Multinational Monitor

SEP/OCT 2008
VOL 29 No. 2

FEATURES:

INTERVIEWS:

Biotech Snake Oil: A Quack Cure for Hunger

by Bill Freese

Rising global food prices reached a flash point this spring, sparking food riots in over a dozen countries. Mexican tortillas have quadrupled in price; Haiti's prime minister was ousted amid rice riots; African countries were especially hard hit. According to the World Bank, global food prices have risen a shocking 83 percent over the past three years. And for the world's poor, high prices mean hunger.

The global food crisis has many causes, but according to the biotechnology industry, there's a simple solution — genetically modified, or biotech, crops. Biotech multinationals have been in media blitz mode ever since the food crisis first made headlines, touting miracle crops that will purportedly increase yields, tolerate droughts, grow in saline soils, and be chockfull of nutrients, to boot.

"If we are to achieve the Millennium Development Goals of cutting hunger and poverty in half by 2015," says Clive James, founder of the International Service for the Acquisition of Agri-biotech Applications (ISAAA), an organization whose funders include all the major biotech companies, "biotech crops must play an even bigger role in the next decade."

Not everyone is convinced. In fact, the UN and World Bank recently completed an unprecedentedly broad scientific assessment of world agriculture, the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), which concluded that biotech crops have very little potential to alleviate poverty and hunger. This four-year effort, which engaged some 400 experts from multiple disciplines, originally included industry representatives. Just three months before the final report was released, however, Monsanto, Syngenta and chemical giant BASF pulled out of the process, miffed by the poor marks given their favorite technology. This withdrawal upset even the industry-friendly journal Nature, which chided the companies in an editorial entitled, "Deserting the Hungry?"

Serving The Wealthy

Genetic engineering involves the laboratory-based transfer of DNA derived from bacteria, viruses or virtually any living organism into plants to endow them with a desired trait. As implemented by biotechnology firms, critics say genetic engineering has trod the well-worn path of previous innovations of industrial agriculture — serving wealthier farmers growing commodity crops in huge monocultures by saving labor through the use of expensive inputs.

Biotech proponents insist genetically modified (GM) seeds are delivering results for farmers. "Already in its first 12 years, this technology has made a significant impact by lifting the incomes of farmers," says James.

But genetically modified crops are heavily concentrated in a handful of countries with industrialized, export-oriented agricultural sectors. Nearly 90 percent of biotech acres in 2007 were found in just six countries of North and South America, with the United States, Argentina and Brazil accounting for 80 percent. For most other countries,

DEPARTMENTS:

including India and China, biotech crops account for 3 percent or less of total harvested crop area.

Commercialized GM crops are confined to soybeans, corn, cotton and canola. Soybeans and corn predominate, and are used mainly to feed animals or fuel cars in rich nations. For instance, Argentina and Brazil export the great majority of their soybeans as livestock feed, mainly to Europe and Japan, while more than three fourths of the U.S. corn crop is either fed to animals or used to generate ethanol for automobiles. Expanding soybean monocultures in South America are displacing small farmers, who grow food crops for local consumption, and thus contribute to food insecurity, especially in Argentina and Paraguay. The only other commercial GM crops are papaya and squash, both grown on miniscule acreage.

Most revealing, however, is what the biotech industry has engineered these crops for. Hype and promises of future innovations notwithstanding, there is not a single commercial GM crop with increased yield, drought-tolerance, salt-tolerance, enhanced nutrition or other attractive-sounding traits touted by the industry. Disease-resistant GM crops are practically non-existent.

“We have yet to see genetically modified food that is cheaper, more nutritious or tastes better,” says Hope Shand, research director for the Ontario-based ETC Group. “Biotech seeds have not been shown to be scientifically or socially useful.”

The industry’s own figures reveal that GM crops incorporate one or both of just two “traits” — herbicide tolerance and insect resistance. Insect-resistant cotton and corn produce their own “built-in” insecticide to protect against certain, but far from all, insect pests. Herbicide-tolerant crops are engineered to withstand direct application of an herbicide to kill nearby weeds. These crops predominate, with 82 percent of global biotech crop acreage.

