

## **Genetic Pollution in Mexico's Center of Maize Diversity**

ETC GROUP\*

Backgrounder

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\*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. [www.etcgroup.org](http://www.etcgroup.org).

Controversy erupted last year after Mexico's Ministry of the Environment and a peer-reviewed article in *Nature*(1) reported that farmers' traditional maize varieties in two remote Mexican states, Oaxaca and Puebla, had been contaminated with DNA from genetically modified (GM) maize. Genetic pollution is alarming both because it is illegal to grow GM maize in Mexico and especially because Mexico is the primary center of maize genetic diversity - the region where maize originated and where the greatest diversity is found. Maize varieties developed over millennia by indigenous farmers, as well as wild ancestors of maize, represent one of the world's most valuable reservoirs of genetic material for plant breeding - the foundation for global food security. Native maize diversity provides the raw material used by farmers and plant breeders to improve the quality and productivity of maize crops worldwide. The Mexico-based International Center for Maize and Wheat Improvement (CIMMYT) also houses the world's most important collection of endangered maize seeds.

The Mexican government believes that GM maize was likely introduced to farmers' fields when Mexican farmers planted U.S.-grown grain intended for food rather than seed, unaware that it was genetically modified. (GM maize and grain grown in the U.S. is not labeled.) Approximately 20 million acres of GM maize were planted in the U.S. in 2001, and approximately 6 million tons of U.S. maize are shipped annually to Mexico as food grain.

**The Bigger Picture** The controversy surrounding GM maize contamination in Mexico reflects a much larger conflict over control and stewardship of genetic resources in a world where biotech research is overwhelmingly dominated by corporate interests, and where public sector research increasingly serves the corporate agenda. Biotech proponents have long insisted that GM technology is safe, precise, and predictable, yet the escape of engineered genes in Mexico demonstrates, once again, the inability of regulatory bodies or industry to control and contain

genetically modified organisms. With European governments scheduled to review their de facto moratorium on GM crops in March 2002 and a United Nations meeting on biosafety slated for April 2002, findings of genetic pollution in Mexico couldn't have surfaced at a worse time for industry.(2) In response, biotech proponents launched a campaign to deny and discredit evidence of GM contamination in Mexico, including attacks on the methodology used by University of California at Berkeley researchers Ignacio Chapela and David Quist, whose controversial findings were published in *Nature* in November 2001.(3) The campaign proved so successful that in early April *Nature* took the highly unusual step of disavowing the Chapela and Quist article, claiming that the "evidence available is not sufficient to justify the publication of the original paper." (4) *Nature's* retraction was declared a "public relations victory" for the biotech industry.(5) But the victory was short-lived. In April 2002 the Mexican government confirmed once again that its own studies find high levels of contamination in native maize populations. According to Jorge Soberón, Secretary of Mexico's National Biodiversity Commission, "This is the world's worst case of contamination by genetically modified material because it happened in the place of origin of a major crop. It is confirmed. There is no doubt about it." (6) Soberón told the *Guardian* that the Mexican government could not verify which company's GM technology was implicated because the companies had refused to disclose sensitive information about the DNA sequence involved.(7) Although CIMMYT has not yet independently confirmed GM contamination in farmers' fields, or in its gene bank, the plant breeding institute has suspended maize collecting missions in Mexico to prevent DNA contamination from spreading.(8) The commercial GM maize that contaminated farmers' varieties in Mexico involves products such as Bt insecticidal toxins (plants modified to produce their own insecticides) and herbicide tolerance (plants engineered to withstand spraying of Monsanto's Roundup - the world's best-selling chemical weed killer).

Is the Pollution a Problem? Unwanted "gene flow" from genetically engineered crops into the environment raises many difficult and as-yet unanswered questions. Could engineered genes escape to wild relatives and disrupt natural ecosystems? What if the gene for herbicide tolerance is transferred from engineered crops to weeds, creating a "superweed" that is hard to kill with chemical weed killers?

