granted in 2001) and the first GM corn granted marketing authorization for commercial growing and use in food and feed in the EU, where the approval was politically very controversial.

Bt 176 was approved in the EU in February 1997, before the *de facto* moratorium on GMOs was adopted by the EU council in 1999. It must be underlined that this moratorium is still in place, given that several countries consider that legislation concerning GMOs needs improvement.

Over the last years many Member States became more cautious. Although France was the first EU country to allow the commercial growing of Bt 176 corn, no more Bt corn is grown since 2000. France also banned the growing of GM oilseed rape. Germany banned the growing of Bt maize and other countries (like Luxembourg and Austria) refused to give the green light to GM crops.

Contrary to the precautionary position prevailing in the EU, in February 2003 the Spanish Government took a step forward in its pro-GMO unilateral policy, approving 5 new insect resistant corn varieties (with Bt 176 and MON 810 genetic modifications) for cultivation in Spain.

Unfortunately the only studies on GM crops available in Spain since 1998 have been produced by industry, while the Government has failed to monitor commercial plantings in order to provide an objective assessment of the impact of GM corn on farming, health and the environment. Documents and reports issued in Spain by industry-funded bodies state that farmers are very satisfied with results of Bt crops, but they fail to address the real issues of GMOs in agriculture and are often based on non scientific approaches (see the paper written by Graham Brookes consultancy^{1,d} and presented in September 2002 by EuropaBio).

^a Syngenta is the result of the merger in November 2000 of the agribusiness parts of AstraZeneca, a UK company, and Novartis, the Swiss giant. It is the world's largest agribusiness firm, number 3 in seeds and number 1 in agro-chemicals sales worldwide.

^b For example *Ostrinia nubilalis*, the European Corn Borer – ECB – and *Sesamia nonagrioides*, the other corn borer present in Spain.

^c Commission Decision 97/98/EC: "...The product consists of inbred lines and hybrids derived from a corn line which has been transformed using plasmids containing: (i) one copy of the bar gene, from *Streptomyces hygroscopicus*, (ii) two copies of a synthetic truncated gene encoding an insect control protein representing the active portion of the Cry1A(b) δ -endotoxin, from *Bacillus thuringiensis*, (iii) the prokaryotic gene bla (coding for a β -lactamase conferring resistance to ampicillin)..."

^d The research funding for this study came from Agricultural Biotechnology in Europe (<http://www.abeurope.info>) which counts among its members the following companies: BASF, Bayer Crop Science, DowAgroSciences, DuPont, Monsanto and Syngenta, the six biggest agribusiness transnational companies.

This report aims to provide some independent data on the most controversial GM crop in the European Union, based on the Spanish experience with Bt 176 in the fields during 5 years.

Corn borer is a lepidopteran insect that can cause damage to corn crops in certain regions, as it can drill the stems of some plants. However, the presence of this pest is not significant in Spain.

Genetically modified crops: What, where, who, how much

In 2002, the estimated global area of GM crops was 58.7 million hectares. The prevailing traits in these crops were herbicide tolerance, insect resistance (Bt plants) or both, according to the last report of ISAAA (International Service for the Acquisition of Agri-biotech Applications)².

Only four countries grew 99% of the total area (USA 66%, Argentina 23%, Canada 6% and China 4%). Very few countries have adopted this technology in the rest of the world until now, and GM areas in these countries are small.

Four companies control GM seed markets: Monsanto (who controls more than 90%), Syngenta, Bayer and Dupont.

GMOs in our food: growing rejection

Genetic engineering enables scientists to create plants, animals and micro-organisms by manipulating genes in a way that does not occur naturally. These genetically modified (GM) organisms can reproduce and interbreed with natural organisms, thereby spreading to new environments and future generations in an unforeseeable and uncontrollable way. Current understanding of genetics is extremely limited and scientists do not know the long-term effects of releasing these unpredictable organisms into the environment and of introducing them in people's diets.

GM ingredients from GM crops are freely entering our fields and our food supply without appropriate testing, without adequate safeguards in place and without explicit farmer and consumer consent and knowledge. People should have the right to know about ingredients derived from GM plants in their food and should have the right to avoid it in all countries.

Despite some governments and industry attempts to hide increasing evidence of risks and to 'educate' the public, opposition to genetic engineering continues to grow. Although transnational companies and their political supporters want us to believe that GM food is safe and thoroughly tested^e, growing awareness about its threats has sparked a global wave of rejection (for instance, surveys show that more than 70% of EU consumers are opposed to GM food). BSE (mad cows disease) and other food scandals in Europe have made people very suspicious of claims that there is no evidence of harm.

Due to consumer pressure, supermarkets are clearing GM food from their shelves and global food companies are removing GM ingredients from their products. An increasing number of food manufacturers and retailers, as well as grain companies have committed themselves not to trade, use or sell GM crops or derived ingredients^f.

^e In a document leaked to Greenpeace, Public Relations firm Burson Marsteller advised EuropaBio (a consortium of biotechnology companies with interests in Europe) to refrain from participating in any public debate and leave it to "those charged with public trust, politicians and regulators, to assure the public that biotech products are safe." See: Communications Programmes for EuropaBio, Burson Marsteller, January 1997.

^f Statements have been done to Greenpeace by companies as a result of market and consumer work, actions, etc. Also Cf. Greenpeace Red and Green Consumer Guides, reporting what companies, products and brands contain / do not contain GM or GM-derived ingredients. Specifically for Spain, 'Guía Roja y Verde de Alimentos Transgénicos' pocket edition or web:
http://www.greenpeace.org/espana_es/campaigns/intro?campaign_id=159562

Bt 176 corn: a controversial crop... ...since its approval in the EU and the USA

The situation in the USA

In the United States genetically engineered insecticidal crops (Bt plants) are registered as biopesticides, and must therefore undergo an evaluation procedure according to pesticide regulations issued by the Environment Protection Agency (EPA). The Bt 176 corn event (an event is a group of modified genes) was approved by the EPA in August 1995 in the midst of strong controversy (its registration expired the 1st April 2001). The first Bt 176 varieties have been grown in this country in 1996. Over the years, however, the percentage of these varieties in total US corn acreage has declined, accounting for less than 2% of the total corn acreage in 2000³.

In January 2000 the EPA stated that "no sales of Event 176 should take place after January 2000" in an extensive list of counties of Texas, Colorado, Oklahoma and Kansas. This restriction apparently responded to rising concerns that these events did not provide complete protection against second generation of European and Southwestern corn borer, thereby posing a high risk of appearance of insect resistance⁴. In October 2001, for the same reason, Bt 176 varieties were withdrawn by the EPA from the revised list of registered products⁵.

Seeds of doubt

Will Spain and the rest of Europe make the same mistakes?

Seeds of doubt is the title of a report presented by the Soil Association in 2002⁶. The document, based on the experience of farmers, independent USA and Canadian experts and government bodies, reveals that: "GM food crops are far from a success story. In complete contrast to the impression given by the biotechnology industry, it is clear that they have not realized most of the claimed benefits and have been a practical and economical disaster".

Dr. Benbrook, an independent agronomy consultant in Idaho who has carried out extensive research work on GM crops, concludes that Bt corn has resulted in a much smaller than expected yield increase⁷ (far lower than the 10-15% claimed by Mr. Brookes in *The farm level impact of using Bt maize in Spain*). As for the agrochemical use, Dr Benbrook's research demonstrates that despite a significant increase in the Bt corn area, the insecticide treated area in the USA rose from 6.75% in 1995 to 7.3% in 2000⁸.

According to Professor Obryski of Iowa State University, "Bt plantings are not being used as a replacement for insecticides, but in addition to them"⁹. Neither has the farmer income increased: the profitability of Bt corn is variable, depending on the year and level of pest problems. In average, over the period 1996-2001, the outcome was negative¹⁰. The technology fee for GM seed, the small yield difference, the continuous use of agrochemicals and the lower market prices explain that GM crops are not as profitable for farmers as the industry claims.

