GMO CONTAMINATION

AROUND THE WORLD

2nd Edition

Friends of the Earth International

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Genetically Modified Organisms Programme

Friends of the Earth International (FoEI) is one of the largest federations of organizations commited to the preservation, restoration and rational use of the environment. FoEI was founded in 1971. There are now 66 independent FoE member groups all over the world that campaign internationally, nationally and locally on the major environmental issues.

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Juan López Villar
Friends of the Earth International
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GMO CONTAMINATION

AROUND THE WORLD

This booklet addresses some of the challenges that genetically modified organisms (GMOs) pose to all countries. It describes several cases of contamination of our fields and the human food chain by a variety of GMOs not authorized or unregulated under many regulatory frameworks in countries around the world. Finally, it contains a brief summary of different testing methods available to monitor for the presence of GMOs.

GMOs are being introduced too quickly without adequate knowledge about their environmental, health and socioeconomic impacts. Friends of the Earth International, on the basis of the precautionary principle, supports the right of any country to impose a moratorium or ban on the introduction of GMOs into the environment and the food chain, until the inocuity of GMOs has been proven through comprehensive and independently conducted assessments.

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FOREWORD

Lim Li Lin, Third World Network

The dawn of the new millennium also marked a turning point in global biosafety regulation. The Cartagena Protocol on Biosafety (CPB), the first international law to regulate genetic engineering, was adopted by more than 130 countries amidst a global climate of concern about the safety, health and ecological risks of GMOs, and the wider debate concerning the political and socio-economic implications surrounding genetic engineering and corporate-driven science.

The decision to negotiate a protocol on biosafety was largely the result of four years of efforts by developing countries. During the negotiations, developing countries also continued to play a major role in articulating biosafety concerns, and in shaping and concluding the final agreement.

Developing countries felt more keenly the need to have an internationally binding legal instrument based on the principle of precaution, which would regulate the movement of GMOs between countries. By the end of the negotiations, almost all developing countries were speaking with one voice, clear about the real and potential threats and the implications that the new biotechnologies would have on their countries. As importers of GMOs, and as countries most vulnerable to the ecological and socio-economic impacts of GMOs, the unity of developing countries was remarkable in the final stages of the international negotiations.

Most developing countries have no laws or regulations on biosafety and lack the capacity, and technological and financial resources to regulate genetic engineering. As public rejection of GMOs in Europe gathered momentum and increased in intensity, the fear of becoming a dumping ground for unwanted and untested GMOs was real. It was thus imperative to place the onus on exporting countries to seek the prior informed consent of importing countries, instead of simply allowing GMOs to pass through the global market, and from one country to another without international regulation.

The CPB process nevertheless continues. Attention is now focused on issues of national implementation of the CPB and on the interpretation and further development of the provisions of the CPB itself. More than 100 countries are already signatories to the CPB. Many are in the process of ratification.

Capacity has to be built in all countries, developing and developed countries alike, for sound biosafety regulation and for implementation of the CPB.

For developing countries that do not as yet have a legal and policy framework for biosafety, this is the logical first step. The negotiation process was intensive and as a result of various compromises, the CPB has many deficiencies. But it is a framework of minimal standards. National biosafety legislation should set the highest biosafety standards and be comprehensive in its scope and regulation of all activities.

A priority in national biosafety legislation in developing countries is the need to have full knowledge of any pending imports that are genetically engineered, and the ability to take an informed decision based on a full assessment of risks and applying the Precautionary Principle. This was the crux of the issue during the negotiations the CPB.

Stemming from such a legal and policy matrix, institutional structures either have to be established of strengthened for specific biosafety regulation. Multi-disciplinary scientific expertise must be mobilised for risk assessment, risk management and other technical biosafety regulation needs.

The capacity to monitor and enforce biosafety rules in any country is crucial as the strictest laws, the most efficient and effective institutional and regulatory mechanisms, and the best scientific expertise will be undermined without proper monitoring and enforcement. The ability to test or the access to testing facilities is critical in this regard. Testing is the fastest and most effective way of determining non-compliance with biosafety laws, and to find out whether or not an organism is genetically engineered.

Developing countries need to ensure that GMOs that have not been approved are not slipping into the country illegally, or even released domestically. The principle of prior informed consent, which places the onus on the exporting country to seek the approval of the importing country, has to be enforced strictly. It would otherwise make a mockery of all that developing countries had fought for during the negotiations and undermine the spirit and rationale of the CPB.

The current lack of an effective global identity preservation system from the source also means that co-mingling is bound to occur and GMOs will enter into the food and crop production chain. Cross-pollination and horizontal gene transfer compound this problem and also pose new problems that have to be addressed. Inadequate regulation and enforcement in producer countries and the inevitable disaster, accident or mistake all have the potential to introduce GMOs into the environment and contaminate non-GM food and crops.

Another way that GMOs are slipping through the regulatory net is through the distribution of food aid. The consumer rejection of GMOs in Europe and other parts of the world is creating a surplus which producer countries are channeling into food aid to developing countries. Domestic legal and regulatory biosafety mechanisms should also cover this aspect of trans-boundary movement and enforcement and testing need to be also extended to this area.