Some scientists believe that gene flow from GM maize may not compromise maize biodiversity and may pose no worse a threat than cross-pollination from conventional (non-

GM) seed.(9) DNA from engineered maize is unlikely to have an evolutionary advantage, they reason, and therefore will not persist in the environment. Some industry and/or industry-sponsored researchers insist that if transgenes (engineered genes) do persist, they may actually prove advantageous for Mexican farmers and crop diversity!(10) These researchers argue that something new is being introduced - ergo there's more biodiversity - and that the new strain has advantageous traits - insect resistance, for example - so its introduction is positive.

Despite these tortuous arguments, there are significant potential risks posed by GM pollution, none of which have been adequately studied. These include the largely unexplored health risks to those who eat modified crops, and the potential ecological and crop management problems that could arise when herbicide tolerance or insect resistance genes pass via pollination into wild relatives.(11) There is also a worrisome lack of knowledge about the potential problems that could be posed by the 35S promoter found in the contaminated local varieties. The function of the 35S promoter gene, which comes from the cauliflower mosaic virus (CaMV) and is inserted together with the gene of commercial interest, is to switch on the activity of the target gene \*.

While these potential risks seem enough to warrant swift action, they may be but a taste of things to come. In the longer term, a much more serious threat is posed by biotech's next generation of products, which include maize that has been modified to produce plastics, spermicide,(12) and even an edible AIDS vaccine.(13) Of course industry assures us that biotech's "farmaceuticals" 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. However, legal restrictions did nothing to prevent gene flow in Oaxaca and Puebla.

**The Threat of Market Losses and Monopoly Controls** Those who dismiss concerns about DNA contamination ignore Mexico's sovereignty (which is expressed in its moratorium on GM planting material) and disregard the sociocultural rights and concerns of Mexican farmers. GM contamination has offended and angered some farmers and indigenous peoples, and it raises grave concerns for their culture, livelihood, health, and environment. In the words of Aldo Gonzalez, a farmer from Sierra Juárez de Oaxaca:

The contamination of our traditional maize undermines 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. (14) Although subsistence farmers in Mexico are not likely to sell their maize crop for export, GM contamination could foreclose any future opportunities to sell their crop in lucrative non-GM and specialty markets. Mexican farmers also risk being victimized by monopoly patents. The DNA sequence most widely discovered in farmers' maize varieties in Mexico is the 35S promoter, a patented sequence owned by Monsanto. In the U.S. and Canada, Monsanto has filed hundreds of lawsuits against farmers who are accused of infringing the company's monopoly patents by using proprietary seed without Monsanto's permission.(15) 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.

**Action Needed** It is simply not known how GM traits will behave in a center of crop genetic diversity. In the absence of rigorous, long-term studies, precautionary steps must be taken. To do otherwise is to play genetic roulette with global food security and the livelihoods of farming communities. In February 2002 more than 144 farmer and civil society organizations from 40 countries signed a Joint Statement on the Mexican GM Maize Scandal, demanding that action be taken at the local, national, and international levels to prevent GM contamination, to help farmers restore their fields and ecosystems, and to ensure that the burden of restoration and compensation to affected farmers and nations rests with the manufacturers of GM products.(16) Above all, the concerns, needs, and demands of the communities most directly affected - the farmers and indigenous peoples who are responsible for creating and conserving maize diversity - must be heard.

At the international level, the Joint Statement calls upon the Consultative Group on International Agricultural Research (CGIAR) and intergovernmental bodies such as the Convention on Biological Diversity (CBD) and the Food and Agriculture Organization (FAO) to:

- Acknowledge that GM contamination poses a potentially serious threat to biological diversity in crop centers of origin and/or diversity.

- Propose an immediate moratorium on the release of genetically modified organisms, either for food, feed, and processing (i.e., GM seeds and grain) or for research, in those countries or regions that form part of the crop centers of origin and/or diversity for a given species.
- Undertake rigorous studies on a crop-by-crop and region-by-region basis to determine what impact GM contamination may have in crop centers of origin and/or diversity.
- Take immediate steps to ensure the integrity of crop seeds held in international gene banks covered under the FAO/CGIAR Trust Agreement (which forbids intellectual property claims on all seeds held in trust), and take steps to safeguard local farmers' varieties and gene banks.