The North American experience shows that GM crops introduced other serious problems for agriculture. Amongst other issues, problems have arisen on GM contamination of non-GM seeds and crops, greater dependency and loss of farmers' right to decide on management options, legal issues between farmers or between farmers and companies and liability issues.

In an August 2001 letter, the president of the American Corn Growers Association (ACGA) expresses to the EPA its deep concerns regarding Bt corn negative market impact for farmers¹¹. He stresses that GM corn varieties jeopardize farmer-choice, which is a key policy of the ACGA⁹. According to the US Department of Agriculture (USDA), the value of US corn exports to the EU dropped 99.4% between 1996 and 2001. Exports to Asia also decreased sharply: corn exports to Japan, for example, decreased by 1.3 million tones from 2000 to 2001.

"Food, health, hope"
Monsanto's slogan.

"Genetically engineered crops represent a huge and uncontrolled experiment whose outcome is inherently unpredictable."
Dr. Barry Commoner, Biologist, City University of New York, 2002.

European Approval process

The Swiss company Ciba-Geigy (later Novartis, and then Syngenta) submitted an application for placing on the market the Bt 176 event to the French authorities in November 1994. France forwarded the dossier to the European Commission on March 1995, requesting European wide approval. The Commission, in turn, put forward an authorization proposal to the relevant regulatory committee that did not approve the Commission's proposal; and afterwards the Commission forwarded the unchanged proposal to the EU Environment Council. This proposal was not approved by the Council. In the meeting of EU Environment ministers of 25th June 1996 in Luxembourg, only France supported the application; Spain abstained and the other 13 Members States voted against it. The Council asked the European Commission to reconsider the proposal.

Despite this almost unanimous decision against it, the European Commission decided to inform France to grant the marketing authorization on 18th December 1996. The Commission decision was published in January 1997^h. On 4th February France officially grants the marketing authorization for the Bt 176 maize. Although the Commission declared having taken the decision on the basis of reports issued by its scientific committees, it was clearly a commercially-motivated decision and, according to certain commissioners, "a decision taken under the pressure and the urgency linked to the problem of the import of significant stocks of maize from the USA"¹².

This Commission decision authorizing EU marketing of Bt 176 regardless of the Council position against is a disturbing example of the existing democratic deficit in the EU and of the influence of biotech industry in Brussels decisions. It was strongly criticized by the European Parliament (EP) in a resolution adopted the 8th April 1997 by an overwhelming majority - 407 votes in favour and only 2 against -, condemning the Commission's lack of responsibility and demanding that the products be withdrawn from the market until further health and safety tests had been carried out.

⁹ President of the ACGA in a letter to the EPA: "Genetically engineered corn varieties alter or modify the entire USA corn crop in the kind of out-of-control manner that exists today through pollen drift and seed contamination ... the biotech companies who put these GMO corn varieties on the market are indeed imposing a negative economic impact on the majority of farmers who choose not to plant such corn varieties ... the major issue of pollen drift and cross-pollination contamination of conventional corn fields by GMO corn varieties has already caused major global market disruption for U.S. corn growers".

^h Commission Decision 97/98/EC of 23 January 1997, Official Journal L 031, 01/02/1997.

The resolution stated that the EP “condemns the lack of responsibility of the Commission in unilaterally authorizing the marketing of GM corn in spite of the negative positions of most Member States and the EP and before the entry into force of the Regulation on Novel Foods¹³ (...) deplores particularly the fact that the Commission did not take sufficient account of the precautionary principle with regard to the health of consumers, the protection of the environment and the producers concerns (...) regrets that trade considerations have obviously dominated the decision-making process so far and strongly requests that food safety and health considerations should have priority in the future”.

Following this controversial and clearly undemocratic approval, Austria, Luxembourg and Italy invoked article 16 of 90/220/CEE Directive (“Safeguard Clause”) to ban Bt 176 from their territory for cultivation and/or import. The reasons put forward by these countries were that the GM corn constitutes a risk on two grounds:

- 1- transfer of the ampicillin resistance gene to disease-causing bacteria.
- 2- the Bt toxin may:
 - (a) have negative effects on non-target species and biodiversity in general.
 - (b) lead to build-up of insect resistance to Bt (therefore loss of this means of pest prevention for organic farmers).

For the Austrian authorities, it was not acceptable that the authorization of the European Commission did not include at least a resistance management program (as foreseen even in the USA) even though the Commission had announced in December 96 it would do so. This was backed by Denmark and Sweden in November 1997. In February 2000, Germany also prohibited the Bt 176, evoking the persistency of the Bt toxin in soil, discovered in December 1999. Although Italy removed the ban, it is still in place in several countries since the Commission has failed to force them to lift the ban.

France granted variety registrations for Bt 176 maize and thereby allows the cultivation of Bt 176 in November 1997, but at the same time announced a moratorium on other GMOs. However, at the end of 1998, the French Conseil d'Etat (the highest administration court), following appeals by four NGO's (Friends of the Earth, Greenpeace, Ecoropa and Confédération Paysanne), suspended the ministerial decree which authorized it. The reason put forward was that the dossier submitted by Ciba-Geigy in 1994 was incomplete; in particular certain important information concerning the Ampicillin-resistance marker gene had not been made available by the company. Friends of the Earth and Greenpeace had access to documents showing that the French organization responsible for evaluation and control (Commission du Génie Biomoléculaire) had studied, in part, the environmental consequences of the Bt toxin presence in the plants, but deliberately omitted to study the other two foreign genes, namely the antibiotic-resistance marker gene and the herbicide-tolerance gene¹⁴.

Bt 176 is a special case within the legal GM European framework regulating the introduction of GMOs into the food chain: it is one of the only two GMOs (Bt 176 corn and Monsanto Roundup Ready soya) that have been approved for food use before the publication of the Novel Foods Regulationⁱ, and thereby escapes provisions of the Regulation, in particular the human health safety assessment.

ⁱ The Commission Decision that approves the placing on the market of Bt 176 corn is dated 23 January 1997, when Regulation 258/97/CE is dated 27 January 1997 and entered into force on 14 May 1997.

Approval in Spain:

Despite the ban adopted by several Member States and its highly controversial approval in the EU and in the USA, in March 1998 Spain approved the inclusion of two Bt 176 corn varieties in the: *Compa CB* and *Jordi CB*^j. Inclusion in the national list of plant varieties is a pre-requisite to the marketing of seeds for cultivation; therefore this decision meant a go-ahead for the growing of these GM varieties in Spain. Although *Jordi CB* has not been used, *Compa CB* has been planted since 1998 in Spain, the only EU country where genetically engineered crops are grown on a commercial scale. Moreover, in February 2003, Spain approved for planting 5 new GM corn varieties (one Bt 176 and four MON 810)^k.

Spain imports millions of tons of corn and soya from countries that grow large scale GM crops.

Spain is the only EU country that tolerates GM crops growing on a commercial scale.

At present, GM and conventional crops are not segregated.

^j Orden 7052 de 23 de marzo de 1998 del Ministerio de Agricultura, Pesca y Alimentación, por la que se dispone la inscripción de variedades de maíz en el Registro de Variedades Comerciales (published 26-3-1998 in the Spanish Official Bulletin).

^k Orden APA/520/2003 de 27 de febrero, por la que se dispone la inscripción de variedades de maíz genéticamente modificadas en el Registro de Variedades Comerciales (published 11-3-2003 in the Spanish Official Bulletin).

