# Food fight! The polarized GM food debate

*The debate over genetically modified (GM) food pits environmental activists against biotechnology proponents. We asked representatives from both sides a series of ten questions to illustrate the divergent opinions on GM agriculture and maize.*

**Raj Patel, Policy Analyst, Food First**

### *1. Why do we have GM maize?*

Genetically modified (GM) maize is a product of the pesticide industry, and the industry's needs explain the product. Monsanto—the company behind GM maize and a range of other genetically modified grains, and the largest single producer of GM crops in the world—is primarily a pesticide company. They market the world's best-selling herbicide: Roundup. To counter their loss of monopoly on Roundup (the patent for which expired in September 2000), Monsanto developed GM seeds, which are sold as a package with Roundup. The other kind of GM maize, Bt Corn, is engineered to excrete its own pesticide. Both of these products are geared towards improving Monsanto's bottom line. GM food was never called for by farmers, or by the hungry, but by the greedy. Recent allegations against Monsanto of price-fixing its GM seed, if true, would bear this out conclusively.

### *2. From your perspective, what are the benefits and risks inherent to GM agriculture?*

For shareholders in Monsanto, and for the pesticide industry in general, GM agriculture was sold as a boon (although the crops performance and sales don't seem to have rewarded the industry as much as they initially projected). For farmers and consumers, though, there are many risks, and a few certain and dire consequences. First, GM agriculture consolidates control of the agriculture in the hands of a few corporations. This is killing family farms, preventing farmers from storing and experimenting with seeds as they have done since the dawn of agriculture, and shrugs off the accumulated knowledge of thousands of generations of people who work on the land. Second, there are many environmental and human health concerns that have yet to be addressed because independent science has been stifled and government agencies haven't the funds to conduct their own investigations. In short, we don't know what the full effects of introducing GM into our environment and food system will be, but the corporations that invented it are pushing us to do it anyway. Third, alternatives are being smothered. Studies by Food First and other organizations have consistently shown that small-scale family farm agriculture produces more of the things that people need to live—fuel, food, medicines and shelter—than industrial agriculture's monoculture model. But small-scale farming can't compete with the subsidies and other favors being granted by the US government to Monsanto and other agribusinesses. The death of these alternatives, and the rural livelihoods that go with them, are the most certain casualties of GM agriculture.

### *3. Should consumers and farmers have a choice between GM and non-GM maize?*

Here's a thought experiment: imagine if people with headaches were offered a choice between Tylenol and a new wonder-pill marked 'X'. We know nothing about the wonder-pill other than what the manufacturers tell us. Sales of these pills are high—there's a big marketing drive behind them. But increasing numbers of people who buy the pill report even bigger headaches. Not only that, but people *near* people taking pill 'X' are also reporting headaches. Should we allow folk to choose between Tylenol (or a host of other perfectly good painkillers) and brand 'X'? Clearly not. In the case of GM and non-GM maize, the situation is similar. We just don't know enough about GM food, or about its long-term environmental and human health impact to be able to certify it safe for people to choose. Legal questions about who bears the costs of cross-contamination remain unanswered by

the USDA. And there are many alternatives to GM crops available today. Until we know more, there should be a moratorium on GM maize. Until there is a moratorium, people ought to know what they're consuming. Every other food in the US is labeled to the hilt to help facilitate consumer choice. More than 90 percent of US consumers said in a recent survey, that they'd like to have their food labeled. If GE is as safe as the industry claims it is, why is the industry so concerned to suppress labeling?

### *4. Do you see genetic engineering of crops to be different than traditional plant breeding?*

Overwhelmingly, the independent scientific community sees genetic engineering as profoundly different from traditional plant breeding. With these new technologies come new unknowns—we don't know which genes are turned on or off, we don't fully know what the long-term effects these manipulations will be, and the transfer of genes between different plant and animal kingdoms is without scientific precedent. Shooting fish genes into strawberries just isn't the same as regular breeding. Reasonable doubts still fill the scientific journals about GE technology and one wonders why Monsanto would have been granted so many patents on GE were it not fundamentally new and different.