Herbicide-tolerant crops (mainly soybeans) are popular with larger farmers because they simplify and reduce labor needs for weed control. They have thus helped facilitate the worldwide trend of consolidating farmland into fewer, ever bigger farms, like Argentina’s huge soybean plantations. According to a 2004 study by Charles Benbrook, former executive director of the Board on Agriculture of the National Academy of Sciences, herbicide-tolerant crops have also led to a substantial increase in pesticide use. Benbrook’s study found that adoption of herbicide-tolerant crops in the United States increased weed-killer use by 138 million pounds from 1996 to 2004 (while insect-resistant crops reduced insecticide use by just 16 million pounds over the same period).

The vast majority of herbicide-tolerant crops are Monsanto’s “Roundup Ready” varieties, tolerant to the herbicide glyphosate, which is sold under the brand-name Roundup. The dramatic rise in glyphosate use associated with Roundup Ready crops has spawned an epidemic of glyphosate-resistant weeds, just as bacteria evolve resistance to an overused antibiotic. Farmers respond to resistant weeds by upping the dose of glyphosate and by using greater quantities of other herbicides, such as the probable carcinogen 2,4-D (a component of Agent Orange) and the endocrine-disrupting weed killer atrazine, recently banned in the European Union. Glyphosate-resistant weeds and rising herbicide use are becoming serious problems in the United States, Argentina and Brazil.

“Roundup continues to be the cornerstone of weed management for farms today and provides a lot of value to farmers,” responds Darren Wallis, a Monsanto spokesperson. “We have some online tools to help farmers manage any weed control issues that they might have. There have been some documented cases of weed resistance, but Roundup continues to control hundreds of weeds very effectively.”

Critics retort that resistant weeds are spreading despite Monsanto’s efforts, and that a technology often promoted as moving agriculture beyond the era of chemicals has in

fact increased chemical dependency and accelerated the pesticide treadmill of industrial agriculture. And, of course, expensive inputs like herbicides (the price of glyphosate has doubled over the past year) are beyond the means of most poor farmers.

What about yield and profitability? The most widely cultivated biotech crop, Roundup Ready soybeans, actually suffers from a 5-10 percent lower yield versus conventional varieties, according to a University of Nebraska study, due to both adverse effects of glyphosate on the soybean's nutrient uptakes, as well as unintended effects of the genetic engineering process used to create the plant. Unintended, yield-lowering effects are a serious though little-acknowledged technical obstacle of genetic engineering, and are one of several factors foiling efforts to develop viable GM crops with drought-tolerance, disease-resistance and other traits.

Monsanto says yield problems occurred only in the first year Roundup Ready soy was introduced, and that initial problems have been cured. "The first year we came out with Roundup Ready soybeans, there was a slight yield drag, but we improved the [seed] in subsequent years," says Brad Mitchell, Monsanto spokesperson.

Critics dispute this assertion, citing a 2007 study by Kansas State University which found that Roundup Ready soybean yields continue to lag behind those of conventional varieties.

Clive James of ISAAA points to the Asian experience with GM cotton, where he says small farmers are benefiting from biotech. More than 7 million farmers — representing some of the poorest in China — are seeing yields rise by 10 percent and pesticide use decline by half, he says. Farmer income is rising by approximately $220 a year, according to James.

But reviews of the Asian experience with GM cotton suggest that yield benefits are due more to good weather and other factors, not the use of biotech crops, and that GM cotton engineered for the shorter growing season in the U.S. sometimes fails to ward off targeted pests in India's longer growing season. It is true that insect resistant crops can reduce yield losses when infestation with targeted pests is severe. However, because cotton is afflicted with so many pests not killed by the built-in insecticide, biotech cotton farmers in India, China and elsewhere often apply as much chemical insecticide as growers of conventional cotton. But because they have paid up to four times as much for the biotech seed as they would for conventional seed, they often end up falling deeper into debt. Debt is an overriding problem among small farmers in developing countries, and any policies or technologies that deepen farmer debt have drastic consequences. Each year, hundreds of cotton farmers in India alone commit suicide from despair over insurmountable debts.

Even the U.S. Department of Agriculture (USDA) has found no economic benefit to farmers from growing GM crops in most situations.