Bt 176 event: Brama (Syngenta) –MON 810 event: Aliacan Bt (Limagrain), Aristis Bt (Nickerson), DKC6575 (Dekalb, Monsanto), PR33P67 (Pioneer)

While more and more countries become cautious... ...Spain is the only one in the UE growing GMOs

A very pro-GMO Spanish administration

Opinion polls state clearly that consumers worldwide, and especially in Europe, are saying 'NO' to GM and GM-derived ingredients in their food. A 2001 official survey in Spain states that the majority of consumers would not eat GM food and, if it were clearly labelled, they wouldn't do it even if it were much cheaper^l. But the Spanish Government has adopted a very pro-GM attitude in the last years which does not take into account public opinion nor the growing evidence of environmental and health risks.

The attitude of the National Biosafety Commission is an example of negligence of the central administration: comments from scientific members to the head of the Commission have been leaked to Greenpeace and Friends of the Earth, suggesting that the information facilitated by the biotech companies to this Commission for the scientific assessment process is very insufficient: companies are not doing the experiments correctly, characterizations are not done integrally, there are no Monitoring Plans and concrete procedures to follow. Nevertheless, the National Commission on Biosafety never decided to denounce it.

At an EU level, the Spanish Government is pushing very hard in favour of GMOs. For example, during the Agriculture Council of 26th May 2003, the Spanish agriculture minister, Miguel Arias Cañete, pleaded in favour of the end of the *de facto* moratorium. However, a lot of remaining questions have to be solved at EU and Spanish level: coexistence measures to guaranty a GM free agriculture, seed purity and environment liability regime amongst others. On those issues, Spain is one of the few countries that don't want stricter rules for GMOs.^m

Spain fails to respect European legislation in many ways, but very especially concerning public information. At the beginning of the year, Spain approved a law¹⁵ in order to adapt legislation to Directive 2001/18/EC on deliberate release into the environment of GMOs¹⁶. But some crucial points have not been correctly included, for instance experimental and commercial fields public registers, although this is crucial to facilitate information to the public in general and farmers in particular in order to avoid contamination of non-GM crops (This was a key point in the EU Directive but has become an "additional point" at the end of the Spanish law, which means the intention is to reduce the importance of this particular point).

On seed purity, even though the official position of Spain is not publicly known (despite many organizations having requested it), it has been heard that some representatives of the Ministry of Agriculture want to allow high contamination percentages in conventional (non-GM) seeds. This would undermine any effort of keeping part of the agriculture and food GM free, yet this would mean the generalization of GM presence in our fields and in our dishes.

^l According to a survey carried out by the Sociological Research Centre (CIS, Centro de Investigaciones Sociológicas), in 2001 (Encuesta del CIS nº2412 'Opiniones y actitudes de los españoles hacia la biotecnología', de marzo-abril de 2001), 64% of the Spanish would not want to consume a potato in which corn genes have been introduced (but they were not asked if they would eat corn with bacteria genes!). 85% of them would not do it even if the price was 25% lower. It also states that 92% of the people think that it should be compulsory to label GM food.

^m For example, during the Environment Council of 4th March 2002 in which the Commission Proposal of Directive on environment liability was discussed, Spain and the UK were the only countries opposing authorized GMOs to be subject to environmental liability laws.

"Those charged with public trust, politicians and regulators have to assure the public that biotech products are safe."

Public Relations firm Burson Marsteller. Communications Programmes for EuropaBio. 1997.

"One could think that there are safety testing systems to ensure that GE foods are safe. But reality is far from this. Companies claim that they are safe but their studies are not made public. Governments that approve the release and use of GE crops are not controlling nor giving publicity to the data given by the companies."

Carlos Sentís, human genetics professor - Universidad Autónoma de Madrid. El Mundo, mayo 2002.

Where are GM crops? The Government and the companies keep silent

During the last growing seasons the area planted with corn in Spain has been around 430.000 to 500.000 ha¹⁷, non-GM and GM varieties included. The main producing regions are Castilla y León, Aragón, Extremadura, Andalucía, Castilla la Mancha, Cataluña. Average yields in Spain vary from 9 to 11 metric tons per hectare.

No official data is available on GM corn planted in Spain. The Statistics Department and the Spanish Office for Plant Varieties, both belonging to the Ministry of Agriculture, facilitate only very vague information on GM crop distribution, and the official figures have not been made available to the public, even though many NGO's and farmer unions have asked once and again for information. Only very partial data – specific provinces or years – have been disclosed on rare occasionsⁿ. Government representatives usually speak of 20.000 to 25.000 GM corn hectares planted since 1998, but these figures are an estimate based on seed sales declared by Syngenta and have not been checked by an independent body.

According to the USDA Foreign Agricultural Service, 30.000 ha of Bt corn was planted in Spain in 2002¹⁸.

As for the regional share, it is even more difficult to know. The limited data available is contradictory. According to Syngenta data found in the Graham Brookes report, during the 1998/2002 period, GM corn has mainly been planted in Huesca, Zaragoza, Lleida, Girona, Albacete, Badajoz and Sevilla¹.

However, the Unión de Pequeños Agricultores (UPA, Union of Small Farmers) obtained data from the Ministry of Agriculture indicating that in 1999/2000 *Compa CB* was planted in 24 provinces, the first one being Madrid (where 74,65% of the corn area was GM)¹⁹. It seems contradictory that the region of Madrid is not even mentioned in the Graham Brookes report: Is it that many hectares were planted in Madrid in 1999 and then the area decreased in the following years? Why should this company try to hide the facts about Madrid and not tell that, after embracing the technology, farmers of a specific region decided not to plant GM corn any more?

No clear information about where GM crops are planted is made available neither by the Ministry of Agriculture nor by Syngenta. For example, the Graham Brookes report does not mention Navarra, precisely the region where contamination cases have been discovered.

ⁿ LAST MINUTE NOTE: After a very recent request, the Ministry of Agriculture sent *Compa CB* seed sales by provinces for the period 1998-2002 to Friends of the Earth and Greenpeace. These data correspond to the seed sales declared by Syngenta, but there is no information about the real area. These figures are not checked by any external body and there is no explicit correlation between seeds and planted area.

“Seed sellers are compelled to inform the Ministry of Agriculture about their GM seeds sales and where, how much and what variety they sale. The head of the Spanish Office of Plant Varieties will probably be able to tell you”
Ana Fresno, President of the National Biosafety Commission, October 2002

“The information about the location [of GM plantings], the map of GM plantings can’t be given to general public.”
Director of the Spanish Office of Plant Varieties. October 2002.

Fraud to the Spanish legislation and lack of precautionary measures

Despite the serious potential impact on environment, agriculture and human and animal health, GM crops have been introduced in Spain without any precautionary measures. Furthermore, the few legal requirements set in place have been largely disregarded.

The law whereby *Compa CB* was included in the National Register of Seed Varieties^j and therefore given green light for commercial growing in Spain states: “Marketing of these varieties is conditioned to compliance with a Monitoring Plan, that must be carried out by the company who applied for the registration of the GM varieties during at least five years, beginning on March 1998”.

When describing the Monitoring Plan, it also states:

- The company has to “supply the Ministry of Agriculture with a list of sales by locality and a list of buyers at the end of each seed sales season”.
- The company has to “draw up a Prevention Plan to be submitted for approval to the Dirección General de Producciones y Mercados Agrícolas before 2 years after the date of publication of this law...” (i.e. it should have been presented before March 2000). This Plan should include, amongst other things:
 - (a) An evaluation of the effectiveness of the Bt insecticidal trait introduced in these varieties.
 - (b) A study of the possible development of corn borer resistance to the Cry1A(b) protein.
 - (c) Possible effects on entomofauna and soil microorganisms in GM crop fields.
 - (d) Possible effects on the evolution of bacterian population of digestive flora of the animals eating the Bt plants, particularly regarding the resistance to ampicillin.
 - (e) An indication of the area that should be planted with conventional varieties in relation to the area sown with GM varieties (refuges for the corn borer).
 - (f) An information program for farmers about alternative crop management for transgenic varieties”.