\* Editor's Note: There is speculation that the promoter is a source of genetic instability, which could potentially cause the loss or degeneration of local varieties.

## Notes

- (1) D. Quist and I. Chapela, "Transgenic DNA Introgressed into Traditional Maize Landraces in Oaxaca, Mexico," *Nature* 414, 6863 (November 29, 2001): 541 - 543.
- (2) J. Hodgson, "Maize Uncertainties Create Political Fallout," *Nature Biotechnology* 20 (February 2002): 106 - 107.
- (3) ETC Group, "Unnatural Rejection: The academic squabble over Nature magazine's peer-reviewed article is anything but academic," February 19, 2002, and "Joint Statement on the Mexican GM Maize Scandal," signed by 144 farmer and other civil society organizations. (Both available online at [www.etcgroup.org](http://www.etcgroup.org).) See also: J. Matthews, "Amazing Disgrace: Monsanto - Up to Its Dirty Old Tricks Again," *The Ecologist* 32, 4 (May 2002).
- (4) Editorial Note, *Nature* 416 (April 11, 2002): 600.
- (5) P. Elias, *The Associated Press*, "Corn Study Spurs Debate over Corporate Meddling in Academia," April 18, 2002.
- (6) C. Clover, "'Worst Ever' GM Crop Invasion," *The Daily Telegraph* (London), April 19, 2002.
- (7) P. Brown, "Mexico's Vital Gene Reservoir Polluted by Modified Maize," *Guardian* (London), April 19, 2002.
- (8) Personal communication between ETC staff and Tim Reeves, Director General of CIMMYT, at meeting in The Hague, April 12, 2002.

- (9) N. Louwaars, J.-P. Nap, B. Visser, and W. Brandenburg, "Transgenes in Mexican Maize Landraces," Plant Research International, Wageningen, The Netherlands; released in April, 2002.
- (10) C. S. Prakash, "Scientists Say Mexican Biodiversity Is Safe; Concerns about Cross-Pollination Unfounded," [www.checkbiotech.org](http://www.checkbiotech.org), posted December 21, 2001.
- (11) See, for example, M. A. Altieri and P. Rosset, "Ten Reasons Why Biotechnology Will Not Ensure Food Security, Protect the Environment and Reduce Poverty in the Developing World," *AgBioForum* 2, 3 - 4 (1999): 155 - 162 (available online at [www.agbioforum.org](http://www.agbioforum.org)), and P. Rosset, "Anatomy of a Gene Spill: Do We Really Need Genetically Engineered Food?" Institute for Food and Development Policy Backgrounder 6, 4 (Fall 2000) (available online at [www.foodfirst.org](http://www.foodfirst.org)).
- (12) R. McKie, "GM corn set to stop man spreading his seed," *The Observer* (London), September 9, 2001.
- (13) Scott, "HIV Vaccine Grown in GM Maize," *Chemical Week*, 164, 18 (May 1, 2002): 33.
- (14) "En defensa del maíz y contra la contaminación transgénica," news release issued by civil society organizations (CASIFOP, CECCAM, ETC Group, ANEC, CENAMI, COMPITCH, FDCCH, FZLN, Greenpeace, Instituto Maya, SER Mixe, UNORCA, UNOSJO, and RMALC) in Mexico City on World Food Day, October 16, 2001. Translated by ETC Group.
- (15) J. Mendelson and A. Kimbrell, "Brief Amici curiae of American Maize Growers Association and National Farmers Union in Support of the Petitioners," *J.E.M. AG Supply, Inc. v. Pioneer Hi-Bred International, Inc.*, U.S. Supreme Court 99 - 1996 (2001).
- (16) February 18, 2002. Available online at [www.foodfirst.org](http://www.foodfirst.org).