Many countries are also implementing and enforcing bans, restrictions and moratoria. These countries need to be even more vigilant in their enforcement and employ testing as a means to uphold the integrity of their policy decision. Labelling and identification requirements also need to be strictly enforced as the lack of or inaccurate labelling is seriously misleading to the consumer or end user.

INTRODUCTION

> "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"
>
> European Commission. 1990 [1]

In the early 1990s, the first (GMOs) were commercialized. Though it was only since the mid-nineties that big areas of land were dedicated to grow GM crops. In 1996, the first significant planting of GM crops took place (2.6 million hectares), almost all in the US.[2] From '96 to '99, the area increased from 2.6 million ha. to 41.4 m ha, which suggests that the introduction of GM crops was going at a much faster speed than past innovations in plant varieties like hybrids.[3] More than 90% of the total area globalwide growing GM crops in 1999 was concentrated only in three countries: U.S. (around 70%), Argentina (around 14%) and Canada (around 9%). In 2001 similar trends were maintained, with the 99% of the global GM crop area based in four countries: The U.S. (68%), followed by Argentina (22%), Canada (6%) and China (3%). But the enthusiasm expressed by some of the biggest agriculture exporters was not shared globalwide. Concerns about the safety of GM crops grew in several parts of the world and promped calls for moratoria like the one existing in the European Union since 1999. No GM crops for commercial release have been authorised there since 1998.

GMO CONTAMINATION: THE TROJAN HORSE OF THE BIOTECH INDUSTRY

The use of testing as a tool to verify when GMOs have contaminated our fields and our food shows the way GMOs have been introduced globalwide. The transmission of undesired traits to non-targeted organisms, and the consequent GMO contamination has become the Trojan horse of the biotech industry. Legal frameworks were supposed to be adequate to ensure that GMOs wouldn't endanger the environment or human health. Biotech companies were supposed to

comply with those frameworks. Regulatory bodies were supposed to monitor and oversee GMO releases to ensure they were complying with the legal frameworks. But the reality shows a completely different picture. The StarLink scandal, the widest case of contamination by a GMO not authorized for human consumption anywhere in the world is only one of the many examples of the problems that contamination poses. The U.S., the biggest promoter of biotech in the world with the strongest capacity in biotechnology has not been able to control their GMOs at home yet keeps on promoting them aggressively globalwide. What is happening then in developing countries generally with inadequate or non-existent regulatory frameworks on biotechnology, and also without financial resources and capacity to control and monitor the flows of GMOs?

THE STARLINK DEBACLE

INTRODUCTION

Discoveries of food contaminated by a type of GMO maize called StarLink illustrates the problems that all countries face in handling GMOs, and the consequences of GMO contamination.

StarLink has become the widest case of contamination by a GMO not authorized for human consumption anywhere in the world.

The maize, produced by biotech giant Aventis, was discovered in Taco Bell taco shells made by Kraft Foods through laboratory testing commissioned by Friends of the Earth U.S. as part of the GE Food Alert coalition in August 2000. StarLink is an insect-resistant type of yellow maize modified to expressing a Bt bacterial toxin. It had U.S. federal approval to be grown for animal feed, but was not approved for direct human consumption because it "exhibits some characteristics of known allergens." This is due to the presence in StarLink of a protein called Cry9C which U.S. authorities warned might cause allergic reactions in some people.

Kraft Foods announced on September 22nd 2000 the voluntary recall of all its taco shells due after confirming the widespread presence of StarLink.[4] More than 300 products were recalled in the end. Also in September, Aventis halted the sales of Cry9C seeds, and the U.S. Department of Agriculture (USDA) issued a formal recall on October 9th for 350,000 acres of StarLink maize planted in the U.S.

The magnitude and the seriousness of the StarLink contamination was really breathtaking. Despite being the only Bt corn variety which was denied for human uses, it came up anyway in the human food chain.[5] StarLink has become the widest reported case of contamination by a GMO not authorized for human consumption in any country in the world. This major U.S. regulatory failure turned into an international scandal with repercussions in countries like Japan and South Korea. The consequences of this finding are still emerging as U.S. authorities announced in July 2001 that there is no reasonable basis to conclude that StarLink is safe for consumption at any level and therefore a tolerance level in food requested by Aventis was not granted.

LACK OF ADEQUATE REGULATORY FRAMEWORKS AND MONITORING POLICIES ON GMOS

The U.S. Environmental Protection Agency (EPA) allowed Aventis to promise to regulate itself to prevent contamination, and the Food and Drug Administration (FDA) clearly failed to carry out adequate monitoring and controls in order to guarantee that StarLink had not entered the human food chain. It showed a major regulatory failure. The tests that detected its presence were administered not by any biotech company, nor by government inspectors, but by a non- governmental organization.

"...what do our consumers have to say when the FDA is not there and the EPA is not there, Agriculture´s not there, but Friends of the Earth find this out? What kind of regulatory scheme is that?"

US Senator Tom Harkin
Sep. 26, 2000 Senate Health, Education, Labor and Pensions Committee emergency hearing on the safety of GE foods. FDA was called to testitfy.

Current food policy of the FDA treats most GM crops as no different than non-GM crops and no premarket safety or environmental testing of GM products is required. The U.S. regulatory framework is weak because it does not regulate important categories of GMOs and it lacks adequate monitoring systems to guarantee enforce-ment of those legal restrictions and prohibi-tions that do exist.[6]

Kraft (...) encourages the appropriate regulatory authorities to consider the following: Requiring as a pre-condition to approval that a fully validated testing procedure be in place for identifying the relevant DNA in crops and in finished products.

