



# Communiqué

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## Fear-Reviewed Science:

### Contaminated Corn and Tainted Tortillas -- Genetic Pollution in Mexico's Centre of Maize Diversity

**Issue:** Both the Mexican Ministry of the Environment and a peer-reviewed article in *Nature* confirm that farmers' maize varieties in Mexico have been contaminated with DNA from genetically modified maize. There are conflicting opinions on whether GM pollution extends into the gene bank operated by the International Maize and Wheat Improvement Center (CIMMYT), the world's most important storage facility for endangered maize seed diversity. CIMMYT has undertaken its own investigation and insists that they have found no contamination.

**Impact:** Genetic pollution is alarming not only because it is illegal to grow genetically modified (GM) maize in Mexico, but especially because Mexico is the primary center of maize genetic diversity. Scientists have warned for years that genes from GM plants (transgenes) could slip to their cultivated and wild relatives. Gene flow could create new weed problems and threaten crop diversity. However, now that GM contamination is a reality, some biotech scientists have become "spin doctors" for a beleaguered biotech industry. To suggest that GM contamination in Mexico is beneficial for biodiversity ignores Mexican sovereignty and insults the socio-cultural rights and concerns of Mexican farmers.

**Policy:** Stringent measures are needed to halt further GM contamination in Mexico through imports of seeds or produce. Internationally, the Food and Agriculture Organization of the United Nations (FAO) and the Consultative Group on International Agricultural Research (CGIAR) should take the lead in conducting rigorous studies on the potential dangers posed by GM contamination for all crops in their centers of diversity, as well as for the safety and integrity of GM-endangered gene banks. In the meantime, FAO and CGIAR should invoke the Precautionary Principle and call for an immediate worldwide moratorium on GM releases in these regions. To do otherwise is to play genetic roulette with global food security. As a matter of the highest priority, the issue of GM contamination in centres of genetic diversity must be addressed by governments at the upcoming Conference of Parties to the Convention on Biological Diversity in the Hague (8-26 April); at the World Food Summit+5 in Rome (10-13 June, 2002); and at the World Summit on Sustainable Development in Johannesburg (26 August-4 September 2002).

## **Background**

Last September, following months of rumour and speculation, both the Mexican Ministry of Environment<sup>1</sup> and later a peer-reviewed article in *Nature*<sup>2</sup> confirmed that farmers' maize varieties (landraces) in at least two remote Mexican states, Oaxaca and Puebla, had been contaminated with DNA from genetically modified maize. These findings are alarming, not only because it is illegal to grow GM maize in Mexico, but especially because Mexico is the primary centre of maize genetic diversity. Maize varieties developed over millennia by indigenous farmers, as well as their wild and weedy relatives, represent one of the world's most valuable reservoirs of genetic material for future plant breeding and for food security. National and international seed banks in Mexico also contain the world's most important collections of near-extinct maize material. The announcement of contamination provoked an immediate crisis for local farmers and spread panic among the world's gene bank curators.

***Weedy Waterloo?*** Scientists have fretted for years that genes from genetically modified (GM) plants could slip to their cultivated and wild relatives. Such an escape could threaten diversity and lead to everything from superweeds to sickly seeds - especially if unwanted gene flow takes place in a crop's center of genetic diversity - the region where it originated and where the greatest diversity usually remains. But, now that GM contamination is a reality, some biotech scientists have undergone their own modification to become "spin doctors" for frightened Gene Giants. In the wake of the *Nature* revelation, Mexico's governmental apologists and several industry-funded scientists insisted that "if" contamination had taken place - and they challenged the peer-reviewed article on this point as well as their own government's study - then the menace was really a marvelous boon. GM pollution suddenly means free technology transfer and more diversity. It's called "spin doctoring" as in, "Aside from the outcome, Mr. Bonaparte, wasn't Waterloo lovely?"

## **Is Mexico's Maize Center Polluted?**

***Mexican Standoff:*** In May, 1999, at a global agricultural congress in Dresden, Germany, one of the top corridor topics was what national and international research centres should do when the inevitable day came that GM maize invaded Mexico; or GM seeds polluted the rice bowls of Asia; or GM potatoes crossed the Andes and GM wheat and

canola (edible rapeseed) swept Asia. The talk was never "if," only "when".