Not only did the Spanish administration delegate the responsibility of monitoring the impact of GM crops entirely upon industry, but, worse still, it postponed 2 years the approval of a so-called “Prevention Plan”, thereby delaying management measures meant to avoid the appearance of insect resistance and other environmental and health hazards. One wonders if a “Prevention Plan” established 2 years after commercial growing of GM crops can be rightly dubbed a “Prevention Plan”, and if this is how the Spanish Government interprets the precautionary approach in GM issues. Moreover, in contrast with the USA where the EPA is responsible for authorization and for issuing management plans for Bt crops, the approval of industry’s “Prevention Plan” in Spain lies with a department of the Ministry of Agriculture normally dealing with “production” and “markets”.

All the same, Novartis (now Syngenta) has failed to meet these very lax mandatory requirements: first of all they did not supply the Ministry of Agriculture with a list of sales by locality, at least during the first years. Such a list is important because it enable measures to be taken in case some problem would appear with these new crops, such as insect resistance.

In a 1999 study funded by the European Commission DG XII²⁰, the authors state that when asking for data about the list of sales by locality and the list of buyers, the Ministry of Agriculture answered Novartis had such list. When Novartis was asked, the answer was that the Ministry had the list.

In an enquiry carried out by one of the main farmers unions in the north of Spain, Euskal Erriko Nekazarien Elkartasuna (EHNE), farmers who bought *Compa CB* explain that no one asked their names nor where they intended to plant it. No information about refuges and the alternative crop management (points (e) and (f)) was provided by the company.

Secondly, in a blatant demonstration of disdain for farmer, consumer and environmental concerns as well as for government regulations, Novartis (Syngenta) has not complied with the requirement of the Prevention Plan to be submitted to the administration before 26 March 2000 (more than 3 years ago!). In September 2002, when asked by the Council of Organic Farming in Navarra (the official authority and control body of this Central-North Spain region, one of the regions where GM corn is planted), Martín Fernández de Gorostiza, who was at that moment the head of the Spanish Office of Plant Varieties, answered in an official letter: “the Monitoring and Prevention Plan [of the *Compa CB* variety] is still not finished, although we have some information (...). Once studied by the National Biosafety Commission, it will be published”.

Another argument to show that the studies to be carried out for the Monitoring Plan for *Compa CB* has not been fulfilled is that the very recent law approving the 5 new varieties in February 2003^o had to be corrected two weeks later^p: the original text said:

“We consider that points (a), (b), (c) and (d) are fulfilled for the Bt 176 variety [*Brama*, registered by Syngenta] because they were fulfilled for *Compa CB*, which has the same event”

15 days later, the Government published a correction saying:

“We will consider that points (a), (b), (c) and (d) are fulfilled for the Bt 176 variety [*Brama*, registered by Syngenta] when they are fulfilled for *Compa CB* which has the same event”.

As detailed above, the Government has failed to ensure compliance with legal requirements related to *Compa CB* deliberate release into the environment. It is a real scandal that after 5 years the Monitoring/Prevention plan has not been made public (strangely, the Spanish Administration does not make distinction between both concepts), that there are still not any results of the studies (have they been carried out?) about an event that has been withdrawn even in the US and nevertheless is still grown in Spain (and a new variety containing this event is now registered!). The absence of information and official assessment of the effects of growing Bt corn varieties, furthermore, evidences the scandalous disregard for environmental and public health concerns of the Spanish Government.

^o Orden Ministerial APA/520/2003 de 27 de febrero por la que se dispone la inscripción de variedades de maíz genéticamente modificadas en el Registro de Variedades Comerciales (published 11-3-2003 in the Spanish Official Bulletin).

^p Corrección de errores nº 6042 a la orden APA/520/2003 de 27 de febrero (published 25-3-2003 in the Spanish Official Bulletin).

"The Monitoring and Prevention Plan [of the Compa CB variety] is still not finished, although we have some information (...). Once studied by the National Biosafety Commission, it will be published".
Director of the Spanish Office of Plant Varieties.
September 2002.

The company has to draw up a Prevention Plan, to be submitted for approval to the Ministry of Agriculture before 26 March 2000.
Extract of the law that registers *Compa CB* in the National Register of Seed Varieties.

The Government is not protecting farmers

Government officials most of the time act as zealous guardians of the biotech industry's public-image rather than consumers and farmers interests. Here is, for example, an abstract of the answer given by the head of the Spanish Office of Plant Varieties, Martín Fernández de Gorostiza in October 2002 when asked by a representative of the Spanish National Organic Consumers Association about the location of GM fields, in order to avoid genetic contamination: "the information about GM plantings can only be made available for "interested public", but we cannot give to general public the map of GM plantings", explaining that "interested public" is a legal position decided by a judge⁹. It is also significant that exactly the same argument of "interested public" is used by the biotech industry when they are asked on the registers issue.

Speaking about the organic crops protection, Gorostiza added: "The organic farmers are the ones that have to isolate their crops or plant them far enough in order to prevent contaminations".

The administration has not been able to adopt precautionary measures nor to prevent negative effects of GM crops planting, such as contamination of other crops: distances at which a GM field cannot be planted, strict seed protection measures, economical and environmental liability measures, etc. The rule should therefore be "Polluters pay" (instead of what the Spanish Government is allowing: "Contaminated farmers pay").

An atmosphere of fear

All this is happening in an unwholesome atmosphere of secrecy and fear where farmers and cooperatives don't want to speak openly about what they are doing and what is happening. Many telephone conversations and personal communications have not been reported in this study because of people's fears to lose their markets or their jobs given that multinational corporations control not only the GM seeds themselves but also the whole production chain and are politically very influential. People feel unprotected by a Government that is permissive, and this is leading to a dangerous situation.

⁹ This enters in complete contradiction with Directive 2001/18/EC that states that Member States have to create registers for recording the location of GMOs grown for commercial release and that the Registers have to be made known to the public.

"Coexistence is not a new concept. What we need is to agree on practical allowances for traces of GM crops in other crops including organic farming produce".

Simon Barber, Director of the Plant Biotechnology Unit at EuropaBio. BINAS NEWS, April 2003.

"If Biotech companies and the (U.S.) Food and Drug Administration are unable to keep an unapproved variety like StarLink out of the human food chain, what are they going to do once the next generation of bio-pharm plants begin to be commercialised, plants containing vaccines and pharmaceutical drugs, crops that could harm and poison unsuspecting consumers?"

New Scientist, 7th of October 2000.

Plenty of remaining and unresolved issues

The biotechnology-based agriculture is a threat to every other kind of agriculture and may cause the disappearance of GM-free agriculture and food (due to gene transfer to non-GM crops). It is crucial that part of the agriculture and food remains GM-free: the effects of GMOs on health and environment are unknown and it would be irresponsible to lose the possibility to withdraw them from the environment and the food chain if problems appear.

It is necessary to ensure the protection of seeds, crops, food and feed from genetic contamination.

It is then necessary to put in place a very strict regulatory framework that makes compulsory these measures, to establish a system of control and penalties and to set a liability regime addressing the issue of who should pay for the protection measures and who is liable in case of contamination.

Until all those guaranties are established, GMOs should be strictly prohibited. At the moment, these issues are not resolved in the EU, yet some are under discussion. Not surprisingly, all this is very far from being in place in Spain, the only EU country that commercially grows GM crops.

While we keep discussing about the possible effects... ...problems from GM corn are already here

Despite a growing scientific evidence that GM crops pose serious risks, the lack of (independent) monitoring and research in Spain is leading to a situation where very few case-studies are available and it is difficult to know the real impact of GM crops in Spain.