Kraft Foods (largest food co. in the world)
News Release, September 22, 2000

THE SCOPE OF THE CONTAMINATION ILLUSTRATES LIMITED KNOWLEDGE OF GMOS

Nearly one-tenth of 110.000 grain tests done by federal inspectors in the U.S. from November 2000 to April 2001 turned up positive, according to the USDA.[7] StarLink was planted on 0.4% of US corn acres, but the acreaged contaminated was much greater. It happened because of mixing with other varieties through handling or by cross-pollinating with other varieties.

More surprising, the contamination was supposed to be found only in StarLink brand seeds. But in November 2000 StarLink corn characteristics were found in a variety of seed produced by Iowa-based Garst Seed Company, which was not supposed to contain the Cry9C protein.[8] Later on it was reported that the Cry9C protein was found in another 80 varieties of yellow corn seed.[9]

Aventis Crop Science does not know how Cry9C came to be present in a variety other than StarLink brand

Aventis Press Release
November 21, 2000

What was even more surprising was that the contamination did not affect only different types of yellow corn varieties. On July 4th 2001, a white corn product was found for the first time. This discovery was a clear shock to many producers who, after the StarLink scandal, switched to white corn thinking that this would eliminate the risk of inadvertently having StarLink contamination. As *The Washington Post* underlined: "The discovery [of contaminated white corn] underscores the food industry's difficulties in keeping modified and conventional crops apart... White corn is grown and distributed separately from yellow corn, and industry observers said there are no genetically modified varieties..."[10]

"Finding the Cry9C protein in another variety of corn raises new questions about how carefully the biotechnology industry is producing and distributing biotech products."

The Washington Post, Nov. 22, 2000

Lack of information

The StarLink case shows a negligent attitude of Aventis which did not give the proper information to many farmers. StarLink was not allowed for human consumption. That meant that Aventis should have informed the farmers about preventive measures to avoid contamination. Accounts by government officials showed that a lot of farmers were not aware of the restrictions on StarLink seed.[11]

"I think we´re just hitting the tip of the iceberg here. We just don´t know what´s in those elevators, and when we start letting this stuff go and it´s tested, it´s going to get worse."

Iowa grain elevator operator
The Washington Post, Oct. 25, 2000

Republican chairman of the Iowa House agricultural committee, Ralph Klemme said that he was not fully informed of the restrictions on growing the corn. Klemme said he would not have grown StarLink corn had he known that other corn varieties should not be grown within a 660-foot "buffer zone" to avoid cross-pollination.[12] Thousands of farmers and grain elevator operators expressed anger at Aventis and the biotech industry. The state Attorney General's office in Iowa criticised Aventis and seed dealers for not telling farmers to keep StarLink out of the human food chain.[13]

Aventis' solution: Legalise what is illegal

Aventis said four years were needed to remove StarLink from the food system.[14] Taking account the magnitude of the contamination and the difficulties to remove the contamination the "solution" Aventis was seeking was to allow a threshold of tolerance for StarLink for food as well as feed uses. That would have authorized retroactively StarLink corn for human consumption and therefore legalise genetic pollution.

The EPA called for a meeting of its Scientific Advisory Panel (SAP) in response to Aventis' petition to allow StarLink corn to be allowed in food consumed by humans.[15] The panel of scientists which met mid July 2001 stated that there was not enough data to conclude with reasonable certainty that there was an acceptable level of StarLink corn that people could eat.[16] Panel members specifically mentioned the need to do more tests on people who unexplained suffered severe, life-threatening allergic reactions after eating corn products.

" The agency had no choice but to turn down the Aventis application. Some of the world´s leading experts on allergenicity and food safety told us there was not enough data to conclude with reasonable certainty that there was an acceptable level of (StarLink corn) that people could eat"

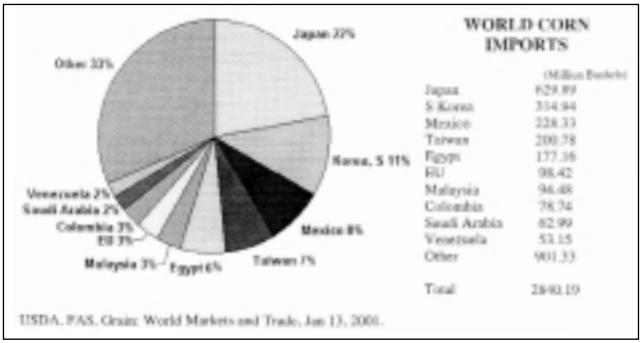
Stephen Johnson
EPA-s Office of Prevention, Pesticides and Toxic Substances
The Washington Post, July 28, 2001