Concerns in Dresden flowed from a September 1995 symposium convened by CIMMYT (the International Maize and Wheat Improvement Centre) together with Mexican governmental and academic institutions.<sup>3</sup> As the world watched commercial GM seeds spread (for the first time) that year, national and international experts concluded that transgenic contamination was almost unavoidable but that the implications were uncertain. Some felt the impact could be devastating. Some Mexican academics in the symposium (now in government) seemed to prefer a "post-cautionary" principle, by insisting, peculiarly, that in the absence of knowledge about how transgenes will behave in nature, scientists should operate on the assumption that they will do no harm.<sup>4</sup> The symposium rejected their advice.

But even after the Mexican government's own study confirmed the presence of transgenes in farmers' varieties, some officials promote the "post-cautionary" principle. Victor Manuel Villalobos, Mexico's Under Secretary of Agriculture, told *Newsweek* in January 2002 that "Mexico as a country cannot exclude itself from biotechnology. It is not an intelligent position to say that because there are risks we won't touch it."<sup>5</sup>

In discussions with numerous geneticists and breeders in Mexico since September, ETC group has yet to find a single scientist who personally doubts the presence of GM maize in Mexican fields. Some argue that the studies done so far are weak or inconclusive. No one disputes that GM material has come, unbidden and unwelcome, to the homeland of one the world's most vital crops.

## **Is the Pollution a Problem?**

*"The hope of the industry is that over time the market is so flooded [with genetically modified organisms] that there's nothing you can do about it. You just sort of surrender."*

-- Don Westfall, biotech industry consultant, and vice-president of Promar International, quoted in the *Toronto Star*, January 9, 2001.

According to some observers, gene flow from GM maize may not compromise diversity and may be no worse a threat than cross-pollination from conventional (non-GM) seed.<sup>6</sup> Others point out that escaped DNA from engineered maize is unlikely to have an evolutionary advantage, and therefore will not persist in the environment. Some industry and/or industry-sponsored researchers insist that if the transgenes do persist, they may actually prove advantageous for Mexican farmers and crop diversity!<sup>7</sup>

For the Gene Giants to argue that there is no problem is to suggest that violating Mexico's sovereignty (i.e. its moratorium on transgenic planting material) and to insult the socio-cultural rights and concerns of Mexican farmers is of no concern. Can industry really be saying that citizens don't have the right to say "no" to a technology that offends their views on life and food and, as well, raises concerns for their livelihood, health and environment? In the words of Aldo Gonzalez, a farmer from Sierra Juarez de Oaxaca:

*"The contamination of our traditional maize exploits the fundamental autonomy of our indigenous and farming communities because we are not merely talking about our food supply; maize is a vital part of our cultural heritage. The statements made by some officials that contamination is not serious because it will not spread rapidly, or because it will "increase our maize biodiversity," are completely disrespectful and cynical."*<sup>8</sup>

**Boon or Bomb?** Scientists who are sanguine about contamination argue that GM traits are just "more diversity" contributing to the millennium-long ebb and flow of old and new genes that crisscross species and environments. "Gene flow" within a species is natural and welcome. Farmers doing their own breeding and selection can choose to incorporate the new traits or weed them into extinction. In a January 2002 interview with *Newsweek*, David Hoisington, Director of the Applied Biotechnology Center at CIMMYT, dismissed the negative impact of transgenes in Mexico's traditional maize, "Just the presence of one new gene is not going to destroy maize in Mexico...It's not a threat to biodiversity. It's just one gene among 50,000 to 60,000 genes."<sup>9</sup>

Tell this to farmers hoping to sell their commodities in non-GM markets (most of Europe, for example,

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and many specialty markets in Japan and North America). Organic growers in Saskatchewan, Canada have just sued Monsanto for GM canola contamination. The Canadian Government confirms that GM canola has become a significant weed problem. Organic growers can no longer guarantee their customers that their harvest is GM free.

**Pardon my Patent:** Mexican farmers must not only fear market losses but monopoly controls. The DNA sequence most widely discovered in farmers' maize varieties in Mexico is the 35S promoter from cauliflower mosaic virus (CaMV), a patented sequence owned by Monsanto. Gene sequences associated with Syngenta's commercial GM varieties were also identified in contaminated maize samples analyzed by University of California scientists. Farmers in Mexico are being told not to worry, that trespassing transgenes won't harm their ancient maize varieties and might even help them. Meanwhile, Monsanto has filed hundreds of lawsuits against US and Canadian farmers (like Saskatchewan's Percy Schmeiser) who are accused of using proprietary seed without Monsanto's permission and in violation of their patent. If you were a Mexican farmer, would you trust Monsanto not to sue you for patent infringement? (While Monsanto's patent may not be currently valid in Mexico, trade agreements could easily change that –and are likely to do so in the future. Even now, Monsanto might be able to block Mexican maize imports into countries that do recognize its patents.)