GM crops, and in particular Bt corn, have many impacts for health, agriculture and the environment: a few of the environment and agriculture impacts are described in this section, since this report deals mainly with the agricultural situation of the Bt corn in Spain.

“The real strategy is to introduce so much genetic pollution that meeting the consumer demand for GM-free food is seen as not possible. The idea, quite simply, is to pollute faster than countries can legislate – then change the laws to fit the contamination.”

When choice becomes just a memory. Naomi Klein. The Guardian, June 2001

“Once a GMO is released into the environment, it could be impossible to recall it or prevent its spread and therefore adverse effects must be avoided as they might be irreversible”

The European Community and the deliberate release of GMOs to the Environment. European Commission, 1990.

Genetic contaminations or coexistence: Is Syngenta lying?

GM plants contain genes which have been transferred from unrelated species, usually distant in the evolution scale. These may come from bacteria, viruses, other plants or even animals. If these ‘foreign’ genes are then transferred into other organisms, this causes genetic contamination of the natural gene pool. Unlike other forms of pollution, genetic contamination has the potential to be a problem that multiplies as plants and micro-organisms grow and reproduce. Therefore, the damage caused by GMOs on environment and agriculture cannot be confined to the original ecosystem in which they are first introduced.

Pollen dispersal can represent a significant proportion of the gene flow and has long been of interest as the potential exists for contamination of one crop variety from another. It is estimated that 14 to 50 million pollen grains are released from “average-sized” maize plant²¹.

In March 2002, the European Environment Agency (EEA) published a report²² that examined the significance of gene flow through pollen transfer in six types of crops in the EU. The conclusion was that corn is a “medium to high risk” crop for gene transfer to other plants of the same species. In this report it is stated: “Maize is primarily wind pollinated although there is evidence to suggest that bees and other insects collect pollen from maize. The majority of airborne pollen is shown to fall within a short distance of the pollen source, though outcrossing has been recorded at up to 800 m. It is predicted that under suitable atmospheric conditions maize pollen has the potential to travel over much longer distances.”

A report from the UK National Pollen Research Unit for the Soil Association²¹ shows that maize pollen cannot be completely contained. The use of border rows on the source and receptor crops can reduce dispersal from the fields and transport into other areas, however in certain weather conditions transport of some pollen will occur. By using the hybridization percentage methodological approach, maize pollen distribution has been recorded at up to 800 m (See table).

Maize pollen dispersal. Hybridisation percentage in between two fields of maize

Distance from pollen source (m)	10	50	100	150	200	400	500	600	700	800
Mean hybridisation percentage	3.3	0.3	0.4	0.3	0.5	0.02	0.1	0.8	0.2	0.2

A corn pollen dispersal study produced by the ITG-A (Instituto Técnico de Gestión Agraria del Gobierno Navarro, the Official Farm Research Institution in this region) and presented at the National Biosafety Commission in 1999²³ shows that, in Northern Spain, pollen from corn plants has been found at least up to 500m away.

Given that the potential impact of pollen from GM crops increases notably with the size and number of fields planted, and that there is no way for farmers to know where the Bt corn is being planted, there is therefore no possibility for them to protect their crops.

Spanish farmers in general are not aware of the risks of this kind of contamination. In particular, corn growers are not informed about the risks of GM varieties planted in the same regions than their non-GM crops. For organic farmers and breeders this is especially dangerous because GMOs are forbidden by the EU regulation for organic production. Contaminations have significant negative economical impact on farmers since the food industry increasingly refuses to use GMOs in their products as a result of consumer rejection.

It is not possible to prevent pollen (contained in the stamen of corn male flowers) from travelling towards other crops.

Contamination cases in Spain:

Traces of GMO were identified in 2001 in three non-GM crops: two maize and one soya organically cultivated in the Navarra region. They were carefully analysed in two independent laboratories^r given that the Council of Organic Farming in Navarra (CPAEN, public organic certifying body in Navarra) closely monitors such crops to avoid any transgenic pollution of the organic food chain. Consequently, the "organic" certificate was withdrawn and they could not be labelled as "organic" for marketing purposes.

Further tests (on one of the maize crops) revealed that the polluting agent was the Bt176 event present in the *Compa CB* variety, cultivated still in small areas in this region, but enough to contaminate. It definitely is a case of cross-pollination.

As for the soya, it was thought to be contaminated by the seeds bought by the farmer from the company Monsanto. There is no soya planted in the region and nobody had done so for 15 years: the seed packages contained GM seeds without any mention ("adventitious presence" as the European Commission likes to name it).

^r 1. Laboratorio del Centro Tecnológico Nacional de Conservas Vegetales (San Adrián, Navarra) - 2. Sistemas Genómicos SL. (Valencia).

These clear cases of pollution confirmed some of farmers' and consumers' worst fears. The organically grown affected crops, were withdrawn from the organic food chain and could only be sold as conventional, an economic drawback for the farmer.

The Navarra and Basque local farmers' union EHNE, the local organic farmers' association Bio Lur Navarra, the regional organic consumers' association Landare and a local organic producer cooperative Trigo Limpio S. Coop., denounced the alarming consequences evidenced by these cases, in particular the lack of farmer control and difficulties for ensuring GM-free food production and consumption in the future. They have called for an end to Bt maize cultivation in Spain given the serious problems it is causing.

The farmer and consumer groups that reported this current case of pollution have also stressed that it is inadmissible that farmers and consumers who do not wish to consume GM food are paying extra costs in order to guarantee GM free food (In this case two technological costs have been paid by the farmers' organisations, given that these corns were double tested^s).

After these first cases of contamination found 2001, one of the consequences is that in 2002 very little organic corn has been planted in this specific region of Navarra, because organic farmers do not want their organic crops to be contaminated, given that, in case of contamination, "the polluted farmer pays".

Little GM corn is planted in Navarra because main cooperatives are not allowing their associated farmers to do so. What would happen if more GM corn were planted in this area? In other words, it is very likely that other conventional and organic corn crops are polluted in areas where GM plants are grown, but insufficient testing and controls are allowing them to slip undetected into the food chain.

Many cooperatives don't accept to plant GM corn because, amongst other reasons, big buyers (the starch producer Amylum for example) do not want to buy GM corn. Greenpeace and Friends of the Earth had access to a letter written by a cooperative to all its associated farmers, where it can be read: "It is totally forbidden to plant GM corn. If we find out that an associate has sown GM corn, the problems and economic liability will be for him, the cooperative will not be liable for anything".

"The organic farmers are the ones that have to isolate their crops or plant them far enough in order to prevent contaminations".

Senior official of the Agriculture Ministry, October 2002.

"Genetic engineering does not respect the inherent nature of plants and animals since it treats living things as a mere factors of production, to be reconstructed as if they were machines."

Bernward Geier – Executive Director of the International Federation of Organic Agriculture Movements. 2001.

^s Each test for GMO traces costs 162 Euro, and a further 54 Euro are paid to identify the event.

Insects are developing resistance to Bt

There is overwhelming scientific data to support the concern that target insects can develop resistance to Bt^t. Constant exposure to the Bt toxin produced by GM plants encourages the survival of individuals which have a genetic immunity to Bt. The possibility of such resistance occurring is much higher with Bt crops than with the natural Bt toxin from bacteria because this one degrades after a short time under the influence of daylight. On the contrary, the continuous production of the toxin in plants, the higher concentration and the accumulation over time expose continually the pest population to the toxin.

The development of resistance would mean that *Bacillus thuringiensis* toxin as such would lose its effectiveness which would affect organic farmers in particular because they have been using Bt bacteria very successfully as an organic insecticide for many years. The application of new and even more toxic chemical pesticides would therefore almost be inevitable.