CONTAMINATION AROUND THE WORLD

JAPAN AND SOUTH KOREA

The effects of StarLink contamination were not contained within the U.S. StarLink maize was also detected in October 2000 in U.S. shipments to Japan.[17] In November 2000 South Korea made similar findings. Both are the top importers of U.S. maize. As happened in the U.S., it was not a biotech company or a governmental agency that found it, but a consumer group. StarLink maize is banned in both countries for food consumption, although it is allowed in South Korea for animal feed. While originally denied as a rumour by the U.S. Department of Agriculture that traces of StarLink maize were found in a shipment headed for Japan. There have since been several such shipments of StarLink-tainted maize to Japan. Despite controls undertaken in the U.S. to ensure that no traces of StarLink corn were exported as food or feed to Japan, in January 2001 the Health Labor and Welfare Ministry of Japan announced findings of traces of StarLink. The U.S. had reported negative findings for StarLink in these shipments.[18]

South Korea had similar problems with U.S. exports of maize tainted with the StarLink variety. The Korean Food and Drug Administration detected traces of the StarLink maize in a January shipment of 55,000 tones of U.S. maize imported for food consumption. This maize had a certificate guaranteeing it to be StarLink-free. This maize was put in



quarantine. In November 2000, the Korea Food and Drug Administration (KFDA) had already recalled 14,528 kilogrammes of tortillas contaminated by StarLink corn.[19]

When looking at the statistics of the world's main corn importers, StarLink has been found in the two main importers. Are other U.S. corn importers checking whether there is corn tainted with StarLink in the shipments they received from the U.S? Are mechanisms of testing in place in every country which imports corn from the U.S?

StarLink has been found in the two main importers of US corn: Japan and South Korea. Are mechanisms of testing in place in every country which imports corn from the US?

But StarLink was not the only GMO which has been illegally introduced into the environment and the human food chain. Multiple cases of contamination arose all over the world. On June 21, 2001, Japan's Calbee Foods Co Ltd voluntary recalled some of its snack products after traces of illegal genetically modified NewLeaf Plus Potato were found. The same type of GM potato was found in "Pringle" chips manufactured by Procter and Gamble which was forced to pull 800,000 packets off the Japanese market.[20] NewLeaf Plus was developed by Monsanto Co and is not approved in Japan.

ARGENTINA

Monsanto was also implicated by the findings in Argentina of unapproved genetically-modified seeds. The illegal variety was Monsanto Roundup Ready corn seed, which has not been approved in Argentina. The Agriculture Department stated that the batch of unauthorized seeds has been found and destroyed, and opened an investigation to determine who was responsible for its distribution.

"A company of our size, with our level of investment, does not have the flexibility to act incorrectly, to do anything illegal"

Carlos Popik
President of the Argentine unit of Monsanto
Reuters, May 10, 2001

EUROPE

In May 2000, before the StarLink case, 6000 hectares of European farmland which were planted with GM-contaminated oilseed rape. The countries affected were France, Germany, Luxembourg, Sweden and the UK. The seed was sold by the company Advanta (a joint venture of the AngloSwedish corporation Astra Zeneca and the Dutch firm Cosun).
Advanta claimed that the contamination happened in Canada due to pollen from a genetically modified oilseed rape, GT 73 tolerant of Monsanto's herbicide Roundup. The pollen from the Monsanto rape

was blown onto fields of conventional oilseed rape, “Hyola 38”, that was being grown for seed. The fields were reportedly at least 800 metres and up to as far as 1.4 kilometres away from each other. According to Advanta and the UK government, the level of contamination of the Advanta seed by the GM variety is around 1%. However, a company selling Advanta’s seed to Swedish farmers has stated that “parts of this year’s imports from Canada of the same variety have been shown to contain some 2.6% of Roundup-resistant seed”.[21]

Testing done by Friends of the Earth of food products in Denmark and the U.K. showed different varieties of GM corn illegal for human consumption in the European Union. Kim Zapatas brand chips bought in Denmark were found to contain Monsanto’s GA 21, which is not approved for cultivation or for import by the European Union. Following the revelation the product was immediately withdrawn from the market. In the U.K., Tortilla chips marketed under the Phileas Fogg brand as well as by supermarkets Safeway and Asda under their own brands, were found to contain Monsanto GA 21.[22] Those cases of contamination were just a few of the multiple cases of contamination by illegal GM varieties in Europe.[23]

INDIA

In October 2001, it was revealed that illegal GM cotton was growing on some 10,000 hectares in the Indian region of Gujarat. India has not yet authorized the cultivation of GM crops because of the uncertainty surrounding the environmental, health and socioeconomic impacts.

" This is a foretaste of a frightening situation where transgenics will be out of control and all over the place."

E.A Siddiq, Chairman of an Indian Department of Biotechnology Committee that monitors transgenic crops
Nature, October 2001

The farmers in Punjarat bought the seeds from a company called Navbharat, but apparently did not know they were GM. The company is thought to have brought the seeds from the United States a couple of years ago, and the seeds were crossed with an Indian cotton variety in order to produce the variety found now in Punjarat. The Genetic Engineering Approval Committee (GEAC) in the environmental ministry was not aware of the introduction of this genetically modified variety and strongly condemned this incident.

Mexico: Contamination in Centers of Origin

In September 2001, it was announced in the journal Nature that researchers in Mexico found wild maize in the Mexican states of Oxaca and Puebla contaminated with genetically modified material despite a moratorium on growing GM maize since 1998. These findings are deeply troubling since maize originates in Mexico. They raise further concerns about pollution by GM crops of plants which have wild relatives, like oilseed rape and beets in Europe, and potatoes in the Andes.