**Silent Science:** Then too (and this is where scientists seem to be reacting more from corporate "fear-review" than their vaunted peer-review) the actual way GM traits will behave in a center of megacrop diversity over several generations is simply not known. Although some CIMMYT scientists seem tranquil about GM contamination in Oaxaca, they re-affirm their conclusion from the 1995 symposium - that "rigorous studies" are required. This has not been done. In their absence, stringent measures are needed to halt further contamination through imports of seeds or produce. To do otherwise is to play genetic roulette with global food security.

GM maize contamination in Mexico has unleashed an unseemly public debate within the scientific community. Some researchers are attacking Dr. Ignacio Chapela, a Mexican scientist at UC Berkeley's Department of Environmental Science,

Policy and Management and one of the authors of the *Nature* article. According to an article in *Nature Biotechnology* (January, 2002) Chapela is warning that the maize gene bank at the International Center for Maize and Wheat Improvement (CIMMYT) outside of Mexico City is already contaminated with GM material.<sup>10</sup> This is no small matter since the CIMMYT seed bank is the world's most important storage facility for endangered maize seed diversity. CIMMYT is concerned about the threat of contamination and has undertaken its own investigation that they claim gives no evidence of pollution. In a meeting with ETC group, CIMMYT's Director General Tim Reeves wondered out loud if it would soon become impossible to rejuvenate maize seed collections anywhere in the world free of the threat of GM pollution.<sup>11</sup>

**Taking Precautions:** The Precautionary Principle adopted in the Biosafety Protocol in 2000 applies here. Certainly, the United States should agree. Last year, the Bush Administration imposed a ban on the planting of genetically modified, insect resistant cotton (*Bt*) in parts of southern Florida and prohibited commercial culture of *Bt* cotton in Hawaii, the US Virgin Islands and Puerto Rico where wild or feral cottons might cross with the transgenic material. "Until thorough research on the impacts of gene flow can be completed, restriction on where *Bt* cotton can be planted are being implemented," concluded the US Environmental Protection Agency.<sup>12</sup> Cotton is a sexually-inhibited "Victorian" kind of crop that doesn't party with its wild relatives too eagerly. By comparison, maize is a Flower Child. GM maize will skip promiscuously into a hotbed of biodiversity with hardly a care.

Recently, Dr. Barry Commoner warned that – both in plants and people – traits seem to be suppressed and expressed within the cell in ways beyond the gene. Opening the Book of Life last year, human genome researchers were stunned to discover how few genes we have and how similar most of them are to those found in bananas or worms. Traits seem to move about and be inherited in ways - and through combinations - that science did not expect. The more we learn about life and about inheritance – the more uncertain we become.

**Food Raid?** How did transgenic maize find its way into farmers' varieties in remote areas of Mexico? While it is illegal to grow GM maize, an average 6 million tons of maize enters Mexico from the USA

every year by truck and train. Since there is no mandatory labeling of GM crops in the United States, these shipments include unknown quantities of GM material. Many believe that Mexican farmers who bought GM corn to eat in the midst of drought may have planted it without knowing it was transgenic. More GM maize seed may have fallen off the backs of trucks. Food aid maize shipped from Canada and the USA to Central America last year might also have found its way into the fields of desperate farmers. Mexico's contamination may be a regional problem for all of Mesoamerica.

In 2000-2001, when illegal traces of Aventis's genetically engineered StarLink maize (banned in the US for human food because of concerns for an allergic reaction) invaded the US food supply, hundreds of products had to be pulled off grocery shelves and farmers, seed companies and grain handlers were compensated for damages.<sup>13</sup> Who will assume liability for genetic pollution in Mexico? Why has the Mexican government failed to act?