### *5. In terms of the impact on the environment, do GM food crops pose any different threats to biodiversity than conventional agriculture?*

The honest answer is "we don't know," but it's looking increasingly like it does. There have been few studies on the environmental impact of GM crops. In the UK, three crops were compared to conventional industrial agriculture, and two, canola and soy, were found to be far worse for biodiversity than conventional agriculture. None of these crops was compared to organic agriculture, which depends on high levels of biodiversity for success. If we're genuinely concerned about the environment and biodiversity, then perhaps we ought to be looking at ways to support agroecological agriculture, rather than trying to tweak the already-harmful industrial agricultural model.

### *6. Does GM maize pose a particular threat to centres of genetic diversity such as Mexico?*

When US researchers found genetic contamination in Mexico, their report was savaged by Monsanto and researchers allied to it. Since then, a number of independent studies have further shown that the researchers were correct—there has been genetic contamination in Mexico. The particular threat comes from not knowing what, exactly, is being inter-bred with existing corn in these areas. There's no remedy for the farmers who've suffered yield losses as a result of this crossbreeding. And, as a recent USDA study has shown, there's no known way of undoing this damage.

### *7. Is there more scientific work to be done on the consequences of GM maize or is it just now a matter of regulation?*

There remains a great deal of scientific work to be done. The long-term human impacts have never independently been assessed. Recent independent trials by the British government have been the first steps on the road to independent assessment of GM crops, and already two out of the three crops tested failed to measure up to claims of modest environmental improvement compared to industrial agriculture. Indeed, studies carried out in the past three years are increasing our understanding of the effects of GM crops. The non–industry-funded studies have shown decreasing profits and increased pesticide use, and the emergence of superweeds is a key worry for US farmers using these technologies. We've only just started to do the science. European governments have realized this. Governmentis in developing countries, in the main, have recognized this. Yet the US government spends far less on testing than it does on promoting these crops.

### *8. What is the most interesting fact about maize you know that isn't common knowledge?*

US maize farmers' backs are up against the wall, and GM maize is part of the problem. While US corn growers are losing over US$20 per acre on all varieties of corn, they're

losing an average of US$3.26 more per acre on Bt corn than on conventional varieties, according to an Iowa State University study. In other words, US farmers are poor, and GM maize is making them poorer.

### *9. Whose responsibility is it to educate the public about GM food?*

The government has already paid for a great deal of the background research into genetic modification. It will pay for the cleanup of GM spills, just as it cleans up the residue of pesticide and chemical industries' mistakes from the past (Monsanto is the company that brought us Agent Orange). It seems reasonable that the government would educate the public and independently fund the science for GM food. Yet this Department of Agriculture, staffed in high-level positions by lobbyists for the food industry, seems ready to shirk the responsibility, passing it on to future generations. Many scientists at the USDA, EPA and FDA want an open debate about GMOs, along the lines of the one held in the UK. The government needs to act as a disinterested third party, and at the moment it is a hostage to corporate interests.

### *10. Please complete the following sentence, "When it's all said and done, the court of public opinion will…*

…see GM food as part of the problem, rather than part of the solution in the war on hunger—the reason people go hungry is that they're poor, and nothing in GM food addresses this central problem."