Food Aid

Southern groups have also protested the shipment of GMOs as food aid. In early 2001, consumer and environmental groups in Bolivia, Colombia and Ecuador found food aid to contain genetically modified ingredients. Samples of food aid originating in the U.S. and distributed by programs in Latinamerica were obtained and sent to an independent laboratory in the U.S. The results showed high levels of GMOs in soya and corn — as much as 90%.[24] In Bolivia most of the food aid comes from the U.S. PL-480 Program. Samples of soy/corn blend and wheat/soy blend from the U.S. Agency for International Development (USAID) were collected by an NGO, the Bolivian Forum on Development and Environment (FOBOMADE) and were found to contain GM soy and corn at levels up to 10%. That happened despite the fact that Bolivia has since September 2000 suspended all GM trials. Additionally, a government decree from January 2001 forbids the import of products derived from GM crops.

The high levels found in the samples of Ecuador and Colombia was highly criticized by Latinoamerican NGOs. Elizabeth Bravo, from the Ecuatorian Friends of the Earth group Accion Ecologica, said that "this could be a deliberate shipment of GMOs into food aid. It is difficult to believe that those high levels are consequence of unintentional contamination".

World Food Summit: Food Aid Contaminated with Starlink and Other Varieties Denounced

After the monitoring activities undertaken in 2000 and 2001 in Bolivia, Colombia and Ecuador, new activities were initiated in Bolivia and two Central American countries: Nicaragua and Guatemala. In

Rome at the World Food Summit - a gathering of world leaders held June 10-13, 2002 to discuss strategies to tackle poverty and hunger- several Latinoamerican NGOs denounced the results of a monitoring programme in the abovementioned countries.

StarLink found in Bolivia

The Bolivian Forum on Environment and Development (FOBOMADE), announced that a sample of U.S. Agency for International Development (USAID) food aid tested positive for the presence of StarLink. This was the first time that StarLink was found in food aid and the first time it has been found outside the U.S., Japan and Korea since originally detected in the U.S. in August 2000. All test results were confirmed using DNA analysis.

The sample sent for testing by FOBOMADE also contained two other types of engineered corn not approved in the European Union (EU) - RoundUp Ready and BtXtra, both produced by Monsanto.

Corn seed contaminated in Guatemala and Nicaragua

Food aid sent to Nicaragua and Guatemala as corn seed was also found to be contaminated with GM corn varieties not approved in the European Union. Colectivo Madre Selva, a citizens' group in Guatemala examined a sample of seed sent as food aid and found three varieties of engineered corn not approved in the EU - Liberty Link produced by Aventis and Monsanto's BtXtra and RoundUp Ready.

"The U.S. considers this genetically engineered corn unfit for human consumption and has banned it for years. Yet it has been sent to Bolivia as food aid,"

Gabriel Hervas,
President of the Bolivian Forum on Environment and Development.

Centro Humboldt, a Friends of the Earth group in Nicaragua, working with other members of the Network for a GMO-Free Nicaragua, obtained samples of food aid from different parts of the country. One corn seed sample contained 3.8% of a GM corn variety and was donated by Germany through the World Food Program (WFP). Three samples of a corn and soy flour blend contained Monsanto's RoundUp Ready corn and were donated by USAID.

Nicaragua and Guatemala are centers of origin of corn. The organizations that made the findings raised the concern that food aid with genetically modified seed may be another pathway of genetically engineered crops into the birthplaces of corn, creating a form of

biological pollution that cannot be recalled. Commercial imports of corn seed for food to Mexico have recently been reported as a likely pathway threatening native Mexican varieties.

Food aid sample test results and regulatory status. WFS 2002

Product	Recipient	Test Results	Regulatory Status	Donor
Food aid Corn/soy flour blend	Bolivia	StarLink < 0.1%	**Not approved globally**	USAID
		Bt Extra (DeKalb) near 0.01%	Not approved in the EU	
		Monsanto RR > 0.1%	Not approved in the EU	
Food aid Whole corn kernels	Guatemala	Liberty Link > 0.1%	Not approved in the EU	WFP
		Bt Extra < 0.1%	Not approved in the EU	
		Monsanto RR > 0.1%	Not approved in the EU	
"Gift from Germany" Whole corn kernels	Nicaragua	Total GMO at 3.8%	GMO seed not accepted by USAID for countries without a biosafety regulation; must be labeled in Germany	Germany through WFP
"Food for Pregnant Mothers" Corn/soy flour mix	Nicaragua	Monsanto RR (GA21) corn at 0.3%; Total GMO > 1.0%	RR not approved in the EU; (Other varieties present approved in U.S. and EU)	USAID through WFP
"Food for Schoolchildren" Corn/soy flour mix	Nicaragua	Monsanto RR (GA21) corn at 2.0%	RR not approved in the EU; (Other varieties present approved in U.S. and EU)	USAID through WFP
"Food for Work" Corn/soy flour mix	Nicaragua	Monsanto RR (GA21) corn at 0.2%; Total GMO > 1.0%	RR not approved in the EU; (Other varieties present approved in U.S. and EU)	USAID through WFP

GMO = Genetically modified organism; RR = RoundUp Ready herbicide resistant variety; USAID= United States Agency for International Development; WFP = World Food Program; EU = European Union

A STRATEGY BEHIND CONTAMINATION?