**Coming Detractions:** The commercial, transgenic maize that contaminated farmers' varieties in Mexico involves biotech's first generation traits such as *Bt* insecticidal toxins and herbicide tolerance (varieties engineered to withstand spraying of Monsanto's RoundUp – the world's best-selling chemical weed killer). If the biotech industry gets its way, this is only the beginning. The following are just a few examples of Generation 3 biotech products in the pipeline:

- Dupont and Dow are modifying maize to produce plastics.
- Epicyte is engineering maize to produce a spermicide for male contraception.<sup>14</sup>
- ProdiGene is developing transgenic maize that produces industrial enzymes for the adhesive industry, super sweet proteins for low-calorie sweeteners, and an edible AIDS vaccine.<sup>15</sup>

Industry will assure us that Generation 3's "pharmaceuticals" would never be allowed to grow in proximity to related plants and wild relatives, and that measures will be taken to mitigate the spread of transgenes from pharma crops and biofortified plants. Farmers in Oaxaca and Puebla would remind us that their maize was contaminated by transgenic crops that were illegal to plant in Mexico – but those legal restrictions did nothing to prevent gene flow.

It is alarming that industry and some scientific bodies are arguing that Terminator technology (genetic seed sterilization) can be used to prevent gene flow. This is like demanding that every farmer wear a condom because Monsanto carries a sexually-transmitted disease. GM contamination must be stopped by the companies who have caused it or their technology should be banned.

### **ETC Action Recommendations:**

GM contamination in Mexico is not biotech's smoking gun; it's more like a raging bonfire that should put the plant breeding and genetic resource communities – and government policy-makers - on high alert. It is only a matter of time before the Mexican scandal is repeated in the Middle East or South Asia and China.

#### **In Mexico:**

- ❑ Indigenous farmers should be consulted and supported on all aspects of this issue including the need for *in situ* maize diversity conservation.
- ❑ Mexico should treat this as both a national and international emergency, and urgently establish where and how much contamination has already occurred.
- ❑ Governments and other non-national entities that have contributed to GM pollution should pay reparations to Mexico or be taken to the International Court of Justice.

- ❑ To prevent further contamination, Mexico must demand that imported maize commodities be GM-free.
- ❑ The Mexican public should be warned that current stocks of maize could be contaminated and must not be used as planting material.
- ❑ Mexico should advise the international community of the situation concerning its center of biodiversity and make whatever requests it considers necessary to ensure the integrity of its agricultural biodiversity.

#### **Internationally:**

- ❑ This issue should be fully discussed at the April Conference in The Hague of the Parties to the Convention on Biological Diversity and at the World Food Summit+5 in Rome in June.
- ❑ FAO and the Consultative Group on International Agricultural Research (CGIAR) should take the world lead in conducting global studies of the general situation for all crops in their centers of diversity as a matter of the highest priority.
- ❑ In the meantime, FAO and CGIAR should invoke the Precautionary Principle and call for an immediate worldwide moratorium on GM releases.
- ❑ CGIAR must work closely with FAO to establish regulations and procedures governing GM- endangered gene bank collections and the rejuvenation of these collections and their exchange within the scientific community.

### **Early Warnings about GM Gene Flow in Centres of Diversity**

“Gene flow from the transformed cultivars to other elements of its gene pool, both domesticated and free-living, could provide a marked selective advantage to individual recipients in both natural and artificial arenas. The advantage would be especially strong for engineered resistance to viral or insect predators that stress both cultivated and free-living populations. Progeny of these introgressed plants, armed with their unique genetic advantage, could then proceed to displace native landraces and free-living populations as a result of both human and natural selection. Thus, erosion of genetic diversity in plants, is currently a critical problem, which could be exacerbated by uncontrolled application of the new technology.” - **Hugh D. Wilson**, “Gene Flow in Squash Species,” *Bioscience*, June, 1990.

“Possibly the greatest ecological hazard that transgenic crops pose in Mesoamerica is the possible creation of new weeds and the erosion of genetic diversity due to genetic exchange between transgenic plants and wild native plants... The possible gene flow between maize and teocintle is of great concern in Mexico...” - **Allan J. Hruska**, *Transgenic Plants in Mesoamerican Agriculture*, 1997.

“With biotechnology, we have a new suite of traits that can move into the wild populations at a faster rate than before. Often these are single genes that can have a big effect on the fitness of the wild plant with little or no cost to the plant, and we can expect that this will speed up the rate at which crops contribute beneficial traits to their wild relatives, perhaps even creating new weed problems.” – **Allison Snow**, *Transgenic Plants in Mesoamerican Agriculture*, 1997.

