

# GM Cotton Fiascos Around the World

An update by The Institute of Science in Society

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and the Australian GeneEthics Network

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## GM cotton not environmentally friendly or safe

Cotton is responsible for more than 10% of world pesticide use including some of the most hazardous, and 25% of all insecticide use. As weeds and insects become resistant, more and more pesticides are needed in a vicious circle that is a recipe for socio-economic, health and environmental disaster. About half of the GM cotton grown in the United States is herbicide resistant, and a comprehensive analysis by Dr. Charles Benbrook, a former Executive Director of the Board on Agriculture of the US National Academy of Science, confirmed that it required more herbicide than conventional varieties.

Most GM cotton crops worldwide are engineered with Bt for resistance to insect pests and promoted by firms like Monsanto as environmentally friendly, because they need less pesticide.

Monsanto's GM cotton Bollgard carries the *cry1Ac* gene from soil bacterium, *Bacillus thuringiensis*, (Bt) to produce a toxin that kills some cotton pests including the boll weevil. However, Bollgard does not resist sucking pests, such as aphids, that might also damage the crop and will therefore require subsidiary spraying.

## GM cotton not friendly to farmers

GM cottonseed prices include a technology fee that can go up every year, and is calculated on supposed savings from reduced pesticide use with the Bt variety in a particular location.

All farmers growing Monsanto's Bt cotton sign a contract, called a Technology Use Agreement that is strictly applied. It stipulates that:

- \* Farmers cannot save seed for replanting;
- \* Farmers are prohibited from supplying seed to anyone else;
- \* Farmers must pay 120 times the technology fee, plus the legal fees of Monsanto, if they violate the contract.

## The Indonesian experience: A cautionary tale

Indonesia was the first country in Southeast Asia to permit commercial GM farming against the warnings of scientists and activists on the environmental and socio-economic impacts. Fortunately, permission was granted only on a year-by-year basis, and the government reviewed the impact of the failed Bt crop.

The review was scathing. This "Gene Revolution", it said, seemed to be "a modern tool for cementing farmers' dependence on seeds and transnational agrochemical corporations appearing in developing countries in different guises." The evidence from Indonesia is that "GM crops are nothing more than a profit-motivated deployment of scientific power dedicated to sucking the blood of farmers."

Monsanto promised Bt cotton would return 3-4 tonnes of cotton per hectare while requiring less pesticide and fertilizer than Kanesia, the local cotton variety. The seed was given to farmers with pesticide, herbicide, (including Roundup) and fertilizer as part of a credit scheme costing sixteen times more than non- Bt cotton. In fact, the average yield was 1.1 tonnes per hectare and 74% of the area planted to Bt-cotton produced less than one tonne per hectare. About 522 hectares experienced total crop

failure. Despite that, the government extended approval for Bt cotton for another year; and the results were no better.

In 2001 farmers signed contracts, but in 2002 the seed price rose and the cotton price slumped. Farmers had no choice but to shoulder the debt and sell at the company's rate; as a result, 76% of farmers who joined the credit scheme couldn't repay their debt and many burned their cotton in protest against the government and the company.

In 2003, Monsanto halted operations saying that the Indonesian Government's decision to authorize Bt cotton production on a year-by-year basis had been a big obstacle to business investment. PT Monagro Kimia, a Monsanto subsidiary, was under investigation by the US Department of Justice and the Indonesian Corruption Eradication Commission on suspicion that a payment of US\$ 50 000 was made to Indonesian officials in 2002.

In January 2005, Monsanto was found guilty of authorising the bribe and fined \$1.5m (see "<http://www.i-sis.org.uk/GMCCHHTAL.php>>GM cotton: corruption, hype, half-truths and lies", this series).

### **Bt cotton in India: Lessons not learned**

Bt cotton entered commercial production in India in 2002 without comprehensive assessment for detrimental effects, and despite fierce protests by farmers and public interest organizations. Only six of India's 29 states in the south and the west of the country have had permission to plant Monsanto's Bt cotton. Four strains of Bt seed were available with at least one Indian variant of the licensed Monsanto varieties.

A 2002 study of Bt cotton in the Warangal district of Andhra Pradesh found a 35% reduction in the total yield of Bt cotton with a net loss of Rs 1295, compared to a net profit of Rs 5368 for non-Bt cotton. Bt cotton yield was 50% lower than that promised by Monsanto. Bollworm was predominant on both Bt and non-Bt crops showing that Bt cotton was ineffective against its target pest.

In 2003, there was 30% more rainfall than in 2002, and a new Bt hybrid compared favourably with the previous year; however it was still 9% less profitable than the non-Bt hybrids.

In 2004, farmers in the state of Andhra Pradesh grew Bt cotton on 10% of the cotton acreage. Half of the farmers growing Bt cotton bought licensed seed from Monsanto at 1 500 rupees per 400 gm packet, while the other half bought unauthorised hybrid Bt seed at between Rs 800 to 1 200 per packet. Non-Bt hybrid seed cost farmers about Rs 400.

Farmers found that, with fluctuating weather as in 2002, much of the crop showed signs of wilt, and although some Bt cotton recovered from severe moisture stress, the yield was very poor compared to non-Bt types; also the yield from the unlicensed Bt cotton was better than Monsanto's seed because drought tolerant females had been chosen for crossing to produce the hybrid. Monsanto is now demanding royalties of 70% from these seed producers.

Many Bt plants were small with few bolls that were infested with bollworm and other pests, including cercospora leaf spot, so the cotton had been neither high- yielding nor resistant to bollworm as promised by Monsanto. On 12 October, hundreds of farmers in Warangal district protested on the streets where the seed and pesticide dealer shops were located and demanded compensation for their losses, staging a sit-in on the highway. A second protest took place two days later when senior officials promised to attend; a Monsanto official was subsequently kidnapped. Meanwhile there has been a bumper harvest in non-GM cotton.