Biotech companies and pro-biotech countries like the U.S. are to blame for their lack of control of these products and the lack of respect for food safety and environmental regulatory frameworks worldwide. At first sight, the contamination could be seen as accidental, but it may also be a real strategy of biotech companies towards legalising genetic pollution.

"You'd think that the North American agricultural export industry would have no choice but to bow to the demand: keep GM seeds far away from their unaltered counterparts and in general move away from the controversial crops.
You'd be wrong. 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".

The Guardian, January 21, 2001

BIOPHARMING: A NEW POTENTIAL FORM OF GMO CONTAMINATION

Larry Bohlen, Friends of the Earth U.S.

> "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 and contained in restricted farm plots, 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, October 7, 2000

Inmediately after the StarLink scandal, concerns over a new potential form of GMO contamination appeared due to the development of plants crops that contain biopharmaceuticals, industrial enzymes, antibodies, and even contraceptives. A new report released in July 2002 by the Genetically Engineered Food Alert Coalition in the US revealed that over 300 field trials in secret locations in the US have been done with crops engineered to produce prescription drugs or industrial chemicals. Those crops include plants that produce an abortion-inducing chemical, growth hormones, a blood clotter, and trypsin, an allergenic enzyme.[25]

The question that is being posed now is whether drugs and chemicals could contaminate the food supply. Experts affirm that the possibility is real. According to an expert committee of the National Academy of Sciences: "it is possible that crops transformed to produce pharmaceutical or other industrial compounds might mate with plantations grown for human consumption, with the unanticipated result of novel chemicals in the human food supply".[26]

According to the GE Food Alert Coalition report, already a case of biopharm contamination has been recognized by an official of the drug company Pfizer: "We´ve seen it on the vaccine side where modified live seeds have wandered off and have appeared in other products".[27]

The majority of engineered biopharmaceuticals and chemicals are in corn. The fact that the majority of open field test plantings are done with corn raises a particular concern since it readily cross-pollinates and its pollen can travel for over a mile. Jane Rissler of the Union of Concerned Scientists in the US fears that there could be a rerun of the StarLink debacle. "If any contamination involved a crop producing a potent drug, the consequences could be far more serious", she said.[28]

The new traits contained in corn could be spread for example through pollen carried by wind or insects, spilled seed, unharvested seed sprouting the next year (volunteers) and biopharm seed residues carried by farm equipment to conventional fields.

Despite these concerns, ProdiGene, the leading company in planting these type of engineered crops, has announced that by 2010, 10% of the corn crop will be devoted to biopharm production. According to a ProdiGene report to its shareholders, it is also lobbying to weaken regulations meant to prevent contamination. The lessons from StarLink seem not yet to be learned.

Some food companies have been lobbying for tighter regulation, at a minimum. One corporate official said publicly that "in a perfect world, there would be no biopharming in food crops". Consumer and environmental groups in the US have written to the US Department of Agriculture requesting that no biopharmaceutical crops be allowed outside of the controlled laboratory circumstances used to develop other pharmaceuticals, and that no food crops be engineered with drugs or chemicals under any circumstances.

CASE STUDY: Rio Grande do Sul

The state of Rio Grande do Sul is known as the "Granary" of Brazil because of the quality and the high level of its agricultural production. Agriculture in Rio Grande do Sul is responsible for almost 25% of the Brazilian production of grains. Among several of the most important crops of the state are: rice, soy, corn, wheat, barley, beans, tobacco, grape and apple.

In 1999, Rio Grande Do Sul declared its political position to work for a "Free of GMOs" State. The uncertainty around the potential impacts to environment and human health of GMOs was one of the key reasons for the government of Rio Grande do Sul to work for a territory Free of GMOs. To implement that decision, Rio Grande do Sul used testing as a key tool to monitor compliance with its decision.

In August 1999, the Rio Grande do Sul's government acquired lateral flow test strips (See Annex I) for testing GMOs. In November 1999, 13 teams of the Department of Agriculture started visiting different regions of the state. They used the lateral flow test strips for detecting Roundup Ready soya to make hundreds of analyses of soya. The result was that 3,5% were genetically modified. However, this test is not recognized by the Brazilian legal system. In order to have the results recognized, 32 samples of seeds were sent to the official laboratory of the federal government. All 32 positive results were confirmed by DNA tests. The results of the Trait kit were not used to determine official and legal measures, but as a tool to make the analysis cheaper, faster and easier. The list of farmers responsible for the GMO soya was sent to the Federal Police and to Public Prosecutors in order to take the required legal measures.

Source: Department of Agriculture - Government of Rio Grande do Sul, Brasil. For more information, please contact: Leonardo Beroldt, lberoldt@saa.rs.gov.br

CONCLUSION

Contamination is one of the biggest problems that GMO releases into the environment pose today. The cases described in the booklet show that when an organism is released in the environment the consequences are unpredictable and the impacts are not known. The fact that once an organism is released into the environment it is very difficult to call back has been ignored or downplayed. The problem of cross-pollination and other forms of transmission of undesired traits to organisms not targeted, and the problems of commingling have not been properly addressed. Authorisation of a GM crop to be released only for animal feed and not for food should have never happened, yet new crops not intended for general human consumption, such as biopharmaceuticals plants, are being developed today.

