GM Contamination Register Report

Annual review of cases of contamination, illegal planting and negative side effects of genetically modified organisms

GREENPEACE

GM Contamination Register Report

Contents

Published by Greenpeace International
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JN 044

Printed on 100% post consumer recycled chlorine-free paper.

Left and cover image:
Spraying of genetically engineered soya
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1. Executive Summary

Genetic Engineering out of control

2006 was the tenth year of the commercial growing of genetically engineered crops. Over these ten years, academic scientists, government officials, farmers, environmentalists and consumers have raised numerous concerns about the threats these crops pose to farming systems, agricultural biological diversity, the environment, and human health. One of the concerns most often raised has been the impossibility of containing these organisms to the fields in which they are planted. Genetically modified organisms (GMOs) are living organisms that reproduce, spread pollen, and produce seed. At any and all points along the production cycle from seed to crop to seed there is a high possibility of contamination. After ten years of commercial growing it is clear that these concerns are well-founded, as contamination events occur on a regular basis.

Global contamination from genetically engineered crops growing

In 2005, GeneWatch UK and Greenpeace started a global register showing incidents where genetically engineered organisms had been found to have contaminated non-GM crops and food supply. Large scale commercial planting of GM crops began in 1996 but there is still no global monitoring scheme of their impacts on food production or the environment. Because of this failure of international agencies the register was created: www.gmcontaminationregister.org

The register contains records of:

- contamination incidents – when food, feed or a related wild species have been found to contain unintended GM material from a GM crop or other organism. These are included when there is evidence from laboratory testing that GM contamination has occurred;

- illegal plantings or releases of GM organisms – when an unauthorised planting or other release into the environment or food chain has taken place. These cases are included when there has been official acknowledgement that rules on the release of GM organisms have not been followed;

- negative agricultural side-effects – when there has been a report in the scientific literature of agricultural problems arising from the GM organism and how it is managed.

In 2006, records of twenty-four incidents were added to the register. In addition, three cases for 2005, one for 2004 and one for 2000, were also included in the register in 2006, bringing the total number of incidents recorded in the database since GM crops were first grown commercially in 1996 to 142. **The number of incidents recorded for 2006 is the highest for any year.**

MAIZE

Over one-third of the contamination incidents recorded over the last ten years involved maize – not surprising, given the wind-pollinated nature of the crop and the ability of maize pollen to travel for miles. The cases in this report highlight the growing threat to maize diversity and ultimately maize producers and consumers from the inability to keep maize transgenes under control.

Last year's report focused on a global contamination scandal, maize contaminated with an unapproved GE variety, Syngenta's Bt10. Syngenta revealed that several hundred tonnes of unauthorized GM Bt10 maize were produced in the US and distributed world-wide between 2001 and 2004. At the time nowhere in the world was genetically engineered Bt 10 maize approved for human consumption, nevertheless it entered the global food chain without being noticed by the US authorities for four years.

The US continues to be the most important source of contamination world-wide. Less known, but equally troubling, is the growing problem of contamination in Spain's maize growing regions. Added to the register in 2006 is documentation of extensive contamination discovered in the Spanish regions Aragón and Cataluña, where maize contamination is threatening the way of life of organic and conventional farmers in the principal maize growing regions.

One of the most concerning aspects of the growing number of global contamination incidents is the continuing recurrence of contamination in maize seed stocks. Over the last ten years contaminated maize seed has been found in eleven countries: Austria, Chile, Croatia, France, Germany, Greece, Italy, New Zealand, Slovenia, Switzerland and the United States of America. All five contamination events in New Zealand over the last seven years have been incidents of maize seed contamination. In 2006, maize seed contamination was documented in four countries: France, Germany, New Zealand and Slovenia. The last contamination event recorded in 2006 was contaminated maize seed found in New Zealand.

Varieties of Mexican maize. Oaxaca, Mexico
© Greenpeace/Roberto Lopez

The extent of contamination of organic and conventional maize crops in Spain and the growing problem of maize seed contamination bode ill for the areas of the world where maize was originally domesticated. Contamination of traditional varieties of maize in Mexico has already been documented, even in the absence of field trials or commercial growing. The move of both the Mexican and Brazilian governments towards field testing (Mexico) and commercial growing (Brazil) is worrying from both genetic diversity and food security perspectives.

RICE

This year's report highlights the major contamination event of 2006, another global contamination scandal, this time of rice. Global rice supplies have been found contaminated with two unapproved varieties, Bayer's LLRICE601 and LLRICE62. As with Bt10, Bayer's LLRICE601 was not intended for commercialisation. The variety had last been grown in field trials ***in 2001***, yet it was found throughout the rice growing areas of the USA in 2006 in one of the most commonly used varieties, Cheniere.

LLRICE601 has not been approved for human consumption anywhere in the world. Nevertheless, the product was exported widely from the United States. How this contamination arose is not known over a year after it was first detected, and it has led to product withdrawals in a number of countries, further damaging the confidence of food companies in the ability of the biotech industry to control its products.

Rice contaminated with LLRICE601 has now been found across the world, including in nineteen European countries: Austria, Belgium, Cyprus, Finland, France, Germany Greece, Hungary, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Poland, Slovenia, Sweden, Switzerland, and the UK. LLRICE601 contamination has also been found in rice purchased in the United Arab Emirates, Dubai, Kuwait and the Philippines, food aid in Ghana and Sierra Leone, and rice being imported into Russia. Another contamination event also rocked the rice industry in 2006. An unapproved Chinese variety, Bt63, was found contaminating food products not only in China but as well in Austria, France, Germany, and the United Kingdom.

As with Syngenta's Bt10 contamination scandal in 2005, the cases of LLRICE601 and Bt63 show that field trials and GM crops not intended for commercialisation are not being properly controlled. The potential for contamination with a plant modified to produce a drug, industrial chemical or other biologically active protein can not be discounted and the implications of such an accident are enormous. All indications are that the biotech industry simply is not up to the task of managing its products safely and responsibly and that lessons of the past have not been learnt.

Rice, growing in the Hung He Valley, Yunnan Province, China.Rice
© Greenpeace/John Novis

The high cost of contamination

GM contamination causes serious environmental risks, poses potential health risks and has a negative economic impact on sectors of the economy that choose to remain GM-free. As most countries do not have a system of liability for GMOs, the costs of (avoiding) GM contamination – such as testing and clean up costs – are born by the contaminated and not by the contaminator.

In 2006, new evidence from Spain was published by Greenpeace. This evidence documented numerous cases of genetic contamination in organic and conventional maize, caused by the uncontrolled spread of GM pollen and seeds from GM maize fields. In several cases the affected farmers suffered significant economic losses, as they were not able anymore to sell the contaminated maize at a premium market value.

Additions to the register in 2006

In the rest of the report, we review all the cases reported in the public and scientific literature of contamination, illegal plantings and releases of GM organisms, and negative agricultural side-effects that were added to the on-line GM Contamination Register in 2006. These cases undoubtedly represent only a sample of the actual cases of GM contamination that have taken place, because many incidents are not able to be detected or are not revealed because they are part of food producers' quality control systems.

The twenty-four incidents added to the register in 2006 involved fifteen incidents of contamination and nine illegal releases. The contamination incidents were in the following twelve countries: Germany (three); China (two); France (one); Japan (one); New Zealand (one); Romania (one); Bulgaria (one); Hungary (one); Slovenia (one); South Africa (one); South Korea (one); and the USA (one). These contamination incidents involved food (nine); seed (four); feed (one); and wild relatives (one). The cause of the contamination in food and feed was often neither determined nor investigated, but in most cases this must have been the result of poor quality control measures following either cross-pollination or post-harvest mixing.

The illegal releases were recorded in Brazil (two); the USA (two); Europe (one); France (one); Japan (one); Mexico (one); and the Philippines (one).

The 2006 incidents of contamination and illegal release involved soybeans (eight); maize (seven); rice (four); cotton (two); grass (one); papaya (one); and killifish (medaka) (one).

Since GM crops were first grown commercially, contamination incidents have taken place in a total of forty-three countries and twice affected Europe as a whole. Bulgaria, Hungary, Slovenia and South Africa recorded their first GM contamination incidents in 2006.