In the USA, this is considered a real problem. The EPA recognizes “the very real concern of insect resistance to *Bt* proteins”^{t,25} and, as a consequence, has developed a strategy to address and reduce insect resistance to Bt. The Insect Resistance Management (IRM) plan focuses on the planting of refuges^u (areas set within or close to a GM crop field, where unmodified versions of the same crops are planted) and imply active participation of companies and growers, imposing penalties for non-compliance, such as sale restrictions or prohibitions, although there have been concerns that these requirements may not be sufficient and rigorously enforced²⁶.

In Spain, as the Spanish Government is not addressing or monitoring the problem of insect resistance, there is no published assessment of resistance to Bt, nor is there any programme to prevent this problem. It is very difficult to imagine farmers planting refuges in Spain, because neither Syngenta^v nor the administration feel responsible for the compliance of this practice.

One of Syngenta’s arguments to justify the fact that GM farmers do not plant refuges is that “Spain is still a huge refuge” because the area planted with Bt crops is very small compared to total corn area! The administration has used the same argument when NGOs denounced the lack of a prevention plan and of independent monitoring. If authorities and industry are not able to set a refuges system when relatively few farmers use Bt seeds, how would they ensure it in case the Bt crops area grew?

Furthermore, the particular conditions of Spanish corn farming do not make it easy to plant refuges: the small size of the farms and the lack of technical control and assistance to farmers make it difficult to convince farmers to introduce new crop management systems²⁰.

^t In an other document, EPA explains “natural selection favors the survival of pests that are not affected by the Bt toxin and that surviving pests may pass their resistance genes on to subsequent generations. Insect resistance could affect the long-term viability of the Bt plant itself and also that of related conventional biopesticides like microbial Bt sprays.”

EPA's Regulation of Biotechnology for Use in Pest Management – June 2003 - http://www.epa.gov/pesticides/biopesticides/reg_of_biotech/eparegofbiotech.htm

^u Farmers are required to plant between 20 and 50% of the total area to non-Bt corn varieties, depending of the region, and if there is overlapping of Bt-corn and Bt-cotton production

^v This information cannot be found on the *Compa CB* seed packages labels, although maybe Syngenta facilitates information in specific regions. In www.syngentaseeds.es it is mentioned: “farmers are recommended to plant at least 20% with non Bt corn”, but this information is not linked at all with the GM seeds advertising and is difficult to find. Furthermore, most of the farmers do not have access to the web.

“20 corn borer generations have gone without this unwanted effect (insect resistance to Bt) appears.”
 Syngenta Seeds Spain web page.

In most of the cases there are not significant differences between the number of borers (or the number of bites) in *Compa CB* or in *Dracma*. The only cases when there are differences (...) show that *Compa CB* (GM) is even more attacked than *Dracma* (non-GM). This means that corn borer can survive on the Bt plant, which poses a real risk of resistance development.
 Result of an ITG-A research, presented at an entomology congress in 2001.

Resistance to Bt is happening in Spain:

In a study about Corn Borer control with GM varieties, carried out in Navarra, during 1998, 1999 and 2000 by the ITG-A, an alarming conclusion was reached: insect resistance to Bt 176 is high²⁷.

The study, based on a 500m² area, compares 2 varieties in fields that have not been treated with insecticide: *Compa CB* and *Dracma*. *Dracma* is the 700-cycle isogene non-GM variety in which the Bt 176 event has been introduced to produce the *Compa CB*; it is a very much commercialised variety in Spain that suits intensive, irrigated, nitrogenated corn cultivation. Both varieties are produced and sold by Syngenta.

The objective was to study how the second generation of corn borers (*Ostrinia nubilalis* –the ECB- and *Sesamia nonagrioides*) affected the plants. For this purpose the number of live borers in the ears, the ear peduncles and the stalk of the plants were analyzed, as well as the number of bites in the same 3 parts.

The results are:

Alive borers presence		Number of bites	
No statistically significant differences in:	Statistically significant differences in:	No statistically significant differences in:	Statistically significant differences in:
Number of total larvae by plant	Number of <i>O. nubilalis</i> : <i>Dracma</i> > <i>Compa</i>	Number of bites in plant	Bites in peduncle: <i>Dracma</i> < <i>Compa</i>
Number of <i>S. nonagrioides</i> larvae	Number of larvae in peduncle: <i>Dracma</i> < <i>Compa</i>	Number of bites in stalks.	
Number of borers in the ear		Number of bites in ear.	
Number of borers in the stalk			

Most of the cases don't show statistically significant differences between both varieties even though one of them is supposedly able to kill the larvae with the Bt toxin (*Compa CB*) and the other one is not (*Dracma*). The only cases when there are differences, except for the *O. nubilalis* count, show that *Compa CB* (GM) is even more attacked than *Dracma* (non-GM). This means that corn borer can survive on the Bt plant, which poses a real risk of resistance development, despite Syngenta saying the contrary.

Therefore, this study shows that on a medium term basis, the appearance of insect resistance defeats any Bt corn advantages. In areas where corn borer presence is high, it is possible that for one year the results are slightly better with the GM variety, but it is a really short term advantage because, after a period, borer resistance to Bt compensates for this.

Navarra has not a big corn production (around 15.000 ha) nor has it the biggest Bt corn percentage (less than 2% of the corn planted in the region), but it is there that the first contamination cases in corn and soya were detected, and much of the Navarra corn goes to starch production (¿for human consumption?), not only to feed, which aggravates the problem.

Effect on non-target species:

Scientific studies have been carried out on the effects of Bt toxin from GM crops on non-target species²⁸. Bt toxin in GM corn does not have the same properties as the one in its natural form in the bacteria. Natural Bt bacteria spores contain an inactive toxin which can only become active in specific larvae, therefore only specific insects are killed. On the contrary, many Bt plants contain an artificial, truncated Bt gene and less processing is required to generate the toxin, so that they can affect non-target species. Furthermore, natural Bt degrades within three days and does not remain in soil, which is not the case for Bt toxin from GM crops.

Research has suggested that transgenic Bt plants could also be harmful to organisms that feed on pests exposed to their toxins. Three Swiss laboratory studies (1998 and 1999), for example, have demonstrated that the mortality of Green Lacewing (*Chrysoperla carnea*) larvae almost doubled after ingesting European corn borers fed on GM maize^{29,30,31}. *Chrysoperla* is a beneficial insect for pest control in organic agriculture, for example.

Other studies show that corn expressing the Cry1Ab Bt toxin, which is supposed to be toxic specifically for lepidoptera larvae, is also toxic to other insects such as beetles. For example, in a field study conducted in 2001 to assess the potential impact of transgenic sweet corn on several beneficial insects, including predatory coccinellids, chrysopids and anthocorids, scientists found a significant trend of higher densities of these insects in non Bt corn³².

In addition, studies have suggested that mortality rates among insects caused by the introduction of genetically engineered Bt crops could create impacts on insectivorous birds or other components of the food web (such as bats).³³

As recognized by the EPA, Bt proteins "are likely to be present in the rhizosphere not only throughout the growth of the crop, but perhaps long after the crop is harvested"³⁴. One research carried out at New York University found that the toxin can remain active in the soil for very long periods, at least 234 days^{35,36}.

The Bt toxin can leak into the soil via the root system of GM plants, deposit from pollen and incorporate through plant residues after harvesting. This may result in the accumulation of Bt toxin in the soil at concentrations high enough to constitute a hazard to non-target organisms

such as microorganisms, beneficial insects and other animal classes^{37,38}. A very recent laboratory study suggests that Bt present in Bt corn litter has long-term toxic effects on earthworms (*Lumbricus terrestris*)³⁹

In Spain, although the effects on insect populations, including non-target species, and soil ecosystems should have been studied for the monitoring Plan (required by the law), up to now no results have been published and no official information at all is available.