The problems of GMO contamination illustrate also the fact that legal frameworks on GMOs created in industrialised countries are clearly inadequate. The lack of adequate monitoring systems to guarantee enforcement of legal restrictions and prohibitions is evident, as well. Legal frameworks worldwide have been breached from the U.S., Denmark, U.K., Germany, Japan, South Korea, Argentina, Bolivia, Ecuador, to Canada. Those are a few of the reported cases, probably only the tip of the iceberg.

Also the scope of the contamination illustrates either limited knowledge of GMOs or intentional attempts to compel people to accept these crops with resignation. The StarLink case shows the failure of U.S. government regulation and the reckless rush of biotech corporations to get their GMOs into the market. As a consequence, food safety and environmental concerns have been given low priority. The negligent attitude of biotech companies towards regulatory frameworks worldwide suggests a strategy towards legalising genetic pollution. Biotech companies should not have introduced GM products where no authorisation was given. The scope and the multiple cases may reflect not a case of global accidental pollution but a strategy towards polluting first, legalising contamination afterwards.

RECOMMENDATIONS

Friends of the Earth urges to take into consideration the following recommendations:

– Governments should not release any GMOs without adequate regulatory frameworks and effective monitoring and enforcement capability to ensure sound biosafety regulation

– Governments should sign and ratify the Biosafety Protocol as soon as possible, in order to implement a minimal regulatory framework globalwide. Countries should also create national regulatory frameworks on GMOs and products thereof.

– Governments should not release any GMO without the capacity to ensure compliance with biosafety laws.

– Governments should not release any GMO without its reference materials, including DNA primer sets required for testing. Countries should not use any GMO or derivative before they have received those materials.

– Adequate funding should be in place so that all countries can monitor, test for food safety, and counduct environmental assessments for possible impacts on native crops and ecosystems.

– Governments should not release any GMO without an adequate liability regime in place. If contamination happens and damage is caused to human health, environment or socioeconomic welfare those Impacts should be addressed by a liability mechanism.

ANNEX I

BRIEFING ON METHODS OF TESTING

DNA TESTING

The identity of a GMO can be determined by looking for the unique patterns of DNA (dioxyribonucleic acid) genetically engineered into a crop. This testing can currently only be performed with sophisticated equipment found in some universities, and governments, and in commercial laboratories. The range of services offered differs from laboratory to laboratory. Not all laboratories have adequate equipment to look for all types of GMOs. Also, there are limits to what can be tested depending on what inventory of patterns of DNA (called primer sets) a lab possesses. Most labs can identify common crops like Bt corn, Roundup Ready soy, GMO cotton, or Bt potatoes. Many labs would have difficulty determining the exact identity (commercial brand) of new GMO crops in field trials, but might at least be able to determine if a crop was genetically modified through a method used commonly on several crops. Most GMO maize has a genetic pattern or event called 35S even though other genes are added to produce different GMO traits. Commercially available tests cost between $120 and $500 per test, depending on the level of information desired.

Polymerase chain reaction (PCR) is the most used method to determine DNA in samples. The PCR method is able to generate billions of copies of a single DNA molecule in some hours. Through biochemical processes a sample of DNA is scanned to locate target sequences of DNA which are amplified billions of times. The amplification allows detection of a specific sequence and quantification of the proportion of DNA molecules in a sample.

This method is known for its sensitivity to detect GMOs at a very low level. It is able to detect GM traits in soy, corn, potatoes, sugar beet, tomato, canola, etc. Levels of accuracy can be as good as 0,05% or only 5 grains out of 10.000
Without endorsing one company over another, we list two that operate laboratories in several locations around the world. For more information:

Genescan: www.genescan.com
Genetic ID: www.genetic-id.com

RAPID TESTS FOR THE DETECTION OF GM EVENTS

LATERAL FLOW TEST STRIP METHOD

GMO EVENTS WHICH CAN BE DETECTED

These testing methods are designed to detect the presence of biotech grains through the detection of a specific protein produced in the biotech grain like Cry9C, Cry1Ab, PAT protein in corn and also CP4 EPSPS protein in soya. These tests generally provide qualitative results using antibodies and color reagents incorporated into a lateral flow strip.[29] Tests are typically sold in lots of 100 at a cost between $350 and $575 or about $4 to $6 per test.

Figure 1
Source: FGIS. Directive 9181.1. 26 February 2001. Testing for StarLink Corn - Lateral Flow Test Strip Method

The Cry9C protein (StarLink) is produced by a gene derived from Bacillus Thurigiensis. (Bt). This gene was incorporated into the insect-resistant corn formerly sold under the StarLink brand by Aventis. The lateral flow test strip method is used by the Federal Grain Inspection Service (FGIS) for testing corn in the US as official criteria under the authority of the United States Grain Standards Act (USGSA). FGIS which verified the performance of the strip tests, estimated that the ones from the Envirologix company can detect the presence of the Cry9C in corn at a level of 0.125% (1 kernel in 800). The ones from Strategic Dianostics (SDI) were able to test at 0.25% (1 kernel in 400) and 0.125% (1 kernel in 800) detection levels.[30]

The Cry1Ab Bt protein (Mon810, Bt 11 and Bt 176) is also produced by genes derived from Bt *Bacillus thurigensis*. These genes have been introduced into insect-resistant corn like YieldGard brands from Monsanto and Novartis, KnockOut from Novartis and NatureGard from Mycogen Seeds.[31]