## Robert B. Horsch, Vice President of Product and Technology Cooperation, Monsanto Company

### *1. Why do we have GM maize?*

Maize is one of the most important agricultural crops on earth, with the capacity for very high rates of photosynthesis—turning sunlight, $CO_2$ and soil nutrients into food. Genetic improvements in maize have a huge contribution to human welfare and human economies around the world. Genetic modification for insect resistance and weed control, using the tools of biotechnology, has built on this tremendous progress of plant breeding to add even more value to the crop. This added value—higher yield of maize per acre of land, per gallon of water, per pound of fertilizer, per hour of labor, per ounce of pesticide used—is shared between consumers, growers, seed companies and the environment. Farmers have increased their use of GM maize each year, from growing fewer than one million acres when it was introduced in 1997 to over 38 million acres in 2003, and now representing 11 percent of global maize acreage. In 2002, GM maize was planted on 20 million acres in the US, and researchers estimated it provided over US$180 million increased productivity and reduced pesticide use by over 8 million pounds of active ingredient.

The GM traits in maize today eliminate the need to spray insecticides for control of pests and enable better control of yield-robbing weeds while replacing other herbicides that are more acutely toxic, persistent in the environment and which can exceed safety thresholds in surface water in agricultural areas. Herbicide tolerance, mostly to the herbicide glyphosate, permits more effective and lower-cost weed control. In addition, glyphosate tolerance combines well with no-till soil management practices and is credited with stimulating a new surge of no-till adoption by farmers. No-till is equally useful to large mechanized farmers who use special equipment to plant hundreds of acres and to smallholder farmers who plant by hand. No-till maize is expanding around the world, providing soil, water and wildlife conservation benefits. Insect-resistant maize is the focus of Clive James global transgenic crop review for 2002, which provides a great compilation of local uses and benefits for this trait in maize around the world. One target pest, the rootworm, infests 20 million acres in the US, requiring more pesticide application than any other pest of maize. Pesticide costs and losses from damage total more than a billion dollars per year. Globally, insects cause the loss of about 52 million metric tons of maize, worth US$5.7 billion, despite the spraying of more than US$500 million worth of insecticides. Biotech solves this problem better, cheaper and without persistent, toxic pesticides.

## *2. From your perspective, what are the benefits and risks inherent to GM agriculture?*

The benefits of GM agriculture include increased income for small- and large-scale farms, higher production of food and feed, reduced dependence on pesticide sprays, less detrimental impacts on the environment, and a pipeline of traits for more nutritious foods and higher productivity under stressful conditions such as drought. These benefits are inherent to specific genes and the proteins they encode—not to biotechnology generally. In like fashion, potential risks are inherent to specific genes and the traits they convey in their new home. For this reason, while there is a comprehensive battery of tests that all engineered genes are subject to, the answers are case-specific. Each new GM trait in each crop goes through extensive testing and analysis by regulatory authorities prior to commercial use. The safety of current biotech crops that have been planted on nearly 750 million acres since 1996 has been confirmed by international scientific bodies, regulatory authorities and health and environmental experts around the world.

Agriculture more generally has a number of inherent risks and benefits, which have profoundly changed society and the environment. The risks of agriculture include the areas of food safety, land use and habitat destruction, water use and water pollution, and pesticide impacts. Biotechnology applications in use today reduce these risks from agriculture in measurable ways. There have been almost no measurable risks discovered for biotechnology applications, but there is the possibility of case-specific risks associated with a new gene, a new protein, or the gene transfer process. For that reason, each new application of biotechnology receives extensive scrutiny on a case-by-case basis before any new biotech product can be approved. These potential risks that are carefully assessed include the digestibility, toxicity and allergenicity of the new protein, the properties of the gene itself, and the possibility of unintended changes to the crop during the gene transfer process.

The characteristics of the crop are also assessed for changes to its capacity to become an invasive weed on farms or in nature, or for outcrossing to wild relatives that might be detrimental.

The few cases of possible risks being discovered during research and development have been dealt with either by stopping work with that particular gene or by further analysis of the possibility for actual harm to occur. The Bt protein that controls ECB in maize is also toxic to Monarch butterfly larvae, if they are forced to eat enough of it. But extensive study has shown that the exposure of the larvae to the protein is so low that it does not cause significant actual harm. This much-publicized case is a good example of the risk of being distracted from real problems. At the same time that the media was filled by claims of "risks" to monarchs from Bt maize, their overwintering habitat in Mexico was under severe threat of destruction from logging and other human encroachment. Fortunately, the Packard Foundation realized the real risk to the monarchs and stepped in to secure the last few remaining acres of over wintering habitat.