Seed Servitude

The agricultural biotechnology industry represents an historic merger of two distinct sectors — agrichemicals and seeds. In the 1990s, the world's largest pesticide makers — companies like Monsanto, DuPont, Bayer and Syngenta — began buying up the world's seed firms. These four biotech giants now control 41 percent of the world's commercial seed supply. Two factors drove this buying spree: the new technology of genetic engineering and the issuance of the first patents on seeds in the 1980s. Biotech firms saw that they could employ genetic engineering to develop herbicide-tolerant crops to exploit "synergies" between their seed and pesticide divisions. Seed patents enable owners to exert monopoly control over seeds, in part by enabling biotech firms to prevent farmers from saving seeds.

While patents on biotech seeds normally apply to inserted genes (or methods for

introducing the gene), courts have interpreted these "gene patents" as granting biotech/seed firms comprehensive rights to the seeds that contain them. One consequence is that a farmer can be held liable for patent infringement even if the patented gene/plant appears in his fields through no fault of his own (e.g. cross-pollination or seed dispersal). Another consequence is that farmers can be sued for patent infringement — as well as for infringing sales contracts — if they save and replant seeds from their harvest, so-called "second-generation" seeds.

In the United States, industry leader Monsanto has pursued thousands of farmers for allegedly saving and replanting its patented Roundup Ready soybean seeds. An analysis by the Center for Food Safety documented court-imposed payments of more than $21 million from farmers to Monsanto for alleged patent infringement. However, when one includes the much greater number of pre-trial settlements, the total jumps to more than $85 million, collected from several thousand farmers.

Spurred on by the biotech multinationals, the U.S. and European governments are pressuring developing nations to adopt similar gene and seed patenting laws. This effort is being pursued through the World Trade Organization, which requires member nations to establish patent-style regimes for plants, as well as through bilateral trade agreements. Since an estimated 80 percent to 90 percent of seeds planted in poorer nations are produced on-farm (that is, they are saved from previous crops), the revenue to be gained from elimination of seed-saving in connection with the introduction of GM crops is considerable — conservatively estimated at tens of billions of dollars. If biotech/seed firms have their way, what farmer advocates call the "seed servitude" of U.S. farmers could soon become a global condition.

Biotech firms also have so-called Terminator and Traitor technologies waiting in the wings. Terminator is a genetic manipulation that renders harvested seed sterile, and represents a biological means to achieve the same end as patents: elimination of seed-saving. Traitor technology is similar, except that the second-generation seed sterility can be reversed upon application of a proprietary chemical. In this scenario, farmers would be allowed to save seed, but would have to purchase and apply a chemical to bring them back to life. While international outrage has thus far blocked deployment of Terminator, Monsanto recently purchased the seed company (Delta and Pine Land) that holds several major patents on the technology (together with the USDA). And while Monsanto has "pledged" not to deploy Terminator, the pledge is revocable at any time.

As the biotech multinationals tighten their stranglehold on the world's seed supply, farmers' choices are diminishing, and high-quality conventional seeds are rapidly disappearing from the marketplace. Biotech seeds presently cost two- to four-times as much as conventional varieties, or more. The price ratchets up with each new "trait" that is introduced. Seeds with one trait were once the norm, but are rapidly being replaced with two- and three-trait versions. As Monsanto put it in a presentation to investors, its overriding goal is "trait penetration" and investment in "penetration of higher-[profit-]margin traits." Monsanto and Dow recently announced plans to introduce GM corn with eight different traits (six insecticides and tolerance to two different herbicides). Farmers who want more affordable conventional seed, or even biotech seed with just one or two traits, may soon be out of luck. As University of Kentucky agronomist Chad Lee puts it: "The cost of corn seed keeps getting higher and there doesn't appear to be a stopping point in sight." While "trait penetration" is now chiefly a U.S. phenomenon, it is likely to be pursued throughout the world wherever GM crops become prevalent.

The Many Uses of Biotechnology

The tremendous hype surrounding biotech crops as a response to the food crisis does serve at least two purposes: as a "carrot" to persuade developing nations to adopt strict patent-style regimes for plants; and to divert attention from the underlying causes of the food crisis.