The PAT proteins have been produced by genes derived from *Streptomyces hygroscopicus* or *S.viridochromogens*. These genes have been incorporated in Liberty Link brands from Aventis, Pioneer and other.[32]

The CP4 EPSPS protein is produced in crops by a gene derived from Agrobacterium sp. Strain CP4. This gene has been incorporated into several crops to make them tolerant to the herbicide Roundup Ready. These crops include soybeans, canola, cotton and others. Different protocols for strip tests are applied for different crops, seeds and grains and for the determination of different expected amounts of the CP4 EPSPS protein in the samples.[33]

METHODOLOGY

Different Protocols are applied to bulk grain, tissue, and single kernels and also they differ from company to company. Tissue sample tests are useful for testing plants directly in the field. In general they are similar and not very complicated to do, requiring no special training. [34]

Here is a brief summary of the steps of one of the protocols for Cry9C in bulk grains followed by one for plant tissues. First of all a food processor, coffee grinder or blender is necessary in order to grind a sub-sample of grain selected. Once ground a determined quantity of water is added following the weight of the sample, and the mix is shaken. Using a transfer pipette provided with the test-kit, a portion of the sample is drawn into a transfer tube (See figure 2). Lastly the strip test is placed inside. After inserting the strip into the reaction tube you will observe liquid travelling up the membra-ne strip toward the absorbent pad at the top of the strip. Allow the strip to remain in the test tube for around 10 minutes and check afterwards whether it gives a positive line (See figure 3).

Figure 2
Source: FGIS. Directive 9181.1

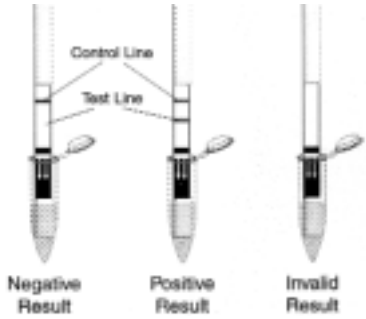


Figure 3
Source: Envirologix. Cry1Ab / Cry1Ac Lateral Flow QuickStix Strip Kit

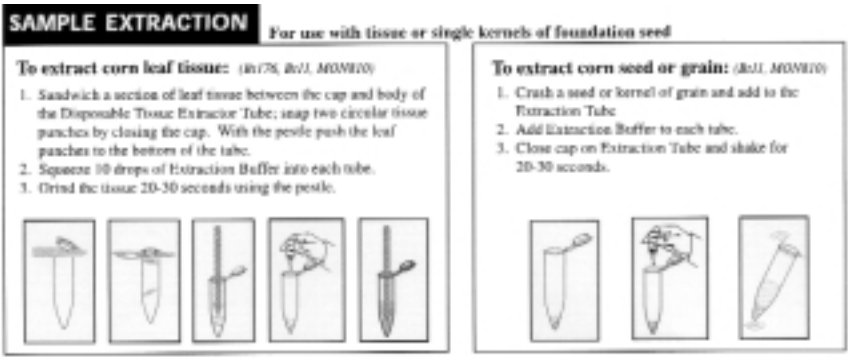


Figure 4
Source: Envirologix. Rapid Field Test for determining Bt expression (Cry1Ab) in corn, plants, seeds, and grain.

MICROTITER WELL ELISA TECHNOLOGY

The testing method is designed to detect the presence of GM grains through the detection of a specific protein produced in the biotech grain. These tests provide quantitative and/or qualitative results using antibodies incorporated into microtiter wells and enzymatic, colorimetric reagents for detection.

Figure 5
Source: Envirologix. A quantitative laboratory test for the detection of Cry1Ab/Cry1Ac (Bt endotoxin) in crops, seeds, and seedlings.

These methods require the user to have laboratory equipment and they are developed to locate Cry1Ab and Cry1AC proteins.

Other kits using the Elisa procedure have been developed to detect thresholds levels of StarLink corn (Cry9C) in processed corn fractions.[35] Also other kits have been developed to detect thresholds of CP4 EPSPS protein (Roundup Ready Soybeans) in processed food ingredients[36] and Cry1Ab thresholds in food ingredients.[37]

FOR MORE INFORMATION:

Without endorsing one company over another, we list contact information for two companies:
Envirologix, http://www.envirologix.com
Strategic Diagnostics, http://www.sdix.com

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[18] Ibid. January 18, 2001.

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[23] For example Germany in April 2001 found batches of the "Arsenal" variety of maize seed contaminated with the variety GA 21 and "Janna" contaminated with the varieties Bt 176 and Bt 11 (Reuters Germany, April 27, 2001). In Poland a soya product sold in Poland by the Czech company "Santé" contained 4% GM soya without any labeling, which is compulsory in Poland (ANPED-FoE Press release. July 2001)

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[35] SDI. Bt9 Maize Kit User's Guide

[36] SDI. Soya RUR Kit User's Guide Processed Ingredient Testing.

[37] SDI. Food Ingredient Testing Bt Maize kit User´s Guide

"This is a foretaste of a frightening situation where transgenics will be out of control and all over the place."

E. A. Siddiq, Chairman of an Indian Department of Biotechnology committee monitoring transgenic crops
Nature, October, 2001

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