FOOD: WHAT TO EAT. WHAT NOT TO EAT.

THE FOUR BARRIERS TO THE GENETICALLY MODIFIED—FOOD REVOLUTION—AND WHY NO ONE IS TALKING ABOUT THEM.

By Paul Roberts
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Could this be the turning point for genetically modified food? As food prices have soared around the world, agro-industry companies like Monsanto and Syngenta, along with their allies in Washington, have been carefully positioning GM technology as our last, best hope against a global food catastrophe. Since traditional crop-breeding methods aren't keeping up with soaring food demand, they argue, we have no choice but to re-engineer our crops at the molecular level to give bigger yields.

Appealing as this argument sounds, it misses the real obstacles facing GM. Yes, traditional crop science is struggling. And yes, rising food prices might help consumers and lawmakers overcome their fears about GM's safety (especially as some of those concerns are overblown). But neither change will alter the fact that GM crop technology itself isn't ready to save the world. Despite GM's potential, the technology faces substantial technical and economic barriers before it will spark a second green revolution—barriers that aren't being discussed in the newly energized debate over genetically modified food.

For starters, for all the talk of saving the world from hunger, the GM industry isn't focusing on crops that are truly relevant to global food security. Today, most GM research targets big Western cash crops: Two of the best-selling GM products are corn and soybeans engineered to tolerate the popular herbicide Roundup. But these high-tech seeds are designed for large-scale, mechanized farmers in North and South America and are of no use to the billions of developing-world farmers who make up three-quarters of the global-farming work force—but without whom lasting global food security can't be achieved.

Genetically modified corn in Illinois
By contrast, relatively little GM investment is going into the crops that do matter to poor farmers—cassava, sorghum, millet, pigeon pea, chickpea, and groundnut. These crops are more nutritionally balanced than corn or soybeans and are far better suited to the local soils and often-tough climates of poor nations. Yet, because poor farmers can’t afford high-tech seeds, GM companies have little incentive to invest research dollars to improve “marginal” crops. Instead, they focus on the money makers: According to the U.N.’s Food and Agriculture Organization, just four commercial crops—corn, soybeans, canola, and cotton—account for 85 percent of all GM crops planted worldwide.

GM companies also aren’t being honest about what this technology can do—and what it can’t. In the rush to exploit the current crisis, the industry routinely promises to re-engineer crops to give massive yields—Monsanto has vowed to double grain yields by 2030—or to grow with less water or to thrive in degraded soils. But delivering on such promises will be much harder than is currently acknowledged. Whereas making corn tolerate Roundup required the manipulation of just one gene, boosting yield is vastly more complex, says Kendall Lamkey, a crop-breeding expert who chairs Iowa State University’s Department of Agronomy. Yield is the expression of a plant’s reproductive success, and reproduction takes nearly all of a plant’s survival “skills,” from its capacity to cope with temperature changes to its resistance to bugs. In other words, says Lamkey, to boost yields through genetic modification, GM companies must manipulate thousands of genes—and so far, they’ve had limited success.

In fact, many breeding experts believe that the fastest way to boost yields isn’t by engineering new seeds but by exploiting the untapped potential of existing seeds. As Lamkey points out, the yields for corn and soybeans on America’s top-performing farms are more than double the national average for those same crops. (In 2007, the top soybean farmer produced 154 bushels per acre, compared with the national average of around 41 bushels.) That means there is considerable room for improvement before these seeds are maxed out. These “top producers” aren’t using different seeds; instead, they’re benefiting from better soils, using better farming practices, and applying lots of water, fertilizer, and other chemicals—factors that GM technology won’t influence anyway.

To be fair, GM technologists may eventually master the
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The complexity of yield—but not without spending lots of money and lots of time; Monsanto says it will need at least two decades for its big yield boosts. That means the world has little hope for quick relief—and that GM companies have little hope for a quick return on their investment. Thus, for all the hype about using GM to solve the current crisis, or to end hunger generally, the industry will be financially inclined to focus on simpler projects with faster payoffs, such as new varieties of commercial crops bred to tolerate herbicides and pesticides.

Even if GM companies do manage to improve crops that truly matter for food security, these miracle seeds won't help if they're not accessible to poor farmers. That means companies must either price seeds cheaply enough for farmers to buy each year or stop objecting when poor farmers save and reuse the seeds the following year. Today, Monsanto and other seed companies object strenuously to seed saving, which they call "seed piracy" and which they claim deprives them of profits. Yet seed saving is central to food security for the billions of farmers too poor to buy new seeds every season. More to the point, while pirated profits are a real issue among wealthy Western farmers, it's a bogus concern in the developing world, where poor farmers were never going to buy new seeds—and certainly not expensive GM seeds—every year anyway.

In fact, many critics believe the GM industry's objections to seed saving have less to do with lost profits in the developing world than with the industry's long-term goal of owning, literally, the seed sector. When seeds are conventionally bred, breeders don't own them—anyone can use or improve the seeds. But genetic modification allows a company to claim property rights over a particular DNA blueprint and to charge a licensing fee for each and every copy—much as Microsoft now claims an interest in each and every copy of Windows. By relaxing its proprietary zeal and allowing seeds in the developing world to be "open source," the GM industry could do much to bolster claims that it is really trying to help poor farmers.

Finally, if the industry wants public support, it can no longer dismiss public concerns about the risks of GM crops—health risks for humans but also the ecological risk that GM crops will escape farms and contaminate the wilderness. True, some concerns are overblown. Ecological contamination, or "gene flow," is a real threat only when pollen from a GM crop in a farm field finds a nearby wild relative; in the United States, most commercial crops such as corn or soybeans don't have any wild relatives. But gene flow is a possible concern in places like Chile, where commercial potatoes do have wild relatives. Human health risks are even less clear-cut. Though we've yet to see credible reports of GM foods causing human health problems, we've also not had the benefit of credible long-term health studies.

Until such studies have been completed, the GM industry needs to stop regarding a skeptical public as a nuisance. And even if GM technology is shown to be safe, the industry needs to accept that many consumers may still choose not to eat genetically modified foods. That means no more lawsuits against food companies that market their food as "GM free." That also means no more lobbying against laws requiring that foods with GM ingredients be labeled as such. Consumers have a right to know what's in their food.
What would the industry get in return for such good behavior? Money, for one. Whatever one thinks of the GM industry, it's hardly fair to force private companies to make products for farmers so poor they can't pay. Once upon a time, breeding new crops for poor farmers was inseparable from the West's larger food-aid strategy and was managed—and financed—largely by governments. (Indeed, most of the green revolution miracle crops from the 1960s were bred by government- and foundation-backed researchers.) Since then, much of the public-sector breeding enterprise has been dismantled (partly at the behest of the seed industry, which was tired of competing with public agencies), leaving a massive gap in our system for developing critical new crops.

GM companies say they (and their technologies) offer the best means of closing that gap. But it's hard to see why these companies would invest heavily in regionally appropriate, but potentially unprofitable, crops. Rather, what's more likely is that the industry will use the promise of a solution to the food crisis to press for more regulatory flexibility and more consumer acceptance—and then use that freedom to keep making the same big-money cash crops they always have.

We shouldn't be shocked by such pragmatism. Seed companies, like any company, are in business to make money. But our policy toward GM companies should be no less pragmatic. If we want private companies to take on what is essentially a public job—helping farmers too poor to participate in the market economy—we're going to have to pay them to do it. So let's make a deal: In return for targeting vital regional and local crops, and for making the seeds accessible to poor farmers, GM companies will get hefty subsidies for research and development of these crops.

Would such a deal be enough to ignite a gene revolution? If the main obstacle to GM miracles is lack of financial and political support, as the industry argues, then such a deal could be the catalyst for serious innovation. But if, as many critics believe, the real obstacle here is that GM technology simply isn't all that its proponents claim, that the real challenges of food insecurity—degraded soils, political instability, lack of water, and soaring energy costs—are beyond the reach of a single technology, that, too, would quickly become clear. In either case, by reframing the GM debate as a challenge to do the revolution right, we can encourage a more constructive conversation about the real role that this technology might play in the future of food security.
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alleged conspiracy by Pioneer Hi-Bred and Monsanto to fix prices on genetically engineered corn and soybean seeds. William Saletan noted that the United States approved incorporating human genes into rice crops.

Paul Roberts is a journalist specializing in resource economics. His latest book, The End of Food, was published in June.

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