## *3. Should consumers and farmers have a choice between GM and non-GM maize?*

Yes on both questions. The issue isn't if there should be choice, but rather how that choice is presented. In the US, information about a product is given on the label because the FDA requires it or because it food marketers add it to attract customers. In the first case, anything that impacts the composition, nutritional value or wholesomeness of foods or that carries a specific risk for any category of people, must be labeled according to established FDA rules. In the second case, companies are allowed to voluntarily list information on the label to inform customers about the product or how it is made (like organic foods). Any information on the label must be verifiable and not mislead consumers. Organic foods do not have to be labeled as organic, but they must meet a set of verifiable standards before they may be voluntarily labeled as organic. For GM or non-GM foods, as with organic foods that do not change the nutritional content or the safety profile of the foods, voluntary labels seem appropriate and are available and in use where market demand supports them today. For GM foods that do change the nutritional content or the safety profile, mandatory labeling is already in effect—there just have not been any such products introduced.

Farmers in the US and Canada have a choice to purchase both GM and non-GM seeds of maize. But in Mexico, maize growers currently are not allowed this choice since no GM varieties of maize have been approved for planting in Mexico. However, Mexican authorities have authorized the import of GM commodities from the US or other countries for use in food and feed products.

## *4. Do you see genetic engineering of crops to be different than traditional plant breeding?*

The process is different but the result is very similar. Genetic engineering uses a different method of changing the genetic make-up of a crop, and can add characteristics from other species that would not be possible through traditional cross breeding. This is the source of both its power and the reason for regulatory control of the process. But the types of GM traits in commercial use today are not different from existing types of traits already in the crop. Breeders have been selecting for and identifying insect resistance and herbicide tolerance and many other traits as well—many more kinds of traits than currently conferred with engineered genes.

There have been substantial changes in breeding methods this past century that most people are not aware of. For example, the use of mutagens, both chemicals and radiation, to induce genetic changes has been commonplace for decades and the genetic changes so caused are present in thousands of crop varieties, including varieties used to produce organic foods. In addition, laboratory techniques have made it possible to cross distantly related species so that useful traits found in wild species can be added to improve the productivity or quality of modern crops.

Tomatos and wheat are good examples of crops where wide-crosses assisted with laboratory techniques are in common use. Home gardeners may recognize the letters VFNT on tomato seed packages, referring to genes that confer resistance to verticillium, fusarium, nematodes and tobacco mosaic virus. These and dozens of other genes, and large amounts of the surrounding chromosomes, were introduced into tomato varieties from wild non-food species related to tomato. These new genetic traits may be used in organic production, but unlike the products of genetic engineering, these new traits and the new genes and proteins that are associated with them are not subject to regulatory scrutiny or comprehensive safety testing.

## *5. In terms of the impact on the environment, do GM food crops pose any threat to biodiversity different than conventional agriculture?*

The major threats to biodiversity are loss of habitat, competition from invasive species, excessive hunting and gathering, and impacts of fertilizer, pesticide and soil run-off. Agriculture figures prominently in most of these: it is the major user of land and water, fertilizer, pesticides and a major cause of soil erosion. Agricultural trade and other practices have been responsible for some of the problems with invasive species. On the other hand, agriculture has greatly reduced the pressure of hunting and gathering and provided some tools for controlling invasive species. And increases in agricultural productivity have reduced the pressure to take more land away from natural habitat. In the US, millions of acres of marginal farmland have been returned to nature, with a great benefit to wildlife.