The new incidents recorded in 2006 have confirmed the main conclusions from the first review of the GM Contamination Register. These are that:

- Controls on GM organisms from the laboratory to the field are ineffective and prone to failure.
- Countries and companies are often unable to prevent illegal sales of GM crops.
- No control system, physical or biological, is totally foolproof - human error will always result in accidents.
- There are no independent systems in place to detect and investigate contamination, illegal releases and negative side-effects of GM organisms. National, international and corporate structures are inadequate and thus probably the majority of GM contamination incidents are undetected and certainly only a fraction of detected cases is published.
- Countries are not fulfilling their obligations under the Cartagena Protocol on Biosafety to inform the Clearing House of illegal transboundary movements of GMOs.
- Potentially dangerous genes could be introduced into the food chain and the environment as a result of the poor controls and lack of information because of claims to commercial confidentiality.
- The economic costs of contamination and other incidents have been, and are likely to continue to be, large in the future. Health, environmental and social costs are potentially immense.

GeneWatch UK and Greenpeace again consider that these findings require that governments:

- ***require*** event specific detection methods for GMOs as a pre-requisite for field trials in addition to commercialisation. The detection methods and associated reference materials should be made publicly available to facilitate identification in case of GMO escape.
- ***urgently enforce*** international standards for the identification and documentation of transboundary shipments of GMOs.
- ***ensure*** that the public interest outweigh commercial confidentiality issues.
- ***target*** imports of food, feed and seed from high-risk, GM growing countries for routine tests for GM contamination and subsequent investigation.
- ***deny*** to companies their right to commercialise GM products if the companies are involved in intentional illegal releases of GMOs or fail to cooperate in their prevention and management.
- ***act firmly*** against violators when an illegal act takes place. Without substantial and predictable sanctions, sloppy practice and complacency are likely to be encouraged.
- ***oblige*** companies to keep records of the global dissemination of their products and GMO events, and make these publicly available, as a matter of product stewardship.
- ***stop*** all approvals and releases of GM organisms under present conditions.

that the Parties to the Biosafety Protocol and Convention on Biological Diversity:

- ***introduce*** national and international rules to provide strict liability for environmental, health or economic damage that arises from GM contamination and illegal growing. The biotechnology company producing the GM organism should be considered liable unless it can demonstrate negligence by another party.
- ***establish*** an independent, international commission to investigate GM contamination and implement measures to reverse GM contamination.
- ***establish and maintain*** a global and publicly available register of cases of contamination, illegal releases and negative agricultural side-effects within the framework of the Cartagena Protocol on Biosafety (CPB).
- ***ensure*** that the CPB Clearing House is fully informed about illegal transboundary movements of GMOs as soon as they are detected.

that companies, insurers and investment companies:

- ***review*** the potential liabilities of GM organism development and sales and disclose these liabilities fully in their financial reporting.

2. GM Contamination incidents in 2006

Large scale commercial planting of GM crops began in 1996 but there is no global monitoring scheme of their impacts on food production or the environment. Because of this failure of international agencies, GeneWatch UK and Greenpeace started the GM Contamination Register in June 2005. The register contains records of:

- contamination incidents – when food, feed or a related wild species have been found to contain unintended GM material from a GM crop or other organism. These are included when there is evidence from laboratory testing that GM contamination has occurred;
- illegal plantings or releases of GM organisms – when an unauthorised planting or other release into the environment or food chain has taken place. These cases are included when there has been official acknowledgement that rules on the release of GM organisms have not been followed;
- negative agricultural side-effects – when there has been a report in the scientific literature of agricultural problems arising from the GM organism and how it is managed.

Only those incidents that have been publicly documented are recorded. As such, the register entries represent a sample of the actual contamination incidents that have taken place globally. There will be others that are, as yet, undetected or unreported because in most countries there is no systematic monitoring of GM crops post-commercialisation and any contamination that is detected as part of food producers quality control procedures is not published. It is probable that the large majority of GM contamination incidents fall into the undetected or undisclosed category. In addition, any contamination by non-commercialised GMOs, such as those in experimental trials, would not usually be detectable as no analytical identification methods are available. This is because companies are not required to submit these when applying for GM crop field trials.

Therefore, the register only gives details of the known incidents of GM contamination, illegal plantings and adverse agricultural side-effects that have occurred during the first eleven years of commercial GM crop cultivation. However, although it cannot be comprehensive, it provides the only public resource available to examine the causes of GM contamination and to inform control measures.

This report gives information about the additions to the register in 2006 and highlights important cases and trends. Short details of all of the incidents are included in Annex 1.

Genetically engineered maize. ©Greenpeace/Fred Dott

2.1 Contamination in 2006

In 2006, records of twenty-four incidents were added to the register. In addition, three cases for 2005, one for 2004 and one for 2000, were also included in the register in 2006, bringing the total number of incidents recorded in the database to 142. **The number of incidents recorded for 2006 is the highest for any year.**

Of the twenty-four incidents reported in 2006, fifteen were cases of contamination involving food (nine); seed (four); feed (one); and wild relatives (one). There were also nine cases of illegal releases in 2006, maintaining the increasing trend in the number of such incidents or their detection. Table 1 shows the occurrence of the categories of incidents over time.

The actual number of incidents does not reflect the true scale of some contamination incidents or their continuation over time. For example, the contamination of long-grain rice in the US with Bayer's unapproved variety LLRICE 601, affected a very large proportion of the rice growing area of the USA. This incident is reviewed in more detail in a later section of the report.

There may also be contamination with several different GM crops included in one incident because the original reporting source does not give sufficient detail to separate these out. They are categorised under what is judged to be the most common.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	All
Contamination	1	1	3	19	16	17	9	16	10	15	107
Illegal releases	1	1	1	1	2		1	3	8	9	27
Negative agricultural side effects	1	1	2					1	3		8
All	**3**	**3**	**6**	**20**	**18**	**17**	**10**	**20**	**21**	**24**	**142**

Table 1: Categories of reported incidents 1997–2006

2.2 Countries affected

The twenty four incidents added to the register in 2006 involved fifteen incidents of contamination in the following twelve countries: Germany (three); China (two); France (one); Japan (one); New Zealand (one); Romania (one); Bulgaria (one); Hungary (one); Slovenia (one); South Africa (one); South Korea (one); and the USA (one).

There were nine cases of illegal releases recorded in Brazil (2); the USA (2); Europe (one); France (one); Japan (one); Mexico (one); and the Philippines (one). Table 2 shows how different countries have been affected over time.

Since GM crops were first grown commercially, contamination incidents have taken place in forty three countries and twice affected Europe as a whole. Bulgaria, Hungary, Slovenia and South Africa recorded their first GM contamination incidents in 2006.

2.3 GM organisms involved

The 2006 incidents of contamination and illegal release involved soybeans (eight); maize (seven); rice (four); cotton (two); grass (one); papaya (one); and killifish (medaka) (one). Table 3 shows how different organisms have been involved over time. About 85% of incidents over the past ten years have involved the main GM crops being grown commercially – soybean, maize, oilseed rape and cotton.

The illegal release incident with fish in Japan is the only organism added in 2006 that has not been involved in a case in previous years.

Fluorescent GM fish sold illegally in pet shops in Japan

On February 3, 2006, the Japanese Ministry of the Environment and Ministry of Agriculture, Fisheries and Food announced a recall on unapproved GM killifish (medaka). The GM fish, known as 'Night Pearl', were developed in Taiwan and imported into Japan. The fish had been genetically modified to contain a jelly fish gene which makes them fluorescent. A distributor in Hyogo Prefecture had imported 800 of the GM killifish and distributed them to 12 different pet shops. The government released a list of shops, and asked consumers to return the GM killifish to the shops, without releasing them into rivers.