In 1991, the U.S. government and Monsanto funded development of a genetically modified virus-resistant sweet potato in collaboration with the Kenyan Agricultural Research Institute. Thirteen years later, the $6 million project was pronounced a dismal failure — the GM sweet potato did not resist the targeted virus, and yields were poor. However, it did help foster an atmosphere enabling introduction of other GM crops, and likely helped persuade Kenyan legislators to pass the Industrial Property Act in 2001, which according to patent expert Robert Lettington "may actually place very little restriction on the patenting of life forms at all." While the Kenyan project failed, a conventional breeding program in neighboring Uganda successfully bred a high-yielding, virus-resistant sweet potato in just a few years at a fraction of the cost. Many other biotech crop projects have also failed, including GM potatoes and tomatoes in Egypt, and GM corn and cotton in Indonesia.

Biotech mania has also diverted attention from the underlying social causes of the food crisis, which include diversion of food crops to make biofuels, and "trade liberalization" policies that have crippled developing country agriculture and made these nations dependent on subsidized surpluses from rich nations. "The structural causes" of the food crisis, says Anuradha Mittal, executive director of the Oakland Institute, "lie in policies of international financial institutions over the last 20 to 30 years, which have made developing countries so vulnerable in the first place." International Monetary Fund (IMF) and World Bank policies, she says, "eroded state and international investment in agriculture," as well as farmer support mechanisms such as state grain marketing agencies and subsidized agricultural services.

The IMF and World Bank also "promoted cash crops instead of domestic production of food for domestic consumption. All of those policies have basically removed the principle of self-sufficiency. At the same time, you have had the lowering of tariffs which has resulted in the dumping of cheap, subsidized commodities from rich countries. With all of those policies, you find an erosion of the agricultural base of developing countries and their ability to feed themselves," says Mittal.

Eliminating agricultural self-sufficiency was an explicit objective of rich-country policies. As Reagan's agriculture secretary John Block expressed it with uncharacteristic candor in 1986: "The idea that developing countries should feed themselves is an anachronism from a bygone era. They could better ensure their food security by relying on U.S. agricultural products, which are available in most cases at lower cost."

The global food crisis underscores the bankruptcy of such policies. The flood of subsidized U.S. corn into Mexico facilitated by NAFTA has thrown at least 1.3 million Mexican farmers out of work. Haiti and the Philippines, once nearly self-sufficient in rice production, are now among the world's largest rice importers. Africa, a net food exporter in the 1960s, now imports 25 percent of its food. With the sharp rise in international grain prices, the reduced ability of poor nations to feed themselves presages increased hunger and poverty for many years to come. In fact, the food crisis recently prompted University of Minnesota food experts C. Ford Runge and Benjamin Senauer to double their projection of the number of the world's hungry by the year 2025, from 625 million to 1.2 billion. The UN-World Bank IAASTD report advocates "food sovereignty," defined as "the right of peoples and sovereign states to democratically determine their own agriculture and food policies."

True Solutions

Another IAASTD recommendation is promotion of agroecological farming techniques suited to small farmers. Ever since the Green Revolution, the agricultural development establishment has focused primarily on high-tech crop breeding and expensive inputs (e.g. fertilizers, pesticides and "improved seeds"). These input-centered schemes offer potential market opportunities to multinational agribusinesses, but have generally favored wealthier growers over small farmers. In

contrast, agroecology minimizes inputs, and relies instead on innovative cultivation and pest control practices to increase food production. A 2001 review of 200 developing country agricultural projects involving a switch to agroecological techniques, conducted by University of Essex researchers, found an average yield gain of 93 percent.

Control of insect pests through the introduction of natural predators has also achieved enormous success at low cost in Africa. One striking example is the introduction of insect predators to control a devastating cassava pest, which averted mass hunger in Africa in the 1980s and 1990s. A new dryland rice farming technique called the System of Rice Intensification dramatically increases yield, and is spreading rapidly in rice-growing nations, despite dismissal by the agricultural development establishment. Besides being low cost, agro-ecological techniques typically benefit smaller farmers.

GM Reality Check

The tremendous hype surrounding biotechnology has obscured some basic facts. Most GM crops feed animals or fuel cars in rich nations; are engineered for use with expensive weed killers to save labor; and are grown by larger farmers in industrial monocultures for export.

"GM crops have nothing to do with feeding hungry people and nothing to do with sustainability," says Shand. "With the consolidation of the seed industry, seed companies' primary objective is to increase profits by restricting farmers' reliance on saved seeds."

Bill Freese is science policy analyst at the Washington, D.C.-based Center for Food Safety, a nonprofit group that supports sustainable agriculture and opposes harmful food production technologies.