The GM crops grown last year by about 7 million farmers on 167 million acres in 18 countries reduced the actual impact of growing those crops compared to conventional agricultural, resulting in a net benefit to biodiversity and the environment. Of course, the possibility of risk to biodiversity from some possible applications of biotechnology is reason for regulatory scrutiny and careful stewardship. The areas of biggest concern include the possibility of increasing invasiveness of a crop or a wild relative, or potential toxicity of a pest control trait to non-targeted species. Fortunately, these are well-understood hazards and readily assessed and avoided prior to commercial use. Since the threat, and actual harm, to biodiversity from conventional agriculture is high, it makes sense to look for ways to use biotechnology to reduce this.

## *6. Does GM maize pose a particular threat to centers of genetic diversity such as Mexico?*

No, if used wisely, GM maize could help to protect genetic diversity. At a recent meeting on this topic in Mexico City, many speakers concluded that there are risks of loss of genetic diversity of maize and its ancestor species, teosinte, in Mexico—but not from biotechnology. Teosinte, and many other species, are at risk via loss of habitat where they grow or live in nature. This habitat loss is from human expansion of agriculture, roads, housing and other human uses of land. Increases in demand for maize could further threaten wildlife habitat, if low yielding varieties are grown to fill that demand. But higher yielding varieties, including varieties improved with biotechnology, could reduce this threat. In the US, use of high yielding varieties and efficient management practices have permitted conservation programs to remove land from cultivation and return it to habitat for wildlife.

The maize land races in Mexico have been evolving and changing ever since they first originated several thousand years ago. They represent one important source of genetic diversity for Mexico and the rest of the world. Threats to this diversity come primarily from their poor yield and competition from new, better varieties than anything in current use from biotechnology. In an important way this is a social question—should the resource-poor smallholders in Mexico who grow and thus preserve the land races today be forced to continue doing this by denying them better choices, including biotechnology, or is there another solution, like seed banks and cultural preserves. In other words, can Mexico, especially the resource-poor smallholders, preserve the cultural and genetic wealth that the land races of maize represent and still also enjoy the nutritional and economic wealth that the rest of the world is reaping from improved, high-yielding hybrids of maize?

### *7. Is there more scientific work to be done on the consequences of GM maize or is it just now a matter of regulation?*

There is always more scientific work to be done, and always will be. That is an unending part of the scientific process and part of ongoing regulation. Since the "consequences of GM maize" are dependent on the nature of the trait, not on the mere fact that GM techniques were used, the question must be answered on a case-by-case basis. The key question today is whether we know enough today to wisely and safely use the few GM traits that have been developed to date. The answer to that question has been “yes” from dozens of regulatory and scientific bodies around world and from almost a decade of safe and effective actual use on nearly 750 million acres.

### *8. What is the most interesting fact about maize you know that isn't common knowledge?*

Maize is not a natural species and cannot survive in nature on its own. It is most likely a variant of teosinte that can only survive with the help of humans who gather the cobs, shell the seeds and plant them deliberately. One major theory suggests that the ear was derived from a progenitor tassel that gained several important new features, including the ability to hold hundreds of kernels in a tight package, making harvest and storage easy while also allowing simple processing, consumption and re-planting.

### *9. Whose responsibility is it to educate the public about GM food?*

We all have a role to play. There is a place for the adversarial pro and con debates. That ensures that adequate scrutiny is given to issues and that there is enough imagination and investigation brought into consideration. It is an antidote to complacency and apathy. But even more important is the need for sound judgment, good science and policy that permits change and progress when the evidence supports it. In published remarks last fall, author Michael Crichton declared that, "the greatest challenge facing mankind is the challenge of distinguishing reality from fantasy, truth from propaganda." He goes on to point out, among other things, the very real benefits to people's lives that science and technology have delivered in the past century.

### *10. Please complete the following sentence, "When it's all said and done, the court of public opinion will…*

…weigh the benefits of this and other new technologies against the possibility of risks and our ability to manage the technologies wisely and then turn its attention to the tasks of helping people improve their lives and protecting our environment from the real threats we face.”