“We believe that the genetic and ecological risks of introducing transgenic crops into the centers of origin of agronomic crops are largely unknown. We must not get beyond the science. The effects may prove, in most cases, of little consequence, but we should not find out by default or accident. Regulatory decisions involving the introduction of transgenic plants should be based on thorough scientific research, which in the case of maize, at least, has not yet been conducted.” -- Letter to the Editor, *Science*, Volume 287, Number 5460, Issue of 17 Mar 2000, p. 1927. Signed by **Ronald Nigh**, Centro de Investigaciones y Estudios Superiores en Antropología Social del Sureste, Mexico; **Charles Benbrook**, Benbrook Consulting Services; **Stephen Brush**, Human and Community Development, University of California; **Luis Garcia-Barrios**, Division de Sistemas de Produccion Alternativos, El Colegio de la Frontera Sur, Mexico; **Rafael Ortega-Paczka**, Universidad Autonoma Chapingo, Mexico; **Hugo R. Perales**, Departamento de Agroecología, El Colegio de la Frontera Sur, Mexico.

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<sup>1</sup> SEMARNAT, Secretary of Environment and Natural Resources

<sup>2</sup> Nature Vol. 414, No. 6863, pp. 541-543, David Quist and Ignacio Chapela, *Transgenic DNA introgressed into traditional maize landraces in Oaxaca, Mexico*

<sup>3</sup> *Proceedings of a forum: Gene Flow Among Maize Landraces, Improved Maize Varieties, and Teosinte: implications for Transgenic Maize*. CIMMYT, INIFAP, CNBA, Mexico 1995.

[http://www.cimmyt.org/abc/geneflow/geneflow\\_pdf\\_engl/contents.htm](http://www.cimmyt.org/abc/geneflow/geneflow_pdf_engl/contents.htm)

<sup>4</sup> See discussion in *Proceedings of a forum: Gene Flow Among Maize Landraces, Improved Maize Varieties, and Teosinte: implications for Transgenic Maize*, pages: 100, 101, 102, 103.

<sup>5</sup> Alan Zarembo, “The Tale of the Mystery Corn in Mexico’s Hills,” *Newsweek International*, 28 January 2002, on the internet: <http://www.msnbc.com/news/691087.asp?cp1=1#BODY>

<sup>6</sup> Tim Reeves, Director-General of CIMMYT, told *Nature Biotechnology*: “Gene flow [in landraces] is constant, and the real question is whether it makes any difference if one of the genes that has flowed in is a transgene.”

<sup>7</sup> Prakash, C.S., “Scientists Say Mexican Biodiversity is Safe; Concerns About Cross-Pollination Unfounded,” 21 December 2001, on the internet:

[http://www.checkbiotech.org/root/index.cfm?fuseaction=search&search=Mexico&doc\\_id=2399&start=1&fullsearch=0](http://www.checkbiotech.org/root/index.cfm?fuseaction=search&search=Mexico&doc_id=2399&start=1&fullsearch=0)

<sup>8</sup> Translated from the Spanish, News Release issued by CSOs that organized a national workshop in Mexico City on World Food Day, “En defensa del maíz y contra la contaminación transgénica,” 16 October 2001.

<sup>9</sup> Alan Zarembo, “The Tale of the Mystery Corn in Mexico’s Hills,” *Newsweek International*, 28 January 2002, on the internet: <http://www.msnbc.com/news/691087.asp?cp1=1#BODY>

<sup>10</sup> John Hodgson, “Doubts linger over Mexican corn analysis,” *Nature Biotechnology*, January 2002, p. 3.

<sup>11</sup> January, 2001.

<sup>12</sup> US Environmental Protection Agency, Office of Pesticide Programs, Biopesticides and Pollution Prevention Division, Biopesticides Registration Action Document, *Bacillus thuringiensis (Bt)* Plant-Incorporated Protectants, October 15, 2001.

<sup>13</sup> StarLink, altered to contain an insecticidal toxin (Cry9C), was approved by US government authorities for livestock feed, but not for human consumption because it could potentially trigger allergic reactions.

<sup>14</sup> <http://www.epicyte.com/products/products1.html>

<sup>15</sup> <http://www.prodigene.com/news.html>

***The Action Group on Erosion, Technology and Concentration, formerly RAFI, is an international civil society organization headquartered in Canada. The ETC group (pronounced Etcetera) is dedicated to the advancement of cultural and ecological diversity and human rights. All our publications are available at: [www.etcgroup.org](http://www.etcgroup.org)***

**ETC group International Office, P.O. Box 68016 RPO Osborne Winnipeg MB R3L 2V9 CANADA**  
Tel: 204 453-5259 Fax: 204 284-7871 <http://www.etcgroup.org>