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Persistent narratives, persistent failures: Why GM crops do not—and will not—"feed the world"

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It has been almost two decades since genetically modified (GM; also called genetically engineered or GE) crops were first commercialized in North America, and anywhere from five to ten years since they have been grown in various countries in the Global South. Though short, their entire history has been a controversial one. In fact, debate about their potential environmental and health impacts, their predicted success in increasing yields and incomes, and the corporate control that accompanies them, was spirited even before the first GM crop was ever commercialized, and remains heated today.

The difference between the debates then and now, however, is that the past years have provided evidence of the performance and impacts of GM crops in the field. This evidence is increasingly showing that GM crops have not lived up to their promises, and have led to a host of negative impacts. Ironically, however, as these failures start to add up, the narrative that we *need* GM crops to "feed the world" and to address hunger seems to be getting stronger.

In this brief article, I outline the emergence of this persistent narrative, and the ways in which it obscures the many failures of GM crops. This dynamic is particularly important to examine at this moment in time, as the agbiotech industry is putting a vast amount of resources into developing and commercializing what it claims is a "second generation" of GM crops that are engineered to be specifically useful in combatting hunger and malnutrition. A deeper look at these "new" crops, however, reveals that they have a lot in common with currently commercialized GM crops, and, like the GM crops currently on the market, they do not promise to address the serious problems of food insecurity in a meaningful way.

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The emergence of a pro-poor narrative

> *"To turn a blind eye to 40,000 people starving to death every day is a moral outrage... We have an ethical commitment not to lose time in implementing transgenic technology."*
> - Klaus Leisinger, head of Novartis Foundation for Sustainable Development (quoted in Macilwain, 1999)

GM crops have often come cloaked in a strong pro-poor narrative. This framing, however, is not as old as the technology itself. The evolution of this framing is closely interwoven with the history of the corporate biotech sector, and with the biotech giant Monsanto in particular. Monsanto reacted to the backlash and regulatory restrictions against the chemical products that made up an important section of its business in the 1990s by investing large amounts of money in the research and development of GM crops that could withstand its own herbicide product, Roundup. These new crops were marketed largely to farmers in North America and Europe. However, when Europe closed its doors to GM crops in 1999, the agbiotech sector needed a new market for its expensive technology and a justification for the large sums of money that had already been spent on research (Glover, 2010). It found both by linking GM crops to existing, recognized and unavoidable global challenges—hunger, poverty, and environmental degradation. Over the next decade, Monsanto set up a number of programs in Asian and African countries, lobbied for regulatory approvals of GM crops and targeted small-scale farmers in the Global South. These activities all took place under the framing of helping poor farmers and "feeding the hungry".

That this shift was driven by commercial interests, however, and was based on a "market based model of technology diffusion" (Glover, 2005) is most obvious in former Monsanto CEO Robert Shapiro's own words, when he said, "It's difficult, in the short term, figuring out how I am going to make money dealing with people who don't have money. But in practice, the development of agriculture at a village level is something that could make an enormous amount of business sense over time" (quoted in Charles, 2001, p. 271).

The new rhetoric was not, however, accompanied by new technologies. Existing traits of herbicide tolerance and pest resistance, engineered largely into a handful of commodity crops comprise (to this day) a large majority of the GM crops on the market. These traits and crops are developed in the economic and ecological context of North America, and targeted to benefit large-scale industrial farming systems.

A strengthening narrative and shifting expertise

Although, as described above, the narrative that we need GM crops to combat hunger is by no means a new framing, it has been getting louder, and occasionally more aggressive, in recent years. Proponents of GM crops have recently gone so far as to accuse critics of being responsible for advocating for "the deaths of millions of children" (Storr, 2013) and being perpetrators of "crimes against humanity" (Moore, 2012).

This narrative has had a number of implications that have shaped the introduction of the technology and obscured the failures. First, it skews the discussion about GM crops away from the broader issues that accompany them and, importantly, excludes the voices of the farmers that are its subject. In presenting the introduction of GM crops with the "discursive high ground" (Kleinman & Kloppenburg, 1991) of addressing hunger and poverty, this narrative has obscured the many failures and negative impacts that GM crops have had in the past years, and portrayed critics as being "emotional", "unscientific", and hindering efforts to address hunger and malnutrition (Jansen & Gupta, 2009).

Second, this narrative situates the existing technology at the centre of the debate around GM crops, instead of the needs of the farmers it claims to be helping or the particularities of farming regions. In doing so, it has shifted farmers away from being experts, to being consumers of particular products, often products that they had to be "trained" to use. This plays out in the discussions about the usefulness and impacts of GM crops, as well as in the ways in which they are introduced and promoted on the ground.

To accompany its release of its GM insect-resistant (Bt) cotton in India, for instance, Monsanto launched an introductory initiative called the Small Holder Program (SHP). The company posted its employees in villages as "project officers" to offer free farming advice to local farmers and to "keep the farmer on track" (Glover, 2005). Along with depicting farmers as ignorant and uninformed, such programs made them passive receivers of knowledge, and further, passive consumers and users—a stark contrast from their more traditional roles as creators, innovators, "owners" of their technologies and knowledge, and in essence, experts in their own right.

The failures of GM crops

The evidence and experiences of GM crops in the field over the past 20 years point to a number of serious impacts and risks that present a compelling counter to the claim that GM crops are necessary or beneficial in addressing hunger and poverty. A small sampling of these is briefly outlined below.

The GM crops that are on the market today were not designed to address hunger or food insecurity. Four crops—corn, soy, canola and cotton—engineered with one or both of two traits – herbicide tolerance and insect resistance—account for over 99% of global GM acres (CBAN, 2015). All four have been developed for large-scale industrial farming systems and are used as cash crops for export, to produce fuel, or for processed food and animal feed. There are very few GM fruits and vegetables on the market, or GM grains that are used for direct human consumption.[1] These crops are clearly not designed to feed hungry people or tackle malnutrition anywhere in the world.

GM crops have not consistently increased yields or farmer incomes, or reduced pesticide use in North America or in the global South (Benbrook, 2012; Gurian-Sherman, 2009). In India, for instance, Bt cotton was introduced with the claim that it would reduce crop loss to pests such as the cotton bollworm, and in doing so would increase yields, but has not met up to its promises (CBAN, 2013). Farmers across the country have had varying success with the crop. Several noticed yields declining after the first years of cultivation, and those growing on marginal soils and in rain-fed conditions have experienced severe crop losses (Stone, 2012). Secondary pests moved into cotton fields when the bollworm population initially dropped, increasing the pesticides farmers had to apply to their fields. Soon after, the bollworm itself developed resistance to the Bt protein, and returned to cotton fields, stronger than before. In India, as in other countries, pesticide use has increased, farm expenses have gone up due to high seed prices, and when crops fail, small-scale farmers are pushed deeper into cycles of debt and poverty (CBAN, 2014b; CGMFI, 2012). Contamination incidents and the emergence of herbicide-resistant weeds further drive up farmers' costs.

These patterns are exacerbated by the fact that the control of the seed market by a handful of companies has meant that farmers are often unable to access non-GM seed. Far from increasing the choices available to farmers in the global South, the past years of GM crop cultivation have reduced the choices available to farmers while increasing the risks they face.

The "second generation"

Evaluating the past two decades of experiences with GM crops, and the persistence of the narrative that we need them to feed a growing and hungry population, is a particularly timely exercise at the moment, as the biotechnology industry is currently in the process of developing and promising to introduce a number of so-called "second generation" GM crops. These crops are being promoted as being distinctly different from existing GM crops in a few key ways. Since they are being engineered with traits that make them tolerant to environmental conditions such as floods and drought, or have altered nutritional contents, they claim to be directly targeting hunger and malnutrition. In some cases, (though they are for the most part being developed by and with the involvement of the same large firms), the crops come without some of the patents and licenses that have characterized GM crops so far.

While at first glance these crop descriptions seem to respond to some of the critiques that have been levelled at GM crops, a deeper look reveals that they share many of the fundamental characteristics of current GM crops, and in doing so, threaten to replicate their failures. These

[1] Small amounts of GM sugar beet (Canada, U.S.), alfalfa (U.S.), some squash varieties (U.S.) and papaya (U.S., China) are grown, but their acreages collectively account for less than 1% of worldwide GM acres.

similarities include the fact that these crops are not shaped to respond to existing knowledge in farming communities, are still being developed and often owned by a small handful of large corporations, and promise to perpetuate the serious environmental impacts GM crops have created so far. Perhaps most importantly, they do not go any further in addressing the root causes of hunger and malnutrition.

GM vitamin-A enriched "Golden Rice" is one example of this new generation of crops. The rice is engineered to synthesize beta-carotene, to help counter Vitamin-A deficiency (VAD). Despite hundreds of millions of dollars being poured into its research over the past 20 years, however, the crop is not yet ready for commercialization (AFP, 2013), has not been tested for bioavailability or human health impacts, and poses serious environmental risks (CBAN, 2014a). It is not certain that daily consumption of Golden Rice improves vitamin A levels of people with VAD (IRRI, 2013), and trials show that its yields may be lower than comparable local varieties (IRRI, 2014). Perhaps most importantly, it is both expensive and unnecessary. There are a number of existing solutions for VAD that are both cheaper and effective. Along with shorter-term solutions such as supplementation and food fortification (WHO, 2013), these include longer-term and more integrated strategies such as ensuring access to a healthy and diverse diet, which address multiple nutrient deficiencies simultaneously, strengthen food security, and can help supplement family sources of income.

Looking ahead

The wider industrial agriculture model that has given rise to GM crops, and that prescribes them as the solution to hunger, is one that places a small set of technologies at the heart of agricultural systems, instead of the situated agricultural knowledge of farmers. In doing so, it has replaced the ability of farming communities in many parts of the world to respond to change as experts of their own land, and environmental and cultural systems. It has instead made farmers passive actors whose role it is to purchase products and implement instructions. Importantly, when crops fail, as they have in the case of Bt cotton in India, farmers are blamed for improper cultivation and farm management. Future approaches to agricultural development, and those aiming to address hunger, need to reverse this pattern. Instead there is a need to focus on the needs of farming communities, and the knowledge they hold, in order to respond to a meaningful "demand pull", instead of being centred around a "technology push" (Levidow, 2009).

An evaluation of the past two decades of experiences with GM crops also presents an opportunity to reiterate the inherent flaws in the reductionist notion that technologies can be uncoupled from and solve complex socioeconomic problems such as structural inequality and poverty. This technological optimism separates the crops and seeds from the socio-economic, environmental and institutional factors that they are inherently embedded within, and that shape the overall wellbeing of agricultural and social systems. "Gene splicing," as Dominic Glover concludes in his analysis on the promotion and performance of Bt cotton in India, "is not intrinsically capable of surmounting obstacles like poor roads, inadequate rural credit systems and insufficient irrigation" (Glover, 2010). These broader factors have all been proven, time and time again, to greatly affect the success or failure of GM—or for that matter non-GM—crops (see for eg., CGMFI, 2012; Newell & Mackenzie, 2004; Qayum & Sakkhari, 2005).

As a new wave of GM crops is developed and promoted by agbiotech companies, it is critical to look past the narrative that these crops are "feeding the world" to uncover the impacts they have on the ground. Devoting important resources to these crops, releasing them into the environment and commercializing them can have serious consequences, especially for small-scale, poor farmers. Repeating the same technological formula can only be expected to replicate the same failures.

Further questions

There is a need for further research on a number of aspects of this discussion. While there are a few studies—including those mentioned in this paper—that have attempted to evaluate the success or failure of GM crops, there is a dearth of independent research that assesses this in various countries and conditions. The following questions are important to continue to explore: How successful have GM crops truly been in providing farmers in various regions in the global South better performances, lower environmental impacts and higher incomes, and how does this performance compare with non-GM alternatives? And, what are the various differences and similarities between existing and 2nd generation GM crops, and what are their implications?

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