Some examples of specific negative impact of Bt 176:

-High rates of mortality of the Monarch butterfly (*Danaus plexippus*) larvae fed with milkweed leaves naturally dusted with pollen from Bt 176 corn⁴⁰. The results showed that:

- 1) larvae fed with dusted leaves for 48 hours suffered significantly higher rates of mortality (around 20%) compared to those fed with non-dusted leaves.
- 2) After 120 hours, the mortality of the Monarch larvae escalated to 37%-70%.

In another study it was found that Bt 176 pollen was the most harmful to Monarch larvae out of several varieties of Bt maize.⁴¹

The EPA also recognizes that “event 176 pollen does have a significant adverse effect on monarch larvae in laboratory assays”³.

-Dramatically cut growth rates of caterpillars of the Black Swallowtail butterfly (*Papilio polyxenes*) exposed to pollen from Bt 176 corn⁴²: “We observed a significant reduction in growth rates of Black Swallowtail larvae that was likely caused by pollen exposure. These results suggest that Bt corn incorporating event 176 can have adverse sublethal effects on Black Swallowtails in field”, authors conclude.

-Harmful effects of Bt 176 maize for Springtails (*Folsomia candida*), a member of the flightless insect family. At certain dose levels they were killed and/or showed reproductive impairment. They feed on fungi and debris in soil and are generally considered as beneficial insects.⁴³

-Spanish scientists have observed that Bt 176 also affects polifageous species such as *Helicoverpa armigera*, *Mythimna unipuncta* and *Autographa gamma*. In these cases it is even more worrying because, as those species feed also on plants and crops other than corn, creating resistance to Bt in them means that the problem is also being exported to crops other than corn.

Risk of the antibiotic resistance gene

Appearance of resistance to certain antibiotics in pathogen bacteria is a big concern for medicine today. The introduction of GM crops containing antibiotic-resistance genes into the food chain enhances the risk of worsening the problem as DNA can survive in animal and human gastro intestinal tract and as there is scientific evidence that genetically modified food can transfer its antibiotic-resistance genes to bacteria in the gastro intestinal tract or to bacteria in the environment^{44,45}.

According to the British Medical Association, "There should be a ban on the use of antibiotic resistance marker genes in GM food, as the risk to human health from antibiotic resistance developing in micro-organisms is one of the major public health threats that will be faced in the 21st Century. The risk that antibiotic resistance may be passed on to bacteria affecting human beings, through marker genes in the food chain, is one that cannot at present be ruled out."⁴⁶

Bt 176 corn contains a marker gene^w that confers resistance to ampicillin, an antibiotic group widely used in human and animal medicine. Many European countries (Austria, Luxembourg, France, Norway, UK), in accordance with public agencies, have expressed concerns about antibiotic-resistance genes in GM products. As a result, the EU decided to prohibit GMOs with antibiotic-resistance genes after the 31st December 2004^x.

In Spain, the monitoring Plan should have evaluated the effects of the antibiotic-resistance gene on the digestive flora of animals eating *Compa CB*. No results have been published. However, it is difficult to imagine how such a study could be undertaken, when there is no segregation of the GM corn production, and the labelling of *Compa CB* seeds did not require mentioning this trait. As stated in the Graham Brookes report "the Bt maize grown in Spain is sold through the usual channels for animal feed use. The supply chain has not seen a need for segregation"¹.

Even worse, as farmers do not declare that they are planting Bt corn and there is no public control, farmers sell their crop to the usual channels, so part of the *Compa CB* production is also ending in the human food chain.

In light of the consensus on this risk, the Spanish Government shouldn't allow growing of Bt 176 varieties, and of course should have not approved a new variety with this same event. Will Spain prohibit all varieties with an antibiotic-resistance gene by 31st of December 2004, even the Bt 176 varieties that are now being planted in Spain?

^w These genes are introduced for the technological process of obtaining the GMO but don't have a specific agronomic function. However they are still present in the GMO.

^x Directive 2001/18/EC (revising Directive 90/220/CEE) states in Art. 4 that "Member States and the Commission shall ensure that GMOs which contain genes expressing resistance to antibiotics in use for medical or veterinary treatment are taken into particular consideration when carrying out an environmental risk assessment, with a view to identifying and phasing out antibiotic resistance markers in GMOs which may have adverse effects on human health and the environment. This phasing out shall take place by the 31 December 2004 in the case of GMOs placed on the market according to part C [for commercial releases] and by 31 December 2008 in the case of GMOs authorized under part B [for non-commercial releases]".

Bt corn in our fields...

...who says we need it?

Some of the questions that come to mind are: why do some Spanish farmers choose to plant GM crops? Do we really need Bt corn in our country? What are the real advantages?

Some thousand hectares of Bt corn are being planted, meaning that a small number of farmers are buying *Compa CB* seeds. But nobody would really be able to explain the agronomic reasons that lead farmers to do so. Two species of corn borers are present in Spain and cause damages to corn but it is widely recognized that the corn borer is –in general- a minor problem. Very few specific areas are considered corn borer pressure areas and farmers agree that there are alternative conventional ways of dealing with this pest, without even using conventional pesticides.

On the other side, there are no independent data about yield increase by using the Bt corn. In fact, available technical data shows that *Compa CB* is not a leading variety in production, not even in the areas where *Dracma*, the isogene to *Compa CB*, has been grown for years due to its good adaptation to climatic and edaphic (soil) conditions.

"Bt maize protects the crop against attack by the European Corn Borer, which can lead to yield losses of 15% or more."

Graham Brookes, September 2002.

"The group decides to give its opinion about the GM corn varieties, declaring that the low corn borer incidence in corn producing regions does not justify the use of these GM varieties".

Spanish Ministry of Agriculture– Report of the Working Group on Pests and Diseases in Extensive Crops. April 2002.

Are there Corn borers in Spain?

Individual farmers and farmer cooperatives report that their yields are as good as always and not lower than yields of farmers who have decided to plant *Compa CB*. Many recognize that the only reason why Syngenta is managing to sell some of these seeds is because of their commercial policy, spreading ideas about how dangerous corn borer attacks are, but without any agronomic scientific base.

However, the seed industry is so desperate to sell Bt corn that they have invested an incredible amount of energy into convincing farmers that what they never identified as a major problem is now a nightmare they have to fight against! ... With the tools that Syngenta provides of course.

Moreover, some cooperatives that tried *Compa CB* have now decided to go back to conventional varieties because the GM variety has not lived up to their expectations (however, despite the authors of this report got in touch with them, they don't want their names to be known publicly).

In Southern Europe climate, corn grows so quickly that plant growth compensates easily for the corn borers slight damages. In fact, insecticide treatments are not even needed in Spain (or only in really specific areas) because the experience shows that there are not differences with non-treated fields, in terms of number of borers in the fields, attacked plants or corn production⁴⁷.

When companies make calculations about corn borer incidence or when they explain to farmers that the borer is "reaping" part of their crop, they forgot to explain that much of the stalk lodging

is not due to corn borer infestations but to other climatic and biological factors that affect the stems so the plants fall. It is the case of the fungus Fusarium, attacking heavily corn fields and causing results on the plant that look like the ones produced by corn borers if there is not closer analysis (Eg, in Navarra, Aragón and Cataluña there are often strong winds called Cierzo that cause lodging on fusarium-attacked plants).

In addition, the GM corn *Compa CB* has a longer cycle, often 2 to 3 more weeks than its isogene, so it takes longer before the corn is dry and ready to be harvested. This extended time results in more Fusarium attack and more climatologic and external conditions impact on the plants.