### **Bt cotton in China**

Monsanto received a permit in 1997 for commercial production of Bt cotton in China and has since

shared the Bt cotton market with domestically developed varieties that have expanded quickly over the country's cotton-growing area.

China has been held up as the success story in GM cotton, and is the key to statistics claiming benefit for small farmers from GM. However, earlier warnings of major problems have now been confirmed by a Chinese researcher who reports that the technology will not only be useless within six to seven years, but "could cause a disaster". Liu Xiaofeng, a researcher from Henan, China's second largest cotton producing province, told Reuters that the cotton bollworm is indeed developing resistance and will not be susceptible to Bt cotton after 20-30 generations, or in six to seven years. Moreover, Bt cotton does not effectively control secondary pests such as Lygus bug.

The early warnings appeared in a study published in June 2002 based on the work of scientists at a research institute funded by China's Environmental Protection Agency. It found that although Bt cotton was effective in bollworm control, it had adverse impacts on the parasitic natural enemies of bollworm, and was not effective in controlling many secondary pests that damaged the crop. The study also found the diversity indices of the insect community in Bt cotton fields to be lower than in conventional cotton fields, and that the cotton bollworm could develop resistance to Bt cotton.

Liu's work has received further collaboration by another study published in October 2004, which found that Bt cotton did not reduce the total numbers of insecticide sprays because additional sprays were required against sucking pests.

### **Field trials in Africa**

South Africa, already the sixth biggest producer of GM crops in the world, grows Bt cotton on large and small commercial scales, extolling the benefits to small farmers in spite of the serious debts incurred.

Although there is a glut of cotton in the world market and depressed prices caused by US subsidies to their own growers worth \$3.7 b per annum, the US government and the world's biggest agrochemical companies are putting pressure on West African countries to introduce Bt cotton, the Trojan horse for other GM crops waiting in the wings. In West Africa there are wild relatives of cotton that may be contaminated, but in the US, GM cotton is prohibited in Florida where wild relatives grow.

In November 2003, USAID, with the official support of the International Institute of Tropical Agriculture, declared that it wants to 'GM-ize' Africa.

Mali's National Agricultural Research Institute has been negotiating with Monsanto and Syngenta for field trials of Bt cotton. There is a plan to convert the country's crop to GM varieties over the next five years; local farmers and the public are unaware of this intention. West African farmers, already unable to sell enough natural cotton because of subsidies, are locked into a cycle of poverty with credit against next year's harvest.

\* Burkina Faso has been field-testing Bt cotton since July 2003 in collaboration with Monsanto. But Francois Traore, president of the National Union of Cotton Producers, says, "If we already have the means to reduce pesticide use, why look for things that are going to complicate life?"

\* Benin has had a moratorium on GM products since March 2002, but is under constant pressure to introduce Bt cotton.

\* Senegal ran an unofficial field trial of Monsanto's Bt cotton, but efforts were abandoned after the cotton failed to perform.

\* Egypt has a pro GM policy with field trials underway for Bt cotton and many other crops.

\* Kenya has many research institutes pushing GM crops, and research on GM cotton is under way.

\* Uganda has just published its first biosafety policy bill, which has yet to be made law by parliament, however it is expected to take up Bt cotton soon.

\* Zimbabwe: The government destroyed some unsupervised field trials of Bt cotton conducted by Monsanto some years ago.

## The Americas

In the US, home of Monsanto's Bollgard first planted in 1996, there have been problems with erratic and disappointing yield, especially in Southeast Arkansas where costs were significantly higher on Bt acreage. In 2002, despite the use of supplementary pesticides, 7.5% of the Bt crop was destroyed by bollworm and 1.4% destroyed by Spodoptera and Pseudoplusia includens caterpillars. The total insecticide use has remained relatively stable due to the increasing importance of secondary pests; it is lower in dry states such as Texas, but increasing in the Mississippi delta.

Research on Bollgard cotton adopted in North Carolina, conducted between 1996-2003 by Jack Bachelier, North Carolina State University Extension entomologist found changes in insect communities, and that while damage from bollworms decreased, stink bug problems have increased.

In 2004, Bt cotton was grown in nine states and comprised more than 75% of all cotton grown. Most varieties are Roundup Ready (RR) or RR and Bt combined [1]. The proposed technology fee for Bollgard II was US \$99 ha in 2004, this is to be added to the seed price.

Bt cotton is also grown in Brazil, Argentina, Mexico and Columbia. In Columbia the vice-president of the biosafety council works for Monsanto and was thus able to both apply for and grant permission for release of a Bt crop in an area that is a centre of origin for some wild cotton species. Moreover, the pest responsible for 70% of pesticide use on cotton is the picudo, which is not targeted by Monsanto's cotton. The small farmer will once again lose out due to this folly.

## Overproduction of cotton devastating the environment and destroying poor farmers

World overproduction of cotton, a crop that degrades the environment by escalating requirement for pesticide, demand on scarce water resources and exhaustion of soil, is a subject for serious concern in its own right. Large commercial plantings - which attract subsidies in rich countries - create monoculture deserts and distort world markets. As a result, the poor producer in the south, who has traditionally grown a crop of one or two hectares, descends into a spiral of debt. The aggressive introduction of GM cotton will exacerbate all the problems of the conventional crop and, in developing countries, nullify centuries of successful local crop breeding by farmers, destroying their autonomy and control of seed, their livelihoods and cultural traditions.

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