GMO vs. Organic

FEBRUARY 27, 2017 BY BRIAN BARTH

COMMENTS

Could they learn to work together? A growing population—and a changing climate—may demand it.

Pamela Ronald and Raoul Adamchak are an unconventional couple. He's an organic farmer; she develops genetically engineered crops. Sometimes the discussion among their friends and colleagues at dinner parties turns tense. After all, organic farming types and advocates of genetic engineering have been shouting each other down since the first GMO crops were planted in a northern California field in 1987. Anti-GMO activists have been known to rip crops out of the ground in protest—and worse. And Monsanto, the biggest purveyor of GM seeds in the world, is not exactly known for playing nice.

But Adamchak, who runs the organic student farm at the University of California–Davis, and Ronald, a prominent genetic researcher on campus, see no fundamental conflict between the two approaches to feeding the world. In fact, they argue that genetic engineering and organic methods are natural allies in the quest to feed a global population—expected to swell to over 9 billion by 2050—in a sustainable way. In 2008, they wrote a manifesto for that vision, "Tomorrow's Table: Organic Farming, Genetics, and the Future of Food."

The premise, explains Ronald, is that the tools of genetic engineering can be applied toward many of the goals of organic agriculture—reducing pesticide use, for example, and raising crops that are healthier, and more resistant to disease. Some GM crops already do this. For example, the vast majority of corn and cotton grown in the United States has been engineered to include the genes of Bacillus thuringiensis, a tiny microbe also known as Bt, which organic farmers have used for decades as a natural insecticide. As a result, insecticide use on cotton has dropped 56 percent since genetically modified Bt crops were introduced; on cornfields, it's declined 90 percent.

While there are benefits to pesticide-resistant GMOs, anti-GMO activists often point to herbicide-tolerant GMOs, the other major category of GM crops, which have led to a vast increase in the use of Roundup, a weed killer produced by Monsanto, which is indeed an environmental travesty, if not a public health risk. Drenching rural America in Roundup has led to so-called "superweeds," which have developed immunity to the herbicide. This in turn has led Monsanto to develop crops that are resistant to older, more noxious herbicides like dicamba and 2,4-D, which pose a far greater threat to the environment than Roundup. But ultimately, increased herbicide use is not a problem with GMO technology *per se*, it's a problem with how they are used.

Another valid concern of the activist camp: the extreme consolidation of crop technology in the hands of a few multinational corporations. Unlike the traditional "heirloom" seed varieties often planted by organic farmers, most GMO are seeds are covered by patents that prevent farmers from saving the seed and planting it the following year. Not only do they have to buy new seed each year, but in the case of Monsanto's Roundup Ready line of seeds, farmers are incentivized to purchase the Monsanto herbicide for use on the crop.

Many anti-GMO activists also promulgate the idea that GM foods, just by virtue of the technology used to create them, are unsafe to eat. Thirty years ago when they were first developed, this fear was not irrational; certainly an abundance of caution was in order for a technology that tinkers with the building blocks of life. But to date, not a single case of illness or compromised health connected to GM foods has been documented. In 2016, the National Academies of Sciences, Engineering and Medicine issued a report reaffirming that GM foods pose no health risks to humans, just the latest in a string of such statements from leading scientific institutions in recent years. Yet the GMO debate, in all its vitriol, is alive as ever.

Ronald says the key to dismantling misconstrued notions of "good" and "bad" in the wide world of genetic engineering is to be specific: X crop has X beneficial trait; Y crop has Y negative trait. Unfortunately, the average consumer views GMO as a single monolithic entity, which couldn't be further from the truth.

"When you break it down for people and explain that you can't generalize about GMOs, that every crop is different, that really advances the discussion," Ronald says. "The most important thing is to try to advance sustainable agriculture, and not be distracted by a false debate over genetic techniques, which we know are safe."

To imagine a future in which organic farming methods and genetic engineering might work hand-in-hand, it's helpful to first understand the current lay of land of these two approaches to agriculture.

In 2015, about 175 million acres of U.S. farmland was planted in GM crops. That's nearly 20 percent of the 912 million acres of farmland in the U.S. (the percentage is much higher if you don't count the vast acreage devoted to grazing). Organic production is a tiny niche by comparison: less than one percent of farmland is certified organic. Even though some studies have suggested that organic methods applied to all of the world's farmland could potentially feed the expanding global population, it's a long road from where we are now to get there.

The vast majority of GMO acreage is in commodity crops like corn, soybeans, cotton, and canola, much of which is used for animal feed, biofuel production, industrial products, and in the case of cotton, for fiber. There are a number of GM fruits and vegetables, including papayas, apples, potatoes, and squash, but the acreages are tiny. It's fair to say that there are far more acres of organic fruits and vegetables for human consumption planted in the U.S. than GM varieties. (Growler readers might take note that many commercial beers contain GMO ingredients, mainly in the form of corn-based additives, like dextrose; though this is not typically the case with craft beers).

Economics are largely what drives these trends. Commodity crops are a massive industry compared to fruits and vegetables, so there has been greater motivation for biotechnology companies to invest research dollars in that arena. Likewise, consumers generally don't like the idea of GM lettuce and carrots in their salad mix, urging produce farmers further in the direction of organics. While organic acreage remains less than one percent, organic food sales have risen rapidly in recent years to about five percent of total food sales in the U.S., indicating that domestic demand far outstrips supply.

In theory, genetic engineering could make a valuable contribution to sustainable agriculture. Some plant diseases are virtually impossible to control with natural methods, for example, so a resistant GM variety could allow these crops to be produced without chemical fumigation. A new blight-resistant potato, for example, recently approved for commercial use by the USDA, is expected to reduce fungicide use by 25 to 45 percent. If organic growers, who don't use fungicide and have few options for dealing with potato blight, were to plant these spuds, yields would likely improve.

GMOs are currently banned under organic standards, however, and most consumers would balk at the idea of genetically-engineered organic potatoes. Yet with traditional breeding techniques—the kind that are allowed under organic standards—plant breeders have struggled for decades to develop blight-resistant crop varieties (a host of food plants besides potatoes are susceptible to similarly insidious pathogens). Thus organic growers must accept lower yields for a dubious rationale.

Adamchak had this to say on the subject when I interviewed him in 2016:

"In California, you can grow tomatoes without fungicides, because the climate is so dry. But in New York [you have] to spray […] organic tomatoes every week, 20 times a season, with a copper compound in order to get a crop. Copper sprays are permitted under organic standards, but there are [toxicity] issues with them. If you had varieties that were resistant to early blight, late blight, and other fungal diseases, organic growers would reduce their costs, improve their product and would not have to spray copper."

There are many other GM crops under development with traits organic growers would likely appreciate were it not for the stigma, some for their pest and disease resistance and some for their adaptability to a changing climate, such as drought-tolerant corn and wheat. Much maligned biotech companies like Monsanto are behind some of these research efforts, but many others are being carried out by NGOs and public universities, such as the Drought Tolerant Maize for Africa initiative.

Similarly, scientists at Cornell University are using genetic engineering to breed sterile diamondback moths, a major pest of broccoli, cabbage, and other brassica crops. As the sterile moths begin to breed with native diamondback moths, the population rapidly declines, cutting back on the need to use insecticides. Conventional farmers are also learning to integrate the techniques of organic agriculture with their GM crops. The insect resistance of Bt crops, for example, declines when they are planted in the same place over and over, so conventional growers are increasingly using crop rotation, a standard practice in the organic playbook. And rather than rely exclusively on chemical fertilizers, more and more conventional growers are turning to soil-enriching cover crops to replace lost nutrients.

Conventional agriculture has a history of depleting the soil and polluting waterways with contaminated runoff. But there is a growing recognition that such practices are not sustainable—short term yields may be higher with conventional methods, but organic methods may hold the key to maintaining high levels of productivity indefinitely into the future. Neither system is likely to succeed on its own.

Perhaps the moral of the GMO saga is that we need to start seeing the trees for the forest and acknowledge the ways crop biotechnology can be beneficial, while continuing to condemn its current harmful applications. Rather than let the technology remain a cash cow for a few multinational corporations, by encouraging non-commercial genetic engineering research that is aligned with the principles of organic farming, perhaps there is hope for a more resilient food system that could feed the world sustainably.

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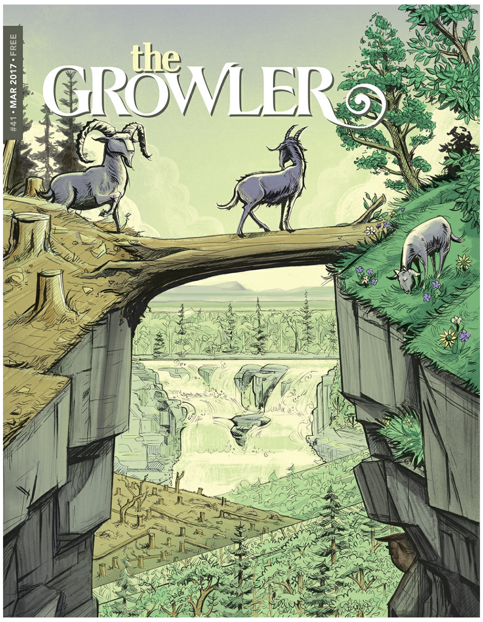

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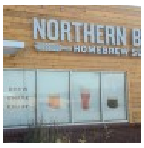

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