Medium

Zombie GMO Myths

Some widespread notions about GMOs — especially that they are "needed to feed a growing world" — are wrong and simply refuse to die.

Strawberries from my garden. Photograph by Jonathan Foley © 2014.

Jonathan Foley Apr 17, 2018 ·

It **never fails**. Every few months, someone — usually a reporter — emails, asking me to talk about genetically engineered organisms (GMOs)*. And they almost always ask the same few questions.

Sadly, these questions are the usual "GMO Zombie Myths" — put into circulation by big agricultural interests and their allies — that just won't die.

Before I dive into them, I should state here, for the record, that I am neither "for" or "against" GMOs. To me, they are simply a new kind of technology, and technology can be used poorly or wisely.

My concern about GMOs is that they are being used *very* poorly right now, and without larger social and environmental consequences in mind. Plus, their use is largely driven by profit, which makes me nervous. And even the more enlightened proponents of GMOs still seem to overlook to the longer-term environmental, economic, and social impacts of this technology.

With that in mind, here are my responses to the zombie GMO questions I get asked all the time.

DON'T WE NEED GMOS TO FEED A GROWING WORLD?

Industrial agriculture and biotech interests have built entire campaigns saying that we "need" genetically engineered organisms to "feed the

world" as we head towards 9 billion people and a "doubling of global food demand".

But it's just not true, despite all of the effort and money put into having us believe it.

First of all, the notion that global food demand will double by mid-century, because we the world's population is moving towards 9 billion people, should be viewed very skeptically.

Let's be clear: The world's growing population is *not* the primary reason agricultural demands are increasing. Look at the math. We currently have 7.4 billion people on the planet, and if we head towards 9 billion people (a ~22% increase in population) — all else being equal — the world would need about 22% more food. (Actually, it would be *less*, because most of the world's population growth is happening in countries that eat less rich diets than the global average.) That's nowhere near the "doubling" of global food demand that you often hear about.

The *real* reason food demand is projected to go up is not due to population growth, but rather to *assumptions about changes in the world's diet*. This "worst case scenario" basically assumes that everyone in the world will shift towards an American-style, meat-heavy diet, with enormous levels of food waste, as they get richer. But that doesn't need to happen. In fact, there are many reasons to suggest it won't.

We need to challenge this notion. Population growth is *not* driving massive increases in food demand; it's assumptions about the world shifting to a wasteful, inefficient, unhealthy diet. Surely that's not something we want, and have to accept by default?

Second, there is the claim that GMOs are "needed" to meet this projected demand. But, even if you think we need a major boost in global food production (and I don't), that's not clear either.

Most of the GMOs in use today aren't even primary food crops that feed the world — like rice, wheat, roots and tubers, pulses, and fruits and vegetables. Instead, most of the world's GMO farm fields are growing things like feed corn (not sweet corn that we eat, but *feed corn* that is used for making animal feed, high-fructose corn syrup, and corn ethanol), soybeans (mainly for animal feed), cotton, and canola. Sure, some of this *eventually* ends up as food — like beef and dairy products — but only a tiny fraction of it, as most of it lost in the very inefficient (usually ~10%) conversion of plant calories to animal calories, or lost altogether by making ethanol and other non-food items.

Bottom line: Very few of the GMO crops in use today are feeding the world's poor; instead, they are crops used in the world's wealthier countries, mainly to fatten animals, make unnecessary biofuels and food additives, or make cheap clothing. To be fair, there some interesting efforts to grow other GMO crops, targeting food crops used in developing countries — but they have been extremely slow to materialize, and have little money behind them.

If GMOs really were going to "feed the world," we would have been growing GMO crops poor people *actually* eat. But where's the profit in that?

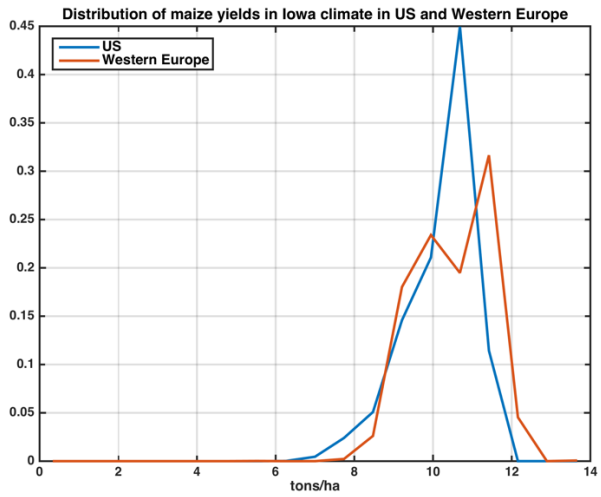
Moreover, there is the common claim that GMOs dramatically increase crop yields. That's not very clear either. Sure, in many experimental plots and field trials, GMOs do seem to help crops get higher yield — mainly be reducing losses from weeds and insects — but this doesn't always happen.

Why? We have to remember that GMOs in the field today are *not* revolutionizing the biology of plant growth or photosynthesis; they are simply replacing one kind of insect- or weed-control with another. Mostly, they have made crops taste

nasty to bugs (Bt corn, for example) or make them resistant to industrial chemicals (glyphosate-resistant crops) that kill weeds, which should make it easier, cheaper, and more profitable for industrial-scale farms to manage their weed and insect problems.

However, despite the fact that experimental plots typically show that GMO crops end up with somewhat higher yields, this sometimes doesn't translate to a real world impact.

For example, the observed, real-world GMO corn yields across the Midwestern United States (the heart of the biggest GMO corn belt on Earth) are *almost identical* to that of similar, non-GMO corn growing regions in Western Europe.



Observed yields (using five years of county-by-county data, from 2008–2012) for corn across the central United States (where GMO corn dominates) and district-by-district corn yield data from climatically-comparable regions of Western Europe (where GMOs are largely absent). This is essentially comparing real-world yields (not experimental plots) from Iowa and Illinois with regions in Western Europe (mostly France and the Netherlands) with the same climatic conditions — within the same range of rainfall and growing degree days. Data and graph courtesy of Jamie Gerber, University of Minnesota.

This comparison looks at the yields of farms across the center of the US corn belt (using five years of county-by-county data) and compares them to distrtict-by-district yield data from regions of Western Europe (which, outside of Spain, do not grow much GMO corn) with identical climatic conditions. While *experimental* plots do often show some differences in yields due to the use of GMOs, at the end of the day, any boost in *real-world* yields are lost in the noise of the larger global food system.

This comparison is a simple-minded one, to be sure. It's a bit of an "apples-to-oranges" comparison of looking at corn yields in the U.S. and Europe. And I acknowledge that, on carefully-controlled experimental plots, GM crops can often give higher yields. But my larger point is this: *If GMO crops are so much more productive, than why don't we see any difference between the world's major corn growing regions — where one is dominated by GMO corn (the U.S.) and others are not?*

The answer is simple: GMO corns doesn't have that big an impact in the *real world* — as opposed to small experimental test plots — where other factors like soil management, real-world pest control techniques, and farmer behavior can make up for the differences.

Again, to be fair, some crops can show significant yield increases from using GMOs. And *in theory* — as shown by carefully-controled experimental field trials — you can for corn too. But for *real-world* corn, the largest GMO crop in the United States, you don't see much of an actual difference. Otherwise, you'd see it in the global food production data between GMO and non-GMO corn-growing regions of the world. And you don't.

Overall, it's pretty clear that GMOs *don't* "feed the world" today. They are not growing food that the poor and hungry of the world eat. Instead, they are mainly used for *non-food* commodities, like animal feed, biofuels, and fiber. Plus, they don't boost yields very much, at least for some crops, in the real-world food system. What they do is make the industrial production of major commodities more profitable.

So what would *really* make a difference to our food system, if GMOs aren't delivering?

If you *really* wanted to feed the world, you'd tackle the *bigger* issues — namely food waste (where 20–40% of the world's food is lost between the farmer's field and the dinner plate, and is *never* eaten), wasteful diets (especially in the U.S. and Europe, where we eat more red meat than is probably healthy for us or the planet), and feedlot animal agriculture (where we turn precious food crops in animal feed).

Even modest gains in reducing food waste, shifting diets away from wasteful practices, and replacing feedlot agriculture with grazing systems would offer *dramatically* more opportunities to feed the world — and reduce the environmental impacts of agriculture — than GMOs will. That's where we should focus more attention.

DON'T GMOS HELP THE ENVIRONMENT?

I also get asked about the purported environmental benefits of GMOs, especially claims that they use fewer chemical inputs, can improve the soil, reduce greenhouse gas emissions, and so on.

To me, the long-term environmental benefits of GMO crops, and their "bundled" pesticide cousins, are dubious — especially as we seem to having an overall *increase* in chemical use.

Sure, in the *short-term,* one can claim that GMO crops might reduce the application of pesticides, or shift them to supposedly more benign chemicals. But for all of the touted-benefits, there are always longer-term problems — namely from the "rebound effect" of weeds, insects, and other pests adapting to the GMO-friendly pesticides. Roundup-resistant weeds, for example. And pesticide-resistant insects. And that might be leading to an overall increase in chemical use.

Moreover, there are *always* side effects to using these bundled GMO-pesticide systems at such large scales. The loss of native plants on the edges of farmers fields, and the subsequent impact on native insects, birds, and other wildlife is an obvious issue. Plus, there are the potential effects of using *any* biocide too much in the environment, and the potential impacts on soil microorganisms and biodiversity — which are still poorly understood.

The real problem is that large-scale industrial monocultures are simply a bad idea — for the food system, for the environment, and for us long-term. And GMOs, bundled with specialized pesticides and other chemical treatments, perpetuate the long-term problems of monoculture farming. It's like a giant treadmill, where we are in a race between GMO+pesticide development and nature's ability to adapt to our chemicals, with new, resistant weeds and bugs. And nature typically wins.

In the long run, there are better ways to farm, producing real food with less environmental damage. And we would be wise to focus on those instead.

WHAT ELSE IS THERE? CAN OTHER FARMING TECHNIQUES FEED THE WORLD?

Most of the world's food today isn't grown with GMOs at all. On an acreage basis, nearly 90% of the world's cropland is not in GM crops, and in

terms of actual *food* eaten by humanity, even more of it is non-GMO. So we obviously can — and do — feed the world without GM crops. And we probably always will.

What *really* feeds the world today is a combination of conventional agriculture (still using chemicals and machines, but not GM seeds), subsistence agriculture (mostly in developing countries), and organic farms (which are growing fast, but are still a small part of the food system globally).

Looking forward, I think we will need new hybrids of organic and conventional agriculture, taking some of the best environmental and agricultural benefits of both, and bringing them to scale. But more importantly, we need to look at the larger food *system*, and realize that our diets and food waste are a *huge* part of the problem today — and they can be a big part of our future solutions too.

We need whole-food-system solutions, from the farmers field to our plates and stomachs. That's the way we can feed 9 billion, with true food security and nutrition, with far less environmental and social harm.

But, first, we need to dispel the myth that GMOs are "needed" to "feed the world". Because that's just not true, and is never going to be.

**Please don't be a smartypants and say, "Hey,* all *crops are genetically modified". Yes, yes, we have been selectively breeding plants for thousands of years. We all know that. But the term "GMOs" refers to the recent development of "gene splicing" and the development of transgenic crops, creating forms of life that nature, or selective breeding, could never have created.*

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NOTE: Edited on April 18th to clarify points, and to add a graph showing yields for GMO corn (in Iowa) versus non-GMO corn (in Western Europe).

NOTE: Edited again on April 21 to further clarify the yield discussion, and follow up on some helpful suggestions of Devang Mehta from ETH Zurich.

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