	COUNTRY	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	TOTAL
1.	USA	1		2	2	2	3	2	5	2	3	22 (16%)
2.	UK			1	3	1	3	1	1			10 (7%)
3.	Australia				1		2	2		4		9 (6%)
4.	Canada	1	1		1	1	3	1	1			9 (6%)
5.	France				3	3	1				2	9 (6%)
6.	Germany		1		2				1	1	3	8 (6%)
7.	Brazil		1						2	1	2	6 (4%)
8.	New Zealand				1		1	1	1	1	1	6 (4%)
9.	Japan				1				1	1	2	5 (4%)
10.	Romania									3	1	4 (4%)
11.	China									1	2	3 (2%)
12.	India					2				1		3 (2%)
13.	Mexico					1				1	1	3 (2%)
14.	Spain							1		2		3 (2%)
15.	Argentina					1			1			2 (1%)
16.	Bolivia					1	1					2 (1%)
17.	Croatia	1							1			2 (1%)
18.	Denmark				1				1			2 (1%)
19.	Europe									1	1	2 (1%)
20.	Ireland						1			1		2 (1%)
21.	Greece				1				1			2 (1%)
22.	Netherlands				1				1			2 (1%)
23.	Philippines					1					1	2 (1%)
24.	South Korea				1						1	2 (1%)
25.	Switzerland			1			1					2 (1%)
26.	Thailand			1					1			2 (1%)
27.	Austria					1						1 (1%)
28.	Bulgaria										1	1 (1%)
29.	Chile								1			1 (1%)
30.	Columbia					1						1 (1%)
31.	Egypt				1							1 (1%)
32.	Equador					1						1 (1%)
33.	Guatemala								1			1 (1%)
34.	Hungary										1	1 (1%)
35.	Italy							1				1 (1%)
36.	Nicaragua						1					1 (1%)
37.	Peru					1						1 (1%)
38.	Poland					1						1 (1%)
39.	Russia			1								1 (1%)
40.	Serbia									1		1 (1%)
41.	Slovenia										1	1 (1%)
42.	South Africa										1	1 (1%)
43.	Sweden				1							1 (1%)
44.	Taiwan							1				1 (1%)
	TOTALS	**3**	**3**	**6**	**20**	**18**	**17**	**10**	**20**	**21**	**24**	**142**
		2%	**2%**	**4%**	**13%**	**14%**	**12%**	**7%**	**14%**	**15%**	**17%**	

Table 2: All incidents according to country 1997–2006 (NB. Percentages are rounded so do not total 100%)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	TOTAL
Maize	1	1	2	8	6	6	5	6	8	7	50 (35%)
Soybean		1	3	2	8	4		5	4	8	35 (24%)
Oilseed rape/canola	1	1		4	2	4	2	3	3		20 (18%)
Cotton	1		1	2	1	2		1	2	2	12 (9%)
Papaya							1	3		1	5 (4%)
Rice									1	4	5 (4%)
Pigs					1	1	1	1			4 (4%)
Sugar beet				4							4 (4%)
Grass								1		1	2 (1%)
Plum									1		1 (1%)
Potato									1		1 (1%)
Tomato							1				1 (1%)
Zucchini									1		1 (1%)
Fish										1	1 (1%)
TOTAL	**3**	**3**	**6**	**20**	**18**	**17**	**10**	**20**	**21**	**24**	**142**

Table 3: Contamination register incidents by organism and year (NB. Percentages are rounded so do not total 100%)

2.4 Causes of GM contamination

The fifteen incidents of contamination reported in 2006, involved food (nine); seed (four); feed (one); and wild relatives (one). The cause of the contamination in food and feed was often neither determined nor investigated, but in most cases this must have been the result of poor quality control measures following either cross-pollination or post-harvest mixing. In one case of seed contamination in New Zealand, repeat testing showed that errors in the initial testing had missed contamination of imported sweet corn seed.[1]

There was one case where pollen flow from an experimental field trial with GM grass led to contamination of wild grasses.

Experimental GM grass contaminates wild grass in USA

Scientists from the US Environmental Protection Agency discovered that GM herbicide tolerant bentgrass had escaped from an experimental site in Oregon. The GM grass spread through cross-pollination of non-GM grass plants and by seed movement. The furthest distance that GM grass was detected to have spread was 3.8 kilometers from the site.[2] The GM grass is tolerant to the herbicide glyphosate (Roundup) and is made by the Monsanto subsidiary, Scotts. The GM grass is intended to be used on golf courses and in gardens to make weed control easier. It is not yet approved for commercialisation.

GM grasses raise serious environmental concerns because they are perennial, freely wind pollinating and often spread via underground shoots (tillering) so gene flow to related plants is inevitable.

2.5 Illegal releases

There were nine illegal releases of GMOs detected in 2006. Three cases involved field trials, one of which was planted too close to a protected area (in Brazil), one where the authorisation for a trial was found not to have been conducted properly (USA), and a third where the location used was not approved (Mexico).

Three illegal releases involved unapproved GM rice varieties originating from the USA and China. One of these, LLRICE601, is reviewed in detail later because it involved an unapproved variety, was on such a large scale, and is likely to have far-reaching consequences. Detecting illegal releases of unapproved varieties is particularly difficult because, in contrast to approved varieties, there is no database of the genetic constructs used in field trials that may contaminate neighbouring crops.

The other cases of illegal releases involved black market or misleading sales (the Philippines and Brazil) and the illegal distribution of GM fish to pet shops (Japan).

A Hani farmer holding traditional rice seed, Yunnan Province, China.
© Greenpeace/ John Novis

Illegal releases – Latin America and corporations out of control

A number of the illegal release incidents involved the deliberate sowing of GMOs in violation of national law. The biotech corporations Syngenta and Monsanto demonstrated their disregard for national laws in two countries in Latin America, in three separate incidents:

Brazil - Syngenta conducts illegal trial with GM soybeans

The agrochemical company, Syngenta, planted a trial plot of around twelve hectares of GM soya in a buffer zone around the Iguaçu Falls World Heritage Site, southern Brazil. Brazilian legislation prohibited the release of GM organisms in protected areas and their surroundings. The plantings were about four miles (6 km) from the park, while the allowed distance was six miles (10 km).

Brazil – illegal Roundup Ready cotton grown on 16,000 hectares

Around 16,000 hectares (39,500 acres) of Monsanto's Roundup Ready Flex cotton have been found growing illegally in Brazil. The GM cotton is tolerant to Monsanto's herbicide, Roundup, but is not licensed for growing. The Brazilian National Biosecurity Commission (CTNBio) has recommended that the fields of illegal GM cotton in the states of Minas Gerais, Mato Grosso, Mato Grosso do Sul, Bahia and Goias, be destroyed and that cotton should not be grown on the land in the following season. Fines and even imprisonment are possible and hearings are being conducted to determine what action should be taken.

Mexico – Monsanto plants GM cotton illegally

In contravention of their field trial permit, Monsanto illegally planted around 100 hectares of GM cotton in the northern Mexican state of Sonora, according to the Ministry of the Environment. Monsanto did have a permit for growing in other areas of Sonora, but not in the location where the GM cotton was being grown. The cotton has been modified to be herbicide tolerant and insect resistant.

Organic cotton growing in California, USA. © Greenpeace/Bill Barclay

2.6 Discussion

A particularly notable feature of the 2006 incidents is the continuing problem with illegal releases of GMOs. The shocking contamination of the US rice chain by an unapproved GM variety not intended for commercial use underlined both how poor controls are and the potential scale of problems if something goes wrong. Other incidents of black market sales, bungled seed testing, mistaken distribution and contaminated food stuffs show that it is the whole pathway from the seed to the field to the plate that remains poorly controlled.

There is little evidence that the underlying lessons from previous episodes of contamination have been learnt. The most common response from officials and the industry is that the incidents have not been dangerous despite the lack of data upon which to base such a conclusion. The evidence from the contamination incidents in 2006 reinforces the findings of our first report from the GM Register. The following realities still have to be acknowledged:

- Selling, testing and promoting GM crops in countries where the existing infrastructure will not allow even basic controls to succeed poses real problems.
- Efforts to isolate GM crops through separation from other crops are unlikely to prevent contamination even if accompanied by serious enforcement regimes and quality control procedures.
- The international nature of the crop commodity market and the companies selling GM crops means that an international response is needed to contain GM contamination.

As the review of the Bt10 incident illustrated in 2005, and the LLRICE601 confirmed in 2006, it is probably impossible to prevent all GM contamination and the potential for serious harm remains.

3. Maize – ten years of contamination

Over one-third of the contamination incidents documented over the last ten years involve maize. In 2005 and 2006, maize contamination accounted for 35% of the incidents registered globally.

The risk of contamination from GM maize to non-GM maize was already pointed out in 2002 by the European Environment Agency, an official institution of the European Union. In a report on likely contamination routes from GE crops, the EEA wrote that "maize can be described as a medium to high risk crop for pollen mediated gene flow." The EEA also pointed at the fact that "GM maize presents a medium to high risk for the inclusion of pollen in honey."[3]

Maize is an outbreeding species that produces very large amounts of pollen and is predominantly wind pollinated, although bees can and do collect pollen.[4] Jean Emberlin, an expert on maize pollination, notes that:

> "The most comprehensive available study on cross-pollination (Jones and Brooks,1950)[5] indicates that:
>
> 1. cross-pollination between two fields of maize at 200m occurs at levels greater than 0.1%;
> 2. for one of the three years in the study, cross-pollination of 2.47% was recorded at 200m from the source; and
> 3. a three-year mean of 1.19% cross pollination, over 11 times more than 0.1%, suggests that cross-pollination above 0.1% is a typical rather than an exceptional occurrence."

Factors "such as scale of pollen emissions or recipient field shape can significantly increase the level of cross-pollination."[6] Research at Iowa State University showed that purple grains of maize could be detected in ears of yellow maize grown up to 1600 feet away (approximately 500 meters) showing that pollen can move such distances.[7]

It is likely to be very difficult to maintain non-GM sources of maize if even small areas of GM maize are grown. An EU wide study looked at different scenarios for co-existence of organic, non-GM and GM crops in Europe[8] and in relation to maize concluded that

> "Under the conditions selected for studying grain maize production, a very low threshold of 0.1% cannot be achieved, neither with current nor with changed practices, neither for organic nor for conventional farms, even if the GMO share in the region is only 10%. Potential seed impurities as well as post-harvest admixtures because of farm logistics render a very strict segregation impossible.

© Greenpeace / Carrasco

3.1 United States – where it all begins

The ***United States,*** of course, has been a leading location for maize contamination, with numerous high-profile cases throughout the years:

In **2000**, Starlink maize, a GM variety only intended for use in animal feed, was found widely contaminating food products throughout the US. A costly product recall is estimated to have cost government agencies and the developer – Aventis, now owned by Bayer CropScience – between half a billion and one billion US dollars.

In **2002**, the first case of contamination with a pharmaceutical-producing maize was discovered in Iowa. Maize engineered to produce a pig vaccine was found growing in a soy crop. The entire silo of soy had to be destroyed and the company was ordered to pay a fine of $250,000 and other costs of $3.5 million.

In **2004**, the Union of Concerned Scientists found low levels of contamination in maize seed (as well as canola and soy seed). Randomly sampled, conventional, non-GM seeds were contaminated to levels of 1%.

In **2005**, Syngenta revealed that several hundred tonnes of unauthorised GM Bt10 maize were produced and distributed between 2001 and 2004. The Bt10 maize was "mistakenly identified" as its approved commercial GM maize line, Bt11, and used in commercial maize breeding lines. At the time nowhere in the world was genetically engineered Bt 10 maize approved for human consumption, nevertheless it entered the global food chain without being noticed by the authorities for four years.

After the Bt10 scandal broke in the US it soon became clear that many importers of maize – such as the European Union – did not have the identification methods needed to ascertain if the illegal GM corn might be entering the food chain or environment. After Syngenta failed to provide these methods, the twenty-five EU member states and Japan decided to stop all GM maize shipments from the US. The blockade ended after identification methods were finally provided and the countries could start controlling shipments for the unauthorised maize. However, since controls only started years after the crisis began, we may probably never know to what extent the global food chain was contaminated by GM maize Bt 10.

3.2 Spain – a growing concern

Less known, but equally troubling, is the growing problem of contamination in Spain's maize growing regions. Spain's first entry in the contamination register dates from 2003, when organic farmers in the Navarra region first detected contamination of their crops. Contamination is a significant problem for organic farmers, as they lose the ability to sell their product as organic if contamination is found. This was the case in 2003, when farmers lost their organic status when contamination was found.

Contamination events have continued to increase in number in the last three years. In 2006, Greenpeace and partner groups Assemblea Pagesa de Catalunya and Plataforma Transgènics Fora! in Spain released the results of systematic research into the contamination conducted in 2005. The results are reproduced here from the report **La Imposible Coexistencia** – Impossible Coexistence.[9]

Impossible coexistence: the threat to organic and traditional maize production

Maize contamination in Spain threatens the way of life of organic farmers in the principal maize growing regions. In Aragón, the cases of contamination in 2004 have caused an alarming reduction in the area in organic maize production, in spite of the fact that production is carried out in isolated areas. In sampling conducted in Aragón in 2004, 100% of the samples taken from the organic maize fields were found to be contaminated with GM.

In 2005, investigators found fields contaminated with the events MON 810 and Bt176 at percentages of contamination between 0,07% and 12,6%. Farmers who risk losing certification for their crop see few options for protecting their organic status, and many decide to abandon growing for the organic market. The farmers lose the additional income that organic production often provides, but society also loses when farmers return to chemical-dependent means of production.

- In 20% of the investigated cases unintended and unwanted presence of GM maize was found in the maize fields of non-GM farmers.
- In several cases the affected farmers suffered economic losses, as they were not able anymore to sell the contaminated maize at a premium market value.
- Three of the contamination cases involved local maize varieties which, after years of careful selection, can no longer be used for future plantings. These cases demonstrate how GM contamination is a threat to biodiversity and to the few local varieties that are still in the hands of farmers.

Location	Conventional or organic	Transgene (if known)	% contamination
Linyola	Convention	MON 810	2,6
Almenar	Organic	Bt 176	0,15
Almenar	Organic	MON 810	0,33
Arbeca	Conventional	MON 810	3,8
Bellcaire d'Urgell	Organic	MON 810	0,9
Bellcaire d'Urgell	Conventional	MON 810	0,7
Albons	Organic		12,6
Gurrea de Gállego	Conventional	Bt 176	2,0
			0,2
Boquiñeni	Organic	MON 810	1,90
			0,41
Quinto de Ebro	Organic		0,23
Huerto	Organic		0,03

Impossible Coexistence – contamination cases in Aragõn and Cataluña, Spain, 2005. (Added to the register in 2006)

3.3 Maize seed contamination – a ticking time-bomb

Maize contamination has been unsurprising, and some would say predictable, due to the large distances the pollen from this plant is known to travel. Most concerning among these incidents is the continuing recurrence of contamination in maize seed stocks.

Over the last ten years contaminated maize seed has been found in eleven countries: Austria, Chile, Croatia, France, Germany, Greece, Italy, New Zealand, Slovenia, Switzerland and the United States of America. All five contamination events in New Zealand over the last seven years have been incidents of maize seed contamination. The last contamination event recorded in 2006 was contaminated maize seed found in New Zealand. Documented seed contamination events contained in the register, beginning in 1999, include:

1999 - Switzerland
2000 - New Zealand
2001 - Austria, France
2002 - New Zealand
2003 - Italy, New Zealand
2004 - Chile, Croatia, Greece, New Zealand, United States of America
2005 - Brazil
2006 - France, Germany, New Zealand, Slovenia

Greenpeace activists entered a GE (genetically engineered) maize field in Southern France and carved a giant "crop circle" with an "X" in the GE maize, marking the field as a contamination zone. © Yann Arthus-Bertrand/Greenpeace

Spanish farmers are burning their maize harvest after it was revealed that it had been contaminated by nearby fields of genetically engineered maize. ©Greenpeace/Rosa Binimelis

The major maize seed contamination events from 2006 listed in the register.

France – one-quarter of maize seed imports have GMO contamination

According to the French newspaper, Le Monde, sampling of maize seed imported into France during 2005 showed that 24.2% of batches contained traces of GMOs. The study by the Direction Générale de l'Alimentation, a section of the Ministry of Agriculture, also found that two-thirds of the positive samples (25 of 39) contained GMOs not licensed for release in Europe. Levels of contamination were below 0.1% in all but 4 of the samples. In a similar study in 2004, 35% of maize seed samples contained GM contamination.

New Zealand - GM sweet corn import bungle

The New Zealand Ministry of Agriculture and Forestry is investigating how sweet corn seed from the USA was incorrectly given approval as non-GM when there was GM contamination. Originally the mistake, which occurred in October and November 2006, was thought to involve 1,800 kilograms of seed, but the estimate has now risen to 4,420 kilograms. Sweet corn crops in Gisborne and Hawkes Bay regions will be destroyed. The varieties of sweet corn affected are produced by Syngenta but details of the actual GM construct involved in the contamination is not available.

Slovenia - GM maize contamination reported

From the minutes of the UK advisory committee on release of genetically modified organisms: "The 2001/18 Competent Authorities have had a notification from the European Commission of contamination of seed lots in Slovenia with two GMOs, MON810 and Bt11. Bt11 does not have authorisation for cultivation, indicating that the traceability and labelling trail was not adequate."

3.4 Real and threatened contamination of centres of maize diversity: Mexico and Brazil

The extent of contamination of organic maize crops in Spain and the growing problem of maize seed contamination bode ill for the areas of the world where maize was originally domesticated. Contamination of traditional varieties of maize in Mexico has already been documented, even in the absence of field trials or commercial growing. The move of both the Mexican and Brazilian governments towards field testing (Mexico) and commercial growing (Brazil) is worrying from both genetic diversity and food security perspectives.

The centre of genetic diversity for maize extends almost the entire length of the North and South American continents. Mexico and Guatemala are recognised as the area of original domestication; other important regions in the Americas responsible for the great diversity of maize include central North America, the northern edge of South America and the Caribbean, the Andean region, and the large central region of Brazil were Coroico types of maize are found.

In all the countries where maize is used primarily as food, the diversity of maize is directly related to food security. This is as true in sub-Saharan Africa as it is in the New World. However, the centre of maize diversity, running the length of the Americas, is a reservoir of genetic security for all in the world who depend on maize. Moreover, the traditional maize varieties of farmers in countries such as Brazil and Mexico are products of centuries of adaptation to local conditions and, importantly, adaptation to agroecological methods of farming.

In industrial nations maize serves primarily as feed for animals and feedstock for various chemical processes. In much of the rest of the world, maize is produced primarily by small-holder farmers. It is a food eaten daily – sometimes three times a day – and serves as the basis for food security for hundreds of millions.

Mexico contamination register entry excerpt, 2001

A paper published in *Nature* in 2001 reported GM contamination in native landraces of maize even though no GM maize should have been grown there commercially. It seems that farmers may have kept and sown maize imported for food. In 2003, contamination was found in maize grown in the states of Chihuahua, Morelos, Durango, Mexico State, Puebla, Oaxaca, San Luis Potosí, Tlaxcala and Veracruz.

Greenpeace create a 65m "crop circle" question mark in a maize field in Ayotzintepec, Oaxaca, a region that has been contaminated by genetically engineered maize. The question mark signifies the unknown nature of where genetic contamination can occur. © Greenpeace/Gustavo Graf. August 2006

4 Bayer's LLRICE601 illegal contamination incident

4.1 Background

On 18th August 2006, the US Secretary of Agriculture announced that Bayer CropScience had reported that rice from the 2005 US crop had been found to be contaminated with a GM variety, LLRICE601, that is not approved for growing or consumption.[10] The rice is genetically modified to be tolerant to the herbicide, glufosinate (trade name: Liberty), made by Bayer, but development of the LL601 variety was ended in 2001 when the last field trials took place. Two other varieties of glufosinate tolerant rice, LLRICE62 and LLRICE06, are approved in the USA but are not being grown commercially.

The contamination was discovered by the company, Riceland, in January 2006 who informed Bayer. Originally found in samples from Arkansas, Riceland are reported to consider, following sampling in May, that the contamination is 'geographically dispersed and random' throughout the US rice growing area. It appears that the US government was not informed about the contamination until July 2006 and the US Department of Agriculture then waited a further 18 days before informing Europe and other importing countries.

The finding of rice contaminated with an unapproved GM variety was an almost identical situation to that which occurred in 2005, when Syngenta's unapproved GM maize, Bt10, was found to have been mistakenly sold as the approved, Bt11, variety. However, the 2006 rice contamination is worse in many respects as it seems to have spread more widely, how it arose is not known over a year after it was first detected, and it has led to product withdrawals in some countries, further damaging the confidence of food companies in the ability of the biotech industry to control its products.

© Greenpeace/Gustavo Graf

Contamination in the Middle East

In September 2006, Greenpeace purchased five packages of US long grain rice in supermarkets in the United Arab Emirates (UAE), Qatar and Kuwait. Testing showed that four out of five packages (80%) were contaminated with LL601.

European supermarkets operating in the Gulf countries, Carrefour and Geant, immediately removed all contaminated rice from their shelves.

Greenpeace then purchased 35 corn-based products in all the three countries visited. Again, all products were of US origin. In this case, 14 of 35 samples showed contamination with GMOs. This represents a 40% contamination rate.

None of the contaminated products had been labeled as there is no such requirement in the UAE, Qatar or Kuwait.

The extent of the contamination in the Gulf countries demonstrates that GM contamination is likely to be most pervasive in countries where labelling and other biosafety laws do not operate.

As public awareness increases and as countries in the region, such as Iran, implement biosafety and labelling laws, it is likely that the extent of the contamination will begin to decrease.

4.2 International spread of LLRICE contamination

Rice contaminated with LLRICE601 has now been found across the world. As of the end of December 2006, there have been reports of GM LL601 rice contamination in food and feed from nineteen European countries: Austria, Belgium, Cyprus, Finland, France, Germany Greece, Hungary, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Poland, Slovenia, Sweden, Switzerland, and the UK.[11] LLRICE601 contamination has also been found in rice purchased in the United Arab Emirates, Dubai, Kuwait[12] and the Philippines,[12] food aid in Ghana and Sierra Leone,[14] and rice being imported into Russia.[15]

The pervasive nature of the contamination has had serious implications for the rice trade. Because LLRICE601 does not have approval anywhere in the world, its presence is illegal in any country that requires pre-market safety assessment of GM crops and foods. As a result, Japan suspended imports of long-grain rice from the USA on 20 August 2006.[16] On 23 August, the European Commission announced that imports of rice would only be allowed if they were accompanied by a certificate demonstrating they did not contain the unauthorised GM rice.[17] The effect of the GM contamination on trade in rice led to a fall in rice futures prices of more than 5% at the Chicago Board of Trade on 22 August.[18] This was reported to be the largest fall in many years.

In November 2006, the European Commission introduced stricter testing protocols for all shipments of rice into Europe including both LLRICE601 and LLRICE62, another illegal GM variety of rice that was detected in imports of US rice into France in October 2006.[19] Requiring a testing regime, rather than accepting US certification of shipments, was introduced after two barges of rice arriving in the Netherlands were found to have LLRICE601 contamination despite having a certificate stating there was none.

Bayer's Rice LL601 History of Contamination

Bayer is a multinational company with a primary focus on pharmaceuticals that has become increasingly involved in genetically engineered crops. This 2006 contamination scandal follows the 2005 canola contamination scandal in Australia in which a GE canola/rapeseed developed by Bayer is estimated to have contaminated over 400,000 hectares. Bayer received no penalties, fine or prosecutions for the contamination.

1998-2001 – Aventis field trials of LL601 are conducted in the United States. Exact location and number of trials not known.

2002 – Bayer buys Aventis and discontinues field trials. Field trials of other GE rice varieties continue worldwide. Plans for commercialisation of LL601 apparently abandoned.

2005 – USDA criticised heavily by Inspector General for poor oversight of field trials of GE crops.

2006, January – Riceland, the largest US producer and exporter of rice, tests rice intended for export. Presence of genetically engineered LL601 is revealed. Further testing conducted and confirmed in Arkansas, Missouri, Louisiana and Texas.

2006, May – Bayer claims first made aware of the contamination. No explanation for the delay in notifying Bayer.

2006, July – Bayer notifies the USDA of contamination and requests deregulation of the strain. No explanation for the delay in notifying the USDA.

2006, August – The USDA release the contamination information publicly. No explanation for delay in notifying rice importing countries and traders. Sharp trading decline in US rice market.

2006, August – EU issues Emergency Declaration (2006/578/EC) in order to prevent ongoing contamination of EU rice supplies. Japan suspends imports of long grain US rice. South Korea demands that its importers be guaranteed there is no genetically engineered contents in US rice shipments. Other countries follow suit.

2006, September – Japan widens testing of US rice to look for GE contamination in short- and medium-grain rice.

2006 – Multi-million dollar class action lawsuits filed by farmers and rice traders against Bayer.

2006, October – France detects LL62 in long grain rice. LL62, approved in the US but not in the EU, represents an entirely new contamination problem. Testing in the US indicates that the problem is widespread in US rice supplies.

2006, November – USDA approves LL601 for consumption, despite 15,000 objections and the European Food Safety Authority finding that there was insufficient data to make a finding of safety. No penalties or prosecutions of Bayer to date.

4.3 Safety questions

Despite the lack of a detailed safety assessment, as soon as the contamination came to light, both the US Food and Drug Administration (FDA) and Bayer CropScience made statements that they considered LLRICE601 to be safe.[20] The USDA said that because LLRICE601 was similar to the two other GM rice varieties approved in the USA, that they considered it would be safe.[2] Normally, each line of a GM crop has to be individually assessed for safety because the genes will be inserted randomly into the genome and may cause unintended effects. The LLRICE601 must be different in some ways from other GM rice varieties or Bayer would not have been able to detect its presence. Indeed, an examination of the available data showed substantial differences in the genetic constructs (promoters) used in different GM rice varieties.[21]

On 15th September 2006, the European Food Safety Authority's GMO Panel said that there was insufficient data to provide a full risk assessment in accordance with EFSA's GM guidance for LLRICE601. However, "on the basis of the available molecular and compositional data and the toxicological profile of a newly introduced protein, the Panel considers that the consumption of imported long grain rice containing trace levels of LLRICE601 is not likely to pose an imminent safety concern to humans or animals."[22]

To try and mitigate against the financial liabilities of the contamination in the US at least, Bayer submitted a dossier to the US authorities applying for deregulation (equivalent to marketing consent) of LLRICE601 and was given post hoc authorisation for the contamination in November 2006.[23] There have been serious criticisms of the approval on the basis that:[24]

- around 40% of the application was deemed commercially confidential and not available for public scrutiny;
- less data were available for assessment of environmental and health impacts than would normally be considered necessary.

However, its presence in rice exports to Europe and Japan, where LLRICE601 is not approved, remains illegal.

4.4 How did the contamination occur?

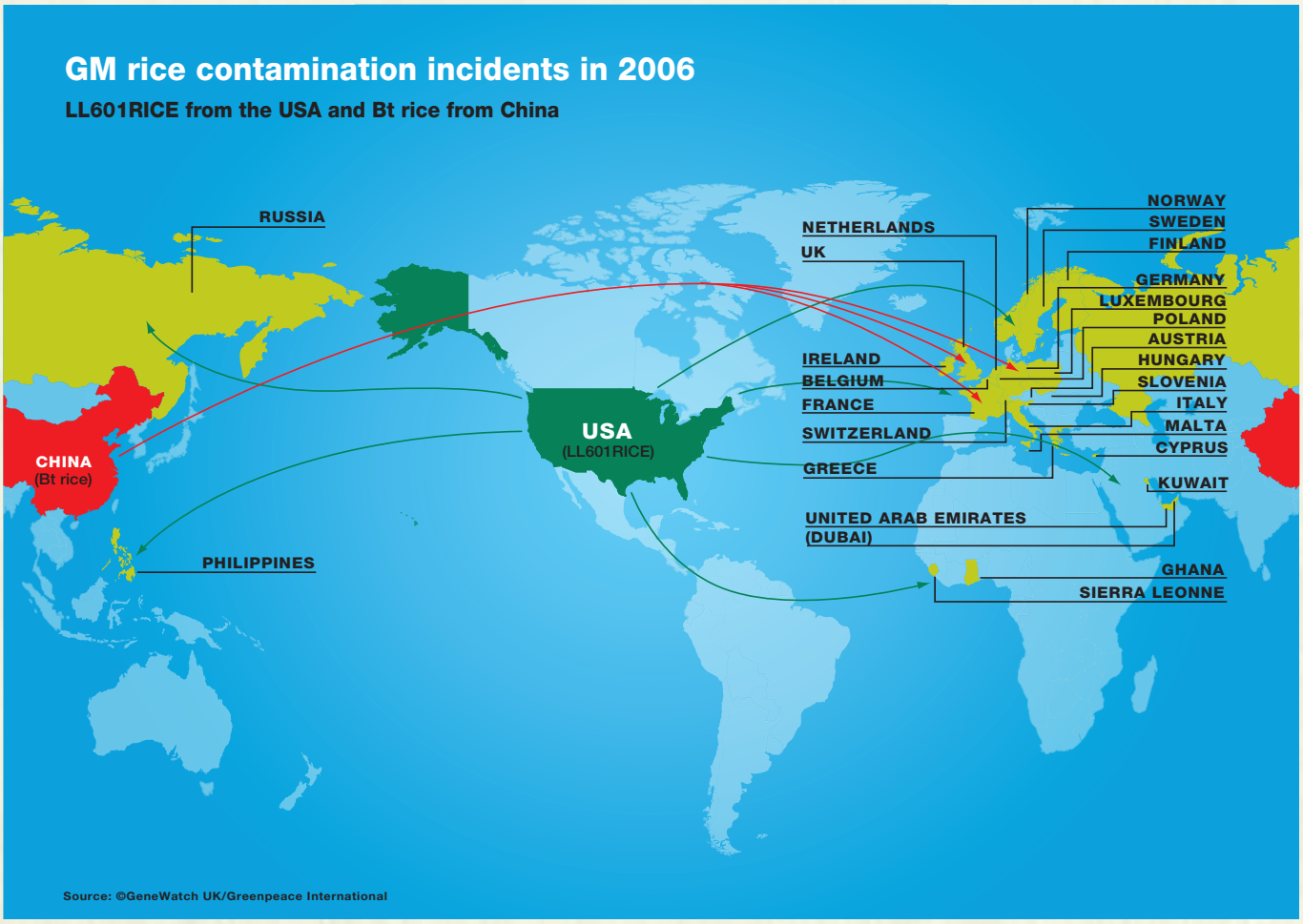
The USDA's Animal and Plant Health Inspection Service (APHIS), is conducting an inquiry into how the contamination incident took place and whether laws were broken. The contamination has been found in one variety of rice, Cheniere, which was grown extensively in the USA in 2005 and 2006; other varieties may also be affected.[25] But how the contamination arose following field trials remains a mystery. This is one of the most worrying aspects of the case because it means that it remains impossible to implement specific safeguards to prevent recurrence.

The field trials that were conducted with LL601 were reported to have been less than one acre in size.[26] Bayer has said: "The Agricultural Centre of the Louisiana State University – an important rice breeding station in the Southern US which conducted some field research on LL601 in collaboration with Aventis CropScience – stated in a press release from August 31, 2006, that they have found trace amounts of LL601 in the 2003 foundation seed of one of their long-grain rice varieties."[27] The implication of this is that in some way, either by cross-pollination or accidental mixing of seed after harvest, contamination arose at Louisiana State University. Whilst finger pointing by Bayer should be treated with some caution, because it may be part of an effort to limit their liability (they have also blamed an 'act of God' in their defence[26]), if cross-pollination was the cause this would have important implications for separation distances both for trials and commercial growing. If accidental mixing has taken place, laboratory quality control is at issue.

It is not known when APHIS will publish the findings of its investigation.

Soya field with Roundup transorb label, a herbicide produced by the US company Monsanto, Rio Grande do Sul, Brazil.
© Greenpeace/Rodrigo Baléia

© Friends of the Earth Europe, GENET and the AER (Assembly of European Regions)



4.5 Controlling the contamination

Now that the contamination has arisen, it is obviously important to limit its spread. While countries and food producers may screen bulk imports and products, the contamination has to be tackled at the source. The US Rice Federation has produced a plan to eliminate LLRICE601 from US rice seed using a testing regime for all seeds and restricting sales of the Cheniere variety in 2007.[28] However, the rice seed industry has rejected the plan. In a statement they said the Federation's proposal "will require substantial additional costs to the industry for no useful purpose, creating the risk that legal seed stocks could be eliminated from the marketplace."[29] The seed industry does not want to do any more testing than is required by law. This conflict between the seed producers and rice growers will do little to alleviate the anxieties of food producers who have lost financially through product withdrawals.

The dilemma for food producers remains, as was illustrated with Syngenta's Bt10 maize, the fact that no tests are undertaken for contamination by unapproved varieties of GM crops. Officially these do not exist and validated testing is not routinely available. Finding methods of screening produce from 'at risk' countries where GM crops are being developed and tested, will be needed by considering what is being trialled. This may also prove difficult because of the frequency with which modifications are deemed commercially confidential. It will also be difficult because of poor regulation and policing of field trials in many countries including the USA. A 2005 audit by the US Department of Agriculture of the inspections of experimental GMO releases revealed serious weaknesses and failures which included the potential to allow GM organisms to persist in the environment.[30]

4.6 A second rice contamination scandal of 2006

In China, the unapproved GE rice variety (Bt 63) that was first found in 2005, continued to contaminate food products in 2006, despite the efforts of the Chinese Government to stop it. In 2006 it was found in supermarket shelves in Guangzhou, and in Heinz baby food sold in Beijing, Guangzhou, and Hong Kong. In September it was also found in rice products sold in France, Germany, the UK and subsequently in Austria.[31] In early 2007, it was found in Japan as well.[32]

Countries in which rice and rice products contaminated with LL601, Bt63, or LL62 have been found

1. Austria
2. Belgium
3. China (Bt63 first identified by Greenpeace)
4. Cyprus
5. Finland
6. France (Bt63 first identified by Greenpeace)
7. Germany (Bt63 first identified by Greenpeace; LL601 first identified by Greenpeace)
8. Ghana (LL601 identified by Friends of the Earth)
9. Greece
10. Ireland
11. Italy
12. Kuwait (LL601 identified by Greenpeace)
13. Luxembourg
14. Netherlands
15. Norway
16. Philippines (LL601 identified by Greenpeace)
17. Poland
18. Sierra Leone (LL601 identified by Friends of the Earth)
19. Slovenia
20. Sweden
21. Switzerland
22. Denmark
23. United Arab Emirates (LL601 identified by Greenpeace)
24. UK (Bt63 identified by Friends of the Earth)
25. USA

4.7 Discussion: lessons to be learned

The presence of an unapproved GM variety in rice seed that was not even intended for commercialisation is an almost identical situation to that seen with the contamination of maize with Syngenta's Bt10 GM variety. It has had far reaching effects on the US rice market, confidence in the biotechnology industry's ability to control its products and on the future prospects of the commercialisation of GM rice globally.

Rice farmers in Arkansas, Missouri, Mississippi, Louisiana, Texas and California have started legal proceedings against Bayer CropScience because of the contamination.[33] Some food companies have stopped buying US rice[34] and are seeking compensation for lost income. Food producers who have had to withdraw contaminated products[35] are also likely to seek redress from their suppliers.

However, the impacts are not simply financial – they have hardened some attitudes against GM. For example, rice growers and exporters in Thailand and Vietnam have signed an accord stating that they will not grow GM rice.

But the biggest issue, as with Syngenta's Bt10 contamination scandal in 2005, is that even small-scale field trials and GM crops not intended for commercialisation are not being properly controlled. Authorities were not aware of the existence of LLRICE601 and would not have been able to test for it. More dangerous GM plants, such as those being modified to produce drugs, could be muddled up in this way and go unidentified. The potential for contamination with a plant modified to produce a drug, industrial chemical or other biologically active protein cannot be discounted and the implications of an accident with something like that are enormous.

Ultimately, foolproof and fraud-proof measures to prevent the unintended or intended spread of illegal GMOs may be an unachievable goal. All the indications are that the biotech industry simply is not up to the task of managing its products safely. A much more honest debate within society is needed to decide whether the risks of GMOs are acceptable at all.

5. Conclusions and recommendations

The new incidents recorded in 2006 have confirmed the main conclusions from the first review of the GM Contamination Register. These are that:

- Controls on GM organisms from the laboratory to the field are ineffective and prone to failure.
- Countries and companies are often unable to prevent illegal sales of GM crops.
- No control system, physical or biological, is totally foolproof - human error will always result in accidents.
- There are no independent systems in place to detect and investigate contamination, illegal releases and negative side-effects of GM organisms. National, international and corporate structures are inadequate and thus probably the majority of GM contamination incidents are undetected and certainly only a fraction of detected cases is published.
- Countries are not fulfilling their obligations under the Cartagena Protocol on Biosafety to inform the Clearing House of illegal transboundary movements of GMOs.
- Potentially dangerous genes could be introduced into the food chain and the environment as a result of the poor controls and lack of information because of claims to commercial confidentiality.
- The economic costs of contamination and other incidents have been, and are likely to continue to be, large in the future. Health, environmental and social costs are potentially immense.

GeneWatch UK and Greenpeace again consider that these findings require that governments:

- ***require*** event specific detection methods for GMOs as a pre-requisite for field trials in addition to commercialisation. The detection methods and associated reference materials should be made publicly available to facilitate identification in case of GMO escape.
- ***urgently enforce*** international standards for the identification and documentation of transboundary shipments of GMOs.
- ***ensure*** that the public interest outweigh commercial confidentiality issues.
- ***target*** imports of food, feed and seed from high-risk, GM growing countries for routine tests for GM contamination and subsequent investigation.
- ***deny*** to companies their right to commercialise GM products if the companies are involved in intentional illegal releases of GMOs or fail to cooperate in their prevention and management.
- ***act firmly*** against violators when an illegal act takes place. Without substantial and predictable sanctions, sloppy practice and complacency are likely to be encouraged.
- ***oblige*** companies to keep records of the global dissemination of their products and GMO events, and make these publicly available, as a matter of product stewardship.
- ***stop*** all approvals and releases of GM organisms under present conditions.

that the Parties to the Biosafety Protocol and Convention on Biological Diversity:

- ***introduce*** national and international rules to provide strict liability for environmental, health or economic damage that arises from GM contamination and illegal growing. The biotechnology company producing the GM organism should be considered liable unless it can demonstrate negligence by another party.
- ***establish*** an independent, international commission to investigate GM contamination and implement measures to reverse GM contamination.
- e***stablish and maintain*** a global and publicly available register of cases of contamination, illegal releases and negative agricultural side-effects within the framework of the Cartagena Protocol on Biosafety (CPB).
- ***ensure*** that the CPB Clearing House is fully informed about illegal transboundary movements of GMOs as soon as they are detected.

that companies, insurers and investment companies:

- ***review*** the potential liabilities of GM organism development and sales and disclose these liabilities fully in their financial reporting.

Greenpeace marks a maize field with signs showing corn with a 'question mark' indicating that 1 in 200 maize crops can be genetically contaminated if the draft EU seed directive is passed. © Martin Langer/Greenpeace

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http://www.mhlw.go.jp/houdou/2007/01/h0126-3.html and update http://www.mhlw.go.jp/houdou/2007/02/h0201-3.html

33 US rice farmers sue Bayer CropScience over GM rice. Reuters, August 28, 2006. http://today.reuters.com/News/CrisesArticle.aspx?storyId=N8S372113

34 Greenpeace Press Release 29th September 2006. World's largest rice company halts all imports from USA. http://www.greenpeace.org/international/press/releases/world-s-largest-rice-company-h

35 See e.g., Gene-altered profit-killer. Washington Post, September 21, 2006.

http://www.washingtonpost.com/wpdyn/content/article/2006/09/20/AR2006092001903.html; Illegal rice recalled. Aftenposten, Norway, September 28, 2006.

http://www.aftenposten.no/english/local/article1475411.ece

Annex 1. Incidents added to GM Contamination Register in 2006

1. Brazil - Syngenta conducts illegal trial with GM soybeans

The agrochemical company, Syngenta, planted a trial plot of around 12 hectares of GM soya in a buffer zone around the Iguacu Falls World Heritage Site, southern Brazil. Brazilian legislation prohibits the release of GM organisms in protected areas and their surroundings. The plantings were about 4 miles (6 km) from the park, while the allowed distance is 6 miles (10 km).

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=123&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=

2. Brazil – illegal Roundup Ready cotton grown on 16,000 hectares

Around 16,000 hectares (39,500 acres) of Monsanto's Roundup Ready Flex cotton have been found growing illegally in Brazil. The GM cotton is tolerant to Monsanto's herbicide, Roundup, but is not licensed for growing. The Brazilian National Biosecurity Commission (CTNBiO) has recommended that the fields of illegal GM cotton in the states of Minas Gerais, Mato Grosso, Mato Grosso do Sul, Bahia and Goias, be destroyed and that cotton should not be grown on the land in the following season. Fines and even imprisonment are possible and hearings are being conducted to determine what action should be taken.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=131&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=

3. Bulgaria – unlabelled GM food products on sale

Sampling of foods in Bulgaria, revealed the presence of GM soya and maize in chocolate waffles, and other soya and maize products. Bulgarian law requires GM foods to have a licence before being sold and no certificates have yet been given for GM soya or maize.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=140&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=

4. China – Heinz baby food contains illegal GM rice

Tests of nineteen foods collected in supermarkets in Beijing, China, revealed unapproved GM rice in one product, Heinz Baby Rice Cereal. The tests were conducted for Greenpeace by an independent laboratory, and revealed the presence of a Bt toxin gene which makes GM rice resistant to insects.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=119&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=

5. China – GM papaya seedlings distributed to farmers in Hong Kong

Greenpeace have discovered that genetically modified papaya seedlings were distributed to farmers in Hong Kong by the Government. The farmers, including organic farmers, who received the seedlings in early 2005 did not know they were GM until they received letters from the Government in December 2005 and early 2006 saying that they might be. No GM papaya is licensed for marketing in China. Some of the fruit have already been sold in markets. Although the exact nature of the genetic modification of the papaya is not known, laboratory analysis of suspect plants conducted for Greenpeace has identified DNA sequences associated with GM.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=118&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=1

6. Europe – rice contamination in products imported from China

An investigation by Greenpeace and Friends of the Earth has found contamination of rice food products imported from China. Rice products in the UK, France and Germany bought from Chinese specialty stores were found to contain the Cry1Ac toxin gene from Bacillus thuringiensis introduced into the rice to make it resistant to certain insect pests. The GM rice has been grown experimentally in China but has not been given approval for commercial growing or food use. The GM rice has caused other contamination incidents, including of Heinz baby food purchased in China.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=136&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=

7. France – second illegal variety GM rice identified in US imports

In October 2006, French authorities announced that they had found Bayer's GM LLRICE62 in rice imports from the USA. This variety of GM rice does not have approval in Europe and is not reported to be grown commercially in the USA even though it has approval there. LL62 rice is genetically modified to tolerate Bayer's herbicide, glufosinate (Liberty).

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=138&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=

8. France – one quarter of maize seed imports have GMO contamination

According to the French newspaper, Le Monde, sampling of maize seed imported into France during 2005 showed that 24.2% of batches contained traces of GMOs. The study by the Direction Générale de l'Alimentation, a section of the Ministry of Agriculture, also found that two thirds of the positive samples (25 of 39) contained GMOs not licensed for release in Europe. Levels of contamination were below 0.1% in all but 4 of the samples. In a similar study in 2004, 35% of maize seed samples contained GM contamination.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=137&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=

9. Germany - feed GM contamination findings 2004-2005

In 2006, the European Commission examined the testing of seed for GM contamination in Germany during 2004 and 2005. The Commission reported that of 996 samples of animal feed (containing soybean, oilseed rape or maize), that had been tested in 2004, 33 feed samples had GM contamination and were not correctly labelled. In 2005, 632 samples of feed were investigated, and 24 were contaminated and not correctly labelled. Exact details of the GM events involved in the 'non-compliant' samples was not revealed, but Starlink maize (Event: CBH-351) was detected in 2005.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=144&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=

10. Germany - food GM contamination findings 2004-2005

In 2006, the European Commission examined the testing of food for GM contamination that had taken place in Germany during 2004 and 2005. The Commission reported that of 5438 samples of food that had been tested in 2004, sixty seven were contaminated and not correctly labelled. In 2005, 6110 samples of foods were investigated, and sixty were contaminated and not correctly labelled. Exact details of the GM events involved in the 'non-compliant' samples was not revealed although they included GM papaya, GM maize and soya.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=143&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=

11. Germany - seed GM contamination findings 2004-2005

In 2006, the European Commission examined the testing of seed for GM contamination that had taken place in Germany during 2004 and 2005. The Commission reported that of 717 samples of seed (maize and oilseed rape), that had been tested in 2004, one seed sample was contaminated and not correctly labelled. In 2005, 771 samples of seed were investigated, and three were contaminated and not correctly labelled. Exact details of the GM events involved in the 'non-compliant' samples was not revealed.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=142&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=

12. Hungary - canned meat products found containing GM soya

Tests conducted by the National Food Safety and Nutrition Science Institute for Greenpeace found canned meat products being sold unlabelled that contained more than 3% of GM soya protein. Products which contain more than 0.9% GM contamination should be labeled according to national laws. The supermarkets, Lidl and Tesco, said they would remove the products from their shelves.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=124&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=1

13. Japan - GM fish sold in pet shops

On February 3 2006, the Japanese Ministry of the Environment and Minsitry of Agriculture, Fisheries and Food announced a recall on unapproved GM killifish (medaka), known as 'Night Pearl' that was developed in Taiwan and imported into Japan. According to the press release, a distributor in Hyogo Prefecture imported 800 GM killifish that were distributed to 12 different pet shops in several locations. The government released a list of shops, and asked consumers to return the GM killifish to the shops, without releasing them into rivers.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=121&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=1

14. Japan - GM soya found in organic and conventional tofu products

The Japanese group 'No GMO Campaign' tested supermarket products for the presence of GM soya. Eighteen of 44 samples (40.9%) tested positive for GM soy. Thirty per cent (3 of 10 samples) of the organic tofu tested and labelled as 'made from 100% domestic Japanese soy' even though GM soya is not grown in Japan. Fifty seven per cent (4 of 7 samples) labelled 'made from organic soy' also tested positive for GM soy. These are likely to have been made from imported soya although the source was not given.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=120&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=1

15. Korea – organic soybean milk has GM contamination

Testing conducted in 2005 by the Korea Food and Drug Administration (KFDA) and the National Agricultural Products Quality Management Service (NAQS) found GM contamination in four brands of organic soybean milk and formula.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=125&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=1

16. Mexico – Monsanto plants GM cotton illegally

In contravention of their permit, Monsanto planted around 100 hectares of GM cotton in the northern Mexican state of Sonora, according to the Ministry of the Environment. Monsanto did have a permit for growing in other areas of Sonora, but not in the location where the GM cotton was being grown. The cotton has been modified to be herbicide tolerant and insect resistant.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=128&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=1

17. New Zealand - GM sweet corn import bungle

The New Zealand Ministry of Agriculture and Forestry is investigating how sweet corn seed from the USA was incorrectly given approval as non-GM when there was GM contamination. Originally the mistake which occurred in October and November 2006, was thought to involve 1,800 Kgs of seed, but the estimate has now risen to 4,420kg. Sweet corn crops in Gisborne and Hawkes Bay regions will be destroyed. The varieties of sweet corn affected are produced by Syngenta but details of the actual GM construct involved in the contamination is not available.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=141&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=1

18. Philippines - farmers lured into planting Bt maize

Filipino farmers in the province of Oriental Mindoro, the Philippines, have been misled into planting GM Bt maize. The province of Oriental Mindoro has banned GMO crops and set its path towards becoming the capital of organic farming in the Philippines. Witnesses asserted that Monsanto's local agent had been luring farmers with generous loans to plant what was claimed to be conventional hybrid corn. Laboratory tests later confirmed, however, that the maize crop was actually GM Bt maize.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=130&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=1

19. Romania – unlabelled GM soya in food products

According to Romanian law introduced in June 2006, products containing more that 0.9% GM content should be labelled. Investigations by Greenpeace, have found between 61.2% and 97.3% GM soya in food products but these were not labelled.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=139&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=1

20. Slovenia - GM maize contamination reported

The minutes of the UK's advisory committee on releases of genetically modified organisms reported that: "...[the] 2001/18 Competent Authorities have had a notification from the European Commission of contamination of seed lots in Slovenia with two GMOS, MON810 and Bt11. Bt11 does not have authorisation for cultivation, indicating that the traceability and labelling trail was not adequate".

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=132&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=1

21. South Africa – food products contaminated with GM

A study by researchers at the University of the Free State, Bloemfontein, has detected GM soya and maize in food products labelled as 'non-GM', 'GMO-free' and 'organic'. A total of 58 foods were tested and GM detected (using the presence of the 35S CaMV sequence as an identifier) in 76%. Of soy products, 90% contained GM and of maize products, 61% contained GM. The level of GM was not determined.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=117&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=2

22. USA - environmental rules broken in allowing trials with GM crops producing drugs

A judge has ruled that the US Department of Agriculture was 'arbitrary and capricious' because it did not conduct environmental studies or explain why they were not necessary before issuing permits for experimental trials with GM crops modified to produce drugs.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=134&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=2

23. USA - experimental GM grass escapes to the wild

Scientists from the US Environmental Protection Agency have identified the escape of GM herbicide tolerant bentgrass from an experimental site in Oregon. The GM grass has spread through pollination of non-GM plants, and by seed movement. The furthest distance that GM grass was detected to have spread was 3.8 kilometers. The GM grass is tolerant to the herbicide, glyphosate (Roundup) and is made by the Monsanto subsidiary, Scotts. The GM grass is intended to be used on golf courses and in gardens to make weed control easier. It is not yet approved for commercialisation.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=133&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page=2

24. USA - long-grain rice contaminated with unapproved GM variety

On 18th August, the US Secretary for Agriculture announced that Bayer CropScience had reported that rice from the 2005 crop being sold commercially in the USA had been found to be contaminated with a GM variety, LLRICE601, that is not approved for growing and consumption. The rice is genetically modified to be tolerant to the herbicide, glufosinate (trade name: Liberty), but development of the LL601 variety was ended in 2001. Two other varieties of glufosinate tolerant rice, LLRICE62 and LLRICE06, are approved in the USA but are not being grown commercially.

http://www.gmcontaminationregister.org/index.php?content=re_detail&gw_id=135&reg=0&inc=0&con=0&cof=0&year=2006&handle2_page

Greenpeace volunteers cordon off a plantation of BT corn as a 'hot zone', as farmers, agriculture and government officials uproot the plantation of genetically engineered BT Corn and demand for a GMO free Mindoro.
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