Slate

GREEN ROOM

The Green Monster

Could Frankenfoods be good for the environment?

By James E. McWilliams

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I'm sitting at my desk examining a $10.95 jar of South River Miso. The stuff is delicious, marked by a light, lemony tang. The packaging, by contrast, is a heavy-handed assurance of purity. The company is eager to tell me that the product I've purchased is certified organic, aged for three weeks in wood (sustainably harvested?), unpasteurized, made with "deep well water," handcrafted, and—the designation that most piques my interest—*GMO free*.

GMO refers to "genetically modified organisms." A genetically modified crop results from the laboratory insertion of a gene from one organism into the DNA sequence of another in order to confer an advantageous trait such as insect resistance, drought tolerance, or herbicide resistance. Today almost 90 percent of soy crops and 80 percent of corn crops in the United States sprout from genetically engineered seeds. Forty-five million acres of land worldwide contain genetically engineered crops. From the perspective of commercial agriculture, the technology has been seamlessly assimilated into traditional farming routines.

From the perspective of my miso jar, however, it's evident that not all consumers share the enthusiasm. It's as likely as not that you know GMOs by their stock term of derision: *Frankenfoods*. The moniker reflects a broad spectrum of concerns: Some anti-biotech activists argue that these organisms will contaminate their wild cousins with GM pollen and drive native plants extinct. Others suggest that they will foster the growth of "superweeds"—plants that develop a resistance to the herbicides many GMOs are engineered to tolerate. And yet others fear that genetic alterations will trigger allergic reactions in unsuspecting consumers. Whether or not these concerns collectively warrant a ban on GMOs—as many (most?) environmentalists would like to see—is a hotly debated topic. The upshot to these potential pitfalls, however, is beyond dispute: A lot of people find this technology to be creepy.

Whatever the specific cause of discontent over GM crops, popular resistance came to a head in 2000, when the National Organic Program solicited public input on the issue of whether they should be included. In response, sustainable-food activists deluged officials with a rainforest's worth of letters—275,000, to be exact—beating the measure into oblivion. Today, in the same spirit, environmentalists instinctively deem GMOs the antithesis of environmental responsibility.

Many scientists, and even a few organic farmers, now believe the 2000 rejection was a fatal rush to judgment. Most recently, Pamela Ronald, a plant pathologist and chair of the Plant Genomics Program at the University of California-Davis, has declared herself one such critic. In *Tomorrow's Table: Organic Farming, Genetics, and the Future of Food*, she argues that we should, in fact, be actively merging genetic engineering and organic farming to achieve a sustainable future for food production. Her research —which she conducts alongside her husband, an organic farmer—explores genetically engineered crops that, instead of serving the rapacity of agribusiness, foster the fundamentals of sustainability. Their endeavor, counterintuitive as it seems, points to an emerging green biotech frontier—a hidden realm of opportunity to feed the world's impending 9 billion a diet produced in an environmentally responsible way.

To appreciate how "responsible genetic modification" isn't an oxymoron, consider grass-fed beef. Cows that eat grass are commonly touted as the sustainable alternative to feedlot beef, a resource-intensive form of production that stuffs cows with a steady diet of grain fortified with antibiotics, growth hormones, steroids, and appetite enhancers that eventually pass through the animals into the soil and water. One overlooked drawback to grass-fed beef, however, is the fact that grass-fed cows emit four times more methane—a greenhouse gas that's more than 20 times as powerful as carbon dioxide—as regular, feedlot cows. That's because grass contains lignin, a substance that triggers a cow's digestive system to secrete a methane-producing enzyme. An Australian biotech company called Gramina has recently produced a genetically modified grass with lower amounts of lignin. Lower amounts of lignin mean less methane, less methane means curbed global warming emissions, and curbed emissions means environmentalists can eat their beef without hanging up their green stripes.

Another area where sustainable agriculture and genetic modification could productively overlap involves nitrogen fertilizer. A plant's failure to absorb all the nutrients from the fertilizer leads to the harmful accumulation of nitrogen in the soil. From there it leaches into rivers and oceans to precipitate dead zones so choked with algae that other marine life collapses. In light of this problem, Syngenta and other biotech companies are in the process of genetically engineering crops such as potatoes, rice, and wheat to improve their nitrogen uptake efficiency in an effort to diminish the negative consequences of nitrogen fertilization. Early results suggest that rice farmers in Southeast Asia and potato farmers in Africa might one day have the option of planting crops that mitigate the harmful effects of this long-vilified source of agricultural pollution.

Animals, of course, are just as modifiable as plants. Livestock farmers have been genetically tinkering with their beasts for centuries through the hit-or-miss process of selective breeding. They've done so to enhance their animals' health, increase their weight, and refine their fat content. Breeding animals to reduce environmental impact, however, hasn't been a viable option with the clunky techniques of conventional breeding. But such is not the case with genetic engineering.

Case in point: Canadian scientists have recently pioneered the "enviropig," a genetically modified porker altered to diminish the notoriously high phosphorous level of pig manure by 60 percent. Like nitrogen, phosphorous runoff is a serious pollutant with widespread downstream consequences. But with the relatively basic insertion of a gene (from E. coli bacteria) that produces a digestive enzyme called phytase, scientists have provided farmers with yet another tool for lessening their heavy impact on the environment.

When commercial farmers hear about GM grass, increased nitrogen uptake, and cleaner pigs, they're excited. And when they hear about other products in the works—genetically modified sugar beets that require less water and have higher yields than cane sugar; a dust made from genetically modified ferns to remove heavy metals from the soil; genetically modified and *edible* cotton seeds that require minimal pesticide use—they're also excited. And they're excited not only because these products have the potential to streamline production, but also because GM technology allows them to play a meaningful role in reducing their carbon footprint.

However, with the exception of the modified sugar beets, the GMOs mentioned in this article are not currently on the market. The cutting-room floors of research laboratories all over the world, in fact, are littered with successful examples of genetically engineered products that have enormous potential to further the goals of sustainable agriculture. Demand for these products remains high among farmers—it almost always does—but food producers fear the bad publicity that might come from anti-GMO invective.

Given the potential of these products to reduce the environmental impact of farming, it's ironic that traditional advocates for sustainable agriculture have led a successful campaign to blacklist GMOs irrespective of their applications. At the very least, they might treat them as legitimate ethical and scientific matters deserving of a fair public hearing. Such a hearing, I would venture, would not only please farmers who were truly concerned about sustainability, but it would provide the rest of us—those of us who do not grow food for the world but only think about it—a more accurate source of scientific information than the back of a miso jar.

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