Data produced by official organizations state that the corn borer action is really very low, and in the areas where Compa is grown the corn borer is not a real problem. For example, the conclusion of the annual meeting of the Ministry of Agriculture Official Working Group on Pesticides for the 2002 plantings reported: "the group states that corn borer incidence is low; when there is an attack, there is no relation between the degree of it and the harm on the corn ears (...). The group decides to give its opinion about the GM corn varieties, declaring that the low corn borer incidence in corn producing regions does not justify the use of these GM varieties"⁴⁸.

"Spanish farmers have suffered from the European Corn Borer for generations".
EuropaBio press release, 27th September 2002.

"The data about corn borer damages are promoted by an economical interest without a technical justification, caused by commercial policies that don't take into account ethical point of views".
COAG (Farming and Breeding Associations Union), June 2003

Does GM corn yield more?

Different studies show that GM crops don't have higher yields than conventional ones. For example, a paper published in the Agronomy Journal in March-April 2001^{49, 50} showed that glyphosate resistant soya cultivars had 5% yield decrease compared to their non GM equivalent varieties and this was due to the gene itself or the insertion process.

In Spain, studies during the last years demonstrate that even in the regions where the corn borer is present it is not true that Bt corn yields more. This is the result, for example, of a report carried out by researchers of the Aragón Plant Protection Centre⁵¹. This study, comparing different control techniques against corn borer, demonstrates that Syngenta and Monsanto Bt corn varieties are not being more effective than conventional ones^y.

Other official studies in Spain show that a reduction in average productions only happens when there is a level of borer attack of at least 65%⁵².

The ITG-A disclosed in October 2001 results of test crops with Bt maize, results which stressed no clear advantages of using Bt maize, advising farmers not to cultivate it. The yield control studies on corn varieties in 1998⁵³, 1999⁵⁴ and 2000⁵⁵ clearly state that each year *Compa CB* produces less or much less than a theoretical average variety (IP100, that can be considered the standard yield for the region) and it is often closer to the lowest yielding variety than to the highest. In other words, there are other commercially grown non-GM varieties that give better or much better results (for example, in 1999 the highest yielding variety produced 25% more than *Compa CB*).

^y Despite Graham Brookes report states that Bt corn is allowing yield increases of 10 to 15%. EuropaBio also states that "corn borer losses in Spain are over 15%" (http://www.europabio.org/pages/ne_gbqmcrops.asp)

Yields are expressed in metric tons (mt) per hectare (ha). with 14% water content.
IP = productivity index, i.e. relative yield.
IP 100 = average yield of more significant varieties in the area (the standard yield for the region)

1998	Yield	IP (%)
Varna	14.906	107.50
Superis	14.229	102.62
Eurodis	14.169	102.19
Compa CB	13.705	98.80
Isosel	12.411	89.51

IP 100 = average (*Dracma*+*Eurodis*) = 13.866 mt/ha Source: ITG-A

- Compa CB* produces 1.2% less than the average (IP 100).
- Compa CB* is in the middle of the range. Many varieties produce more than *Compa CB*.
- Compa CB* produces 8.1% less than the most productive variety (also, the variety that produces most is 8.8% more yielding than *Compa CB*).

1999	Yield	IP (%)
Goia	12.699	113.40
Dracma	11.422	102.00
Eurodis	10.974	98.00
Compa CB	10.128	90.44
Alton	8.515	76.04

IP 100 = average (*Dracma*+*Eurodis*) = 11.198 mt/ha Source: ITG-A

- Compa CB* produces 9.56% less than the average (IP 100).
- Compa CB* is much closer to the lowest yielding variety than to the highest. More varieties produce more than *Compa CB*.
- *Compa CB* produces 20.25% less than the most productive variety (also, the variety that produces most is 25.40% more yielding than *Compa CB*).

2000	Yield	IP (%)
Colonia	16.379	113.26
Eurodis	14.872	102.84
Triana	14.657	101.35
Compa CB	14.299	98.87
Giorgio	12.454	86.11

IP 100 = average (*Dracma*+*Eurodis*+*Triana*) = 14.462 mt/ha Source: ITG-A

- *Compa CB* produces 1.13% less than the average (IP 100).
- *Compa CB* is in the middle of the range. Many varieties produce more than *Compa CB*.
- *Compa CB* produces 12.7% less than the most productive variety (also, the variety that produces most is 14.5% more yielding than *Compa CB*).

“Small farmers in North East Spain are achieving environmental benefits as well as higher yields, better quality and increased income by growing genetically modified maize”.
EuropaBio press release – September 2002.

“At the moment we are getting relatively high yields for non-GM corns that are not treated with insecticide. Also, we have cases of *Compa CB* fields with really low yields”.
COAG (Farming and Breeding Associations Union), June 2003.

Conclusion

The actual scientific understanding of genetic material and manipulations is very partial and it is impossible to predict the evolution of a genetically modified organism (GMO) introduced in complex ecosystems. At the moment, there is not adequate evaluation of their impact on the environment and human health and the risk of irreversible damages is high.

Negative consequences for the environment and agriculture begin to be a reality in the very few countries where transgenic crops are planted already on a large scale, like USA and Canada. Problems such as resistance in pests, increase in the agrochemical use, herbicide resistant weeds or genetic contamination of non-GM crops are occurring. And these problems are not even compensated by an increase of crops yields.

Spain has become a big experimental field for GM crops since 1998, when the first transgenic variety (a Bt corn) was approved for planting. This situation is unique in the European Union where no other country is currently growing GMOs and where the moratorium *de facto* on new authorizations is still in place (even if the moratorium may be lifted for import at the end of this year, the question of commercial growing has still to be addressed).

The cultivation of GM corn varieties is taking place with a total lack of information. No official data is available on the exact area planted with GM crops or on where they are planted. Nor is there an independent analysis of GM crops results in agronomic terms, of the possible appearance of resistance in pest, of the unwanted impacts on non-target species and soil ecosystem, or of the effects of antibiotic resistance gene on animals and humans.

Even worse, GM crops are being cultivated for the last 5 years without any measures to prevent their negative impacts and in fact, some are already occurring. The few independent studies available show that pests can survive on Bt corn (which poses a real risk of resistance development) and that some non-GM crops have been contaminated by GMOs. Nevertheless, the Spanish Administration does not address at all these issues and neither the Government nor the biotechnology companies take responsibility for preventing those problems.

Social consequences of GMOs in agriculture and food have not been evaluated: lost markets for GMO producers, economic damages due to contamination by GMOs, liability problems between farmers, loss of farmers' independence and of consumer right to choose, appearance of an atmosphere of secrecy, suspicion and fear in rural areas, amongst many others.

It has not been proven that the GM varieties cultivated in Spain give better results than conventional ones and are necessary and useful for pest control. The low corn borer incidence in Spain does not justify taking the high risk of introducing Bt corn.

During five years, the Spanish Government has not provided an independent assessment of the environmental, social and economical impacts of the release of GMOs in Spain nor has ensured compliance of European and national legal requirements imposed to the companies that sell GM seeds.

In this context it is absolutely necessary to apply the precautionary principle and to stop the growing of GM crops. These crops must not be released into the environment and used in feed and food before a full and complete assessment is carried out and a comprehensive legal framework is in place and correctly enforced, in particular regarding:

- the control of the releases into the environment, including a real and credible risk evaluation before the release authorization is granted and public registers that inform about the location of GM fields;
- the prevention of contamination by GMOs in conventional and organic seeds, crops, feed and food which guaranty them to remain really GM-free; contamination of seeds above the detection limit cannot be accepted;
- the burden of cost for contamination prevention, that has to be put on the GMO producers instead of farmers who do not want to grow GMOs (organic and conventional);
- the liability issue in case of environmental and economical damage, that has to respect the “polluters pay” principle.

Preventing genetic contamination and other negative effects of GM crops should now be the number one priority for the Spanish Government instead of actively promoting GM agriculture in Spain.

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