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*by Simon Nicholson**

Introduction

Over recent months, sharply rising global food prices have increased chronic hunger, exacerbated poverty, and sparked political unrest around the world.[1] In the midst of this crisis a controversial agricultural technology has been receiving renewed attention: the genetic modification of food crops.[2] This renewed attention comes after a period of muted consolidation by the food biotechnology industry. The spread of genetically modified ("GM") foods has advanced steadily in recent years, but in the face of widespread public protest and other forms of political contestation in many countries, this has been taking place with little fanfare.[3]

Now, GM foods are once again in the headlines. Proponents of the technology have seized on the global food price crisis as evidence that we need wider acceptance of food biotechnology. In the process, we are seeing the recycling of arguments that were first rolled out with the commercial debut of GM foods in the mid 1990s.[4] We are being told now, as we were told then, that unless we wholeheartedly embrace the biotechnological manipulation of the global supply, there is no way that we will be able to feed an expanding human population without overstressing an increasingly fragile environment.[5] The argument, in other words, is that GM foods must be at the heart of the sustainable food systems of the future.[6]

What are we to make of this renewed call for the more widespread development and deployment of GM foods? In this article, I will make the case that GM foods in their current guise actually offer very little to help us overcome the current food crisis, and even less to help us with long-term hunger and poverty. In fact, by affording greater and greater power to fewer and fewer seed and chemical conglomerates, GM foods threaten to worsen our long-term food prospects. This is because GM foods further entrench the very political dynamics that are currently producing global hunger and a range of other food-related challenges. Our food systems must undergo revolutionary change if we are to eradicate hunger and ensure sustainability. Unfortunately, GM foods fail to offer this revolutionary change, but instead lead us further down our present, deeply problematic path.

Making Sense of the GM Foods Debate

There is no question that since the introduction of commercial GM food products in 1994, the food biotechnology industry has seen extraordinary growth.[7] The reach of GM crops has expanded rapidly to the extent that they now blanket more than 57 million hectares (140 million acres) of farmland in the United States alone,[8] with the result that between seventy and seventy-five percent of all processed foods now in U.S. supermarkets contain genetically engineered ingredients.[9] In 2007, worldwide plantings of GM foods covered as much as 114 million hectares (280 million acres), and GM crops were grown by an estimated 12 million farmers across twenty-three countries.[10] Regarding the area planted with GM crops and the number of farmers who are now using them, many claim that GM foods have been the most rapidly spread and adopted agricultural technology in all of human history.[11]

There is little question that GM foods are one of the most contentious and contested technologies to have been developed in recent times.

Nevertheless, the technology's spread has not been a smooth one. The concerns and actions of a diverse and committed worldwide network of opponents have greatly impacted the biotechnology industry's expansion plans.[12] Certainly, there is little question that GM foods are one of the most contentious and contested technologies to have been developed in recent times.[13] They have sparked protest in every place they have been introduced, and have proved a lightning rod for those with wider concerns about corporate control of the food supply and the harms associated with the practices of industrial agriculture.[14]

The debate over GM foods has been wide-ranging, built around several recurring themes and arguments. On one side of the debate, supporters claim that genetically modified plants produce, or have the potential to produce, higher crop yields while

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reducing the use of agricultural chemicals, making for more efficient and more environmentally-friendly farