



Briefing Paper

Friends of the Earth International

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GM Rice: a new threat to our food supply

1. Rice is the main staple food in the world

Rice is the most consumed cereal grain in the world, constituting the dietary staple food for more than half of the planet's human population.ⁱ About 80% of the world's rice is grown by small-scale farmers in developing countries.ⁱⁱ

In recent years the Biotech industry and some scientists have been trying to introduce GM rice into our fields for commercial purposes, but after a decade of commercial planting of GM crops they have not succeed in making it acceptable to the market yet. Experimental releases of GM rice have taken place around the world, and although two varieties of GM rice by German biotech company Bayer, have been approved in the United States, these lines have not been commercialized.ⁱⁱⁱ Despite that, since 2005 the biotech industry has been stepping up the pressure to commercialize GM rice by filing applications for approval of herbicide-tolerant LLRice in many countries around the world, like the EU, South Africa, Canada, and Brazil.

In contrast with the main crops genetically engineered so far –soybean, maize and cotton-, which are primarily, destined for feed and/or industrial uses, rice remains as today essentially a food commodity, with only a small share of its global production destined to feed usage.^{iv} Maize for example devotes around 60% of its total production for feed uses, and another significant percentage to industrial uses as starches, sweeteners and ethanol. In the United States it is estimated that ethanol manufacturing is consuming 20% of the 2006 maize crop.^v

2. Biotech industry provokes the contamination of our rice supply with experimental rice

A release of experimental GM rice is at the origin of the most recent cases of contamination of our food supply. In August 2006 it was confirmed a serious case of contamination of the rice supply by an experimental GM rice variety from Bayer. The US Department of Agriculture (USDA) revealed on August 18, 2006 that a GM rice unapproved for human consumption has contaminated commercial rice seed.^{vi} The statement did not reveal how widespread the contamination is nor when or how it took place.

German biotech giant Bayer produces the GM rice known as ‘LL601’, a variety that was not approved in any country of the world and has not passed the safety assessments necessary to protect human health and the environment. The presence of LL601 in the food supply is illegal, as it has not undergone USDA review for potential environmental impacts required prior to marketing, nor review by the U.S. Food and Drug Administration (FDA) for possible harm to human health.^{vii} GM rice LL601 is engineered to withstand application of the herbicide glufosinate. According to Bayer the GM rice was “present in some samples of commercial rice seed at low levels”^{viii} Even though it was field tested only between 1998 and 2001, it is unclear how it could have contaminated later harvests. Bayer informed the USDA of the contamination on 31 July 2006. Bayer claims that it is not intending to commercialise LL601. But because it is now “in the marketplace” as a result of accidental contamination, Bayer has applied to the US Authorities to approve it, which will effectively limit liability on the company for the incident. Such approvals for placing on the market/release into the environment after the fact, makes a mockery of any serious risk assessment procedures.

The international reactions to the announcement followed suit. On the 19th of August 2006 the Ministry of agriculture, forestry and fisheries of Japan announced that its country was suspending US long-grain rice imports.^{ix} Several days later the European Union on the 23rd of August adopted emergency measures and required imports of long grain rice from the USA to be certified as free from the unauthorised GMO LL Rice 601.^x In September the first contamination case was reported in The Netherlands.^{xi}

The US exported more than 3 million tonnes of rice in 2005.^{xii} If EU imports of American rice were tainted it is highly probable that top importers of US rice, may have also received tainted shipments. In 2006 main export markets for US rice were in Mexico, Japan, Central America, Caribbean, and Subsaharian Africa.^{xiii}

Table 1. Top 10 U.S. rice export markets (in thousand of metric tonnes)

2004/05		2003/04		
Rank	Country	Exports	Country	Exports
1	Mexico	522,1	Mexico	541,5
2	Japan	352,4	Japan	376,4
3	Haiti	258,8	Haiti	272,5
4	Canada	232,0	Canada	202,1
5	Ghana	166,4	Cuba	180,5
6	Nicaragua	130,7	Brazil	154,2
7	Costa Rica	127,1	Philippines	111,2
8	Turkey	125,8	Costa Rica	110,3
9	Iraq	123,6	Honduras	94,2
10	Cuba	122,3	Saudi Arab	87,0
	Sub-total	2.161,1	Sub-total	2.130,0
	Total exports	3.542,2	Total exports	3.310,9

Source: Foreign Agricultural Service, USDA.^{xiv}

Not only commercial imports may have been contaminated. GM rice may have contaminated also the food aid shipments of rice. The main destinations for rice shipments of US food aid are Asia, Central America and Sub-Saharan Africa.

Table 2. Main food recipients of US Food aid as rice (in thousand metric tonnes)

Recipients	2005
Philippines	63.5
Honduras	12.9
Burkina Fasso	12
Cameroun	11
Indonesia	9.3
Sierra Leone	6.5
Madagascar	6
Sri Lanka	5.7
Nicaragua	3.9

Source: Table III. Programmed U.S. Food aid for FY 2005.^{xv}

3. More rice contamination: this time from China

The LL 601 scandal that occurred at the end of August was immediately followed by the announcement of a new GM rice contamination case on the 5th of September, where food products illegally contaminated with experimental genetically modified (GM) rice from China were discovered in the UK, France and Germany.^{xvi}

Friends of the Earth and Greenpeace tested foods in the UK, France and Germany and found rice products to be contaminated with the unauthorized GM rice.^{xvii} The products were found in Asian specialty stores and were imported from China.

Table 3. Products found to be contaminated with GM rice originated from China

Country	Product	Importer
France	Rice sticks	Tang Brothers
Germany	Rice sticks	Heuschen &Schrouff
UK	Guangdong Rice vermicelli	SeeWoo Foods Ltd
	Rice vermicelli Amoy (Xiamen)	SeeWoo Foods Ltd
	Kongmoon Rice Stick	Packed for Double Happiness Wholesale Ltd. Freshwater Road, Romford, RM8 1RX

Source: Friends of the Earth and Greenpeace

This latest contamination incident appears to have stemmed from field trials in China, as no GM rice has been commercialised there yet. A previous investigation by Greenpeace in 2005 found that research institutes and seed companies in China had been illegally selling unapproved GM rice seeds to farmers. Further testing indicated that the whole food chain had been contaminated, with the most recent case being contaminated Heinz rice cereal products in Beijing, Guangzhou and Hong Kong. The Chinese government, in the wake of the situation, reportedly punished seed companies and destroyed illegal-grown GM rice.^{xviii}

The illegal rice is an experimental variety genetically engineered to produce an insecticide. It is not approved for human consumption or commercial cultivation anywhere in the world. Scientific studies raise concerns about the risk to human health of eating the rice, particularly the potential to cause food allergies. The GM rice contains either the Cry1Ac protein, or a fusion Cry1Ab/Cry1Ac protein. A 1999 study partly sponsored by the US Environmental Protection Agency found evidence to suggest that the Bt protein Cry1Ac can elicit antibody responses consistent with allergic reactions in farm-workers,^{xix} and a series of studies published in 1999 and 2000 by a

team of scientists led by Cuban researcher Vasquez-Padron on Cry1Ac documented immunogenic responses which indicate the potential for allergic reactions or other immune system responses.^{xx}

4. Global Rice trade

The contamination of rice by experimental crops is a signal to rice importers to take adequate measures to ensure their rice supplies are not contaminated in the future. Over 400 million MT of rice were produced for 2005/06 at the global level. Asia has been the main producer with around 370 millions MT for that period, followed by Latin America with around 15 mil. MT (See Annex).^{xxi} Most of the rice produced is used for domestic consumption. Only 28 million MT out of those have been exported during 2005/06.^{xxii}

Table 4. World rice production, trade and use

World Balance (milled basis)	2004/05	2005/06	2006/07
Production	408.5	421.2	424.2
Trade	29.4	28.5	28.2
Total utilization	415.1	418.5	420.6
Food	363.1	368.2	371.3
Ending Stocks	99.3	102.3	106.1

Source: FAO. 2006. Food outlook n. 1. June 2006. Quantities in million tonnes

Asia is also the world major importer of rice, with over 7 mil. MT, followed closely by Africa with also over 7 mil. MT (See Annex). On a country basis the biggest rice importers in the world are Philippines with 1.9 mil. MT, followed by Nigeria (See Table 3).

Table 5. World Rice importers

IMPORTS	2003	2004	2005	2006
<u>Philippines</u>	<u>1.300</u>	<u>1.100</u>	<u>1.890</u>	<u>1.900</u>
Nigeria	1.448	1.369	1.777	1.700
Iran	900	950	950	1.200
<u>Iraq</u>	<u>672</u>	<u>889</u>	<u>800</u>	<u>1.200</u>
<u>Saudi Arabia</u>	<u>1.150</u>	<u>1.500</u>	<u>1.250</u>	<u>1.000</u>
EU-25	950	1.079	968	975
South Africa	725	818	850	800
Malaysia	500	700	750	750
Cote d'Ivoire	750	740	867	750
Senegal	750	850	1.200	750
<u>Cuba</u>	<u>371</u>	<u>639</u>	<u>736</u>	<u>700</u>
<u>China</u>	<u>258</u>	<u>1.122</u>	<u>609</u>	<u>700</u>

Source: FAS. USDA.2006. In thousand metric tons

5. Lessons from a decade of GM crops: the Starlink contamination

More than a decade after the first GM crop appeared on market shelves, biotech corporations are still failing to deliver their promised GM crops with clear benefits for

consumers or farmers. Instead, GM corps are increasingly creating new problems and posing new risks for human health and the environment.^{xxiii}

Contamination with illegal GM crops is nothing new. In 2000 StarLink, a variety of GM maize authorised in the United States for animal feed purposes only was found in the food supply. It was not authorised for human consumption as food because of the potential allergenicity of the protein Cry9C that was genetically engineered into the maize.^{xxiv} The magnitude and gravity of the StarLink contamination was breathtaking. More than 300 corn products were recalled across the United States. Despite the fact that StarLink was only planted on 0.4 per cent of total US corn acreage, the number of acres contaminated was much greater.

StarLink contamination was not contained within the US, but was also detected in 2000 and 2001 in food shipments to Japan and South Korea.^{xxv} This led to a series of recalls in these countries as well, and an immediate decline in Japanese exports. Certification of “StarLink free” was required for corn exports to Japan where Japanese inspectors monitored and tested feed corn shipments.^{xxvi} At the June 2002 United Nations World Food Summit in Rome, Latin American NGOs announced that StarLink had been found in US food aid in Bolivia. In February 2005 the presence of StarLink in Central American food aid was also denounced.^{xxvii} Five years after its discovery in the human food chain, StarLink still persists, thereby contradicting industry projections for full withdrawal within four years.^{xxviii} The StarLink case underlines the unpredictability of releasing a GMO into the environment and the failure on the part of GMO developers to prevent contamination.

6. Recommendations

Experimental releases of GM crops should have never ended up in the food supply. The contamination of our rice supply in Europe, US and Asia may just be the tip of the iceberg and is a clear signal that the regulatory frameworks to manage field trials have completely failed. Field trials are deliberate releases into the environment and the regulatory frameworks should regulate them as such.

Friends of the Earth believes that as starting point no GMO experimental releases should ever take place in a country that does not have comprehensive and adequate Biosafety frameworks that can effectively avoid contamination. In the light of the rice contamination with experimental GM rice varieties and the fact that its health and environmental impacts have not been adequately evaluated Friends of the Earth International is calling for:

- A global ban on field trials and other efforts to commercialise GM rice until effective containment and segregation systems, and detection regimes are in place.
- Rice exporters, and competent authorities in importer and recipient countries should engage in routine testing and monitoring activities to ensure that products contaminated with illegal GM material do not enter the seed and food supply. The validated detection tests and reference materials for experimental GM rice must be provided in order for this testing and monitoring to occur.
- Importers of commercial rice, and recipients of rice as food aid should require from exporters and distributing agencies a certificate guaranteeing that the shipments of rice are free of GM contamination.

- Exhaustive and comprehensive food safety research needs to be undertaken in order to determine whether or not GM rice can create human health or environmental hazards.
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Annex I: Rice imports, exports, production and consumption

Regional Rice imports, production, and consumption

IMPORTS	2003	2004	2005	2006
North America	1.282	1.283	1.272	1.450
<u>Latin America</u>	<u>2.685</u>	<u>2.658</u>	<u>2.710</u>	<u>2.680</u>
EU-25	950	1.079	968	975
<u>Other Europe</u>	<u>209</u>	<u>230</u>	<u>220</u>	<u>220</u>
Former Soviet Union	540	526	526	551
<u>Middle East</u>	<u>3.970</u>	<u>4.510</u>	<u>4.359</u>	<u>4.630</u>
North Africa	238	225	261	225
<u>Sub-Saharan Africa</u>	<u>6.901</u>	<u>7.244</u>	<u>8.383</u>	<u>7.130</u>
East Asia	2.166	2.948	2.556	2.765
<u>South Asia</u>	<u>1.351</u>	<u>1.169</u>	<u>1.050</u>	<u>915</u>
Southeast Asia	5.063	3.202	4.235	4.260
<u>Oceania</u>	<u>244</u>	<u>238</u>	<u>256</u>	<u>225</u>
PRODUCTION	2002/03	2003/04	2004/05	2005/06
North America	6.669	6.620	7.657	7.289
<u>Latin America</u>	<u>14.053</u>	<u>16.058</u>	<u>16.478</u>	<u>15.331</u>
EU-25	1.731	1.728	1.864	1.710
<u>Other Europe</u>	<u>15</u>	<u>21</u>	<u>22</u>	<u>21</u>
Former Soviet Union	690	846	774	854
<u>Middle East</u>	<u>2.151</u>	<u>2.483</u>	<u>2.611</u>	<u>2.737</u>
North Africa	3.746	3.941	4.169	4.171
<u>Sub-Saharan Africa</u>	<u>7.025</u>	<u>7.314</u>	<u>7.775</u>	<u>8.662</u>
East Asia	137.917	126.628	140.858	142.058
<u>South Asia</u>	<u>106.556</u>	<u>124.689</u>	<u>118.781</u>	<u>130.548</u>
Southeast Asia	96.639	101.066	99.267	101.653
<u>Oceania</u>	<u>313</u>	<u>395</u>	<u>231</u>	<u>749</u>
CONSUMPTION				
North America	4.476	4.666	4.985	5.139
<u>Latin America</u>	<u>15.436</u>	<u>16.388</u>	<u>16.873</u>	<u>17.284</u>
EU-25	2.597	2.509	2.529	2.550
<u>Other Europe</u>	<u>224</u>	<u>236</u>	<u>227</u>	<u>231</u>
Former Soviet Union	1.231	1.434	1.354	1.370
<u>Middle East</u>	<u>6.694</u>	<u>6.697</u>	<u>6.639</u>	<u>6.997</u>
North Africa	3.429	3.491	3.552	3.541
<u>Sub-Saharan Africa</u>	<u>14.014</u>	<u>15.016</u>	<u>15.816</u>	<u>16.174</u>
East Asia	153.015	148.454	147.042	144.643
<u>South Asia</u>	<u>113.850</u>	<u>120.519</u>	<u>115.692</u>	<u>122.293</u>
Southeast Asia	89.449	90.493	90.597	91.511
<u>Oceania</u>	<u>535</u>	<u>540</u>	<u>545</u>	<u>550</u>

World rice exporters

EXPORTS	2003	2004	2005	2006
Argentina	170	249	345	400
Australia	141	131	52	500
Burma	388	130	190	200
China	2.583	880	656	800
Egypt	579	826	1.095	1.000
India	4.421	3.172	4.687	3.800
Pakistan	1.958	1.986	2.900	3.000
Thailand	7.552	10.137	7.274	7.300
Uruguay	675	804	762	700
Vietnam	3.795	4.295	5.174	5.200
EU-25	220	187	201	175
United States	3.834	3.090	3.862	3.700
Others	1.259	1.297	1.679	1.391
WORLD TOTAL	27.575	27.184	28.877	28.166

Source: FAS. USDA.2006. In thousand metric tons

ⁱ FAO. 2004. <http://www.fao.org/rice2004/en/rice-us.htm>

ⁱⁱ Idem.

ⁱⁱⁱ FDA. 2006. Statement on report of bioengineered rice in the food supply. August 18.

<http://www.cfsan.fda.gov/~lrd/biorice.html>

^{iv} FAO. 2006. Food outlook n. 1. June 2006.

^v Idem.

^{vi} Statement by Agriculture Secretary Mike Johanns regarding Genetically Engineered Rice. August 18

2006. <http://www.usda.gov/wps/portal/usdahome?contentidonly=true&contentid=2006/08/0307.xml>

^{vii} Center for Food Safety. 2006. Unapproved, Genetically Engineered Rice found in food supply. August 18, 2006.

^{viii} Statement by Agriculture Secretary Mike Johanns. Op.cit.

^{ix} Media reports are available online here: <http://www.chron.com/disp/story.mpl/ap/business/4128520.html>

^x European Commission. 2006. Commission requires certification of US rice exports to stop unauthorised GMO entering the EU. 23 august.

<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/06/1120&format=HTML&aged=0&language=EN&quiLanguage=en>

^{xi} Reuters. 2006. Unauthorised U.S. GMO rice arrived in Netherlands. August 31.

^{xii} In 2005, the US exported 3,800,000 tonnes of rice

<http://usda.mannlib.cornell.edu/usda/ers/89001/2005/table27.xls>

^{xiii} ERS USDA. 2006. Rice Outlook. August 14.

^{xiv} <http://usda.mannlib.cornell.edu/usda/ers/89001/2005/table30.xls>

^{xv} <http://www.fas.usda.gov/excredits/FoodAid/Reports/2005tableiii.pdf>

^{xvi} Friends of the Earth Europe. 2006. New Food Scandal: illegal GM rice from China found across Europe. 5 September 2006.

^{xvii} The foods testing were bought from Asian stores in Germany, France and the UK. Products testing positive were: Cock Brand Rice Sticks (France), Swallow Sailing Rice Sticks (Germany), Brotherhood Rice Vermicelli (UK), Happiness Rice Vermicelli (UK), Gold Plum Rice Sticks (UK)

^{xviii} Greenpeace. 2006. Illegal experimental GE rice from China: now entering Europe's food chain.

September. <http://www.greenpeace.org/international/press/reports/illegalChinaGERice>

^{xix} Benstein et al. 1999. "Immune responses in farm workers after exposure to *Bacillus thuringiensis* pesticides". *Environmental Health perspectives* 107 (7): 575-82.

^{xx} Vázquez-Padrón RI, Moreno-Fierros L, Neri-Bazán L, de la Riva G & López-Revilla R. 1999. "Intragastric and intraperitoneal administration of Cry1Ac protoxin from *Bacillus thuringiensis* induce systemic and mucosal antibody responses in mice". *Life Sciences* 64 (21): 1897-1912; Vázquez-Padrón RI, Moreno-Fierros L, Neri-Bazán L, de la Riva G & López-Revilla R, 1999. "*Bacillus thuringiensis* Cry1Ac protoxin is a

potent systemic and mucosal adjuvant". *Scandinavian Journal of Immunology* 46: 578–584; Vázquez-Padrón RI, Gonzáles-Cabrera J, García-Tovar C, Neri-Bazan L, López-Revilla R, Hernández M, Moreno-Fierro L & de la Riva GA, 2000. "CryIAc protoxin from *Bacillus thuringiensis* sp. kurstaki HD73 binds to surface proteins in the mouse small intestine". *Biochem Biophys Res Commun* 271: 54-8.

See also Friends of the Earth. 2003. *What do experts say about the potential human health effects of genetically engineered corn*.

www.humboldt.org.ni/transgenicos/docs/what_experts_says_human_effects.pdf

^{xxi} FAS USDA. 2006. World Rice Trade.

^{xxii} FAS USDA. 2006. World Rice Trade.

^{xxiii} Friends of the Earth International. 2006. Who Benefits from GM crops?

<http://www.foei.org/gmo/index.html>

^{xxiv} Friends of the Earth US. Regulatory History of StarLink corn.

http://www.foe.org/camps/comm/safefood/gefood/foodaid/StarLink_regulatory_history.pdf

^{xxv} Friends of the Earth International. 2002. GMO Contamination around the world.

<http://www.foei.org/publications/pdfs/contamination2eng.pdf>

^{xxvi} Segarra, A., Rawson, J. 2001. StarLink Corn Controversy: Background. CRS Report for Congress.

January 10, 2001. <http://www.ncseonline.org/nle/crsreports/agriculture/ag-101.cfm>

^{xxvii} Alianza Centroamericana de Protección a la Biodiversidad. 2005. World Food Programme and the United States denounced for the distribution of genetically modified organisms in Central America and the Caribbean. February 16. http://www.humboldt.org.ni/transgenicos/denuncia_englishfeb16.htm

^{xxviii} Segarra, A, Rawson, J. 2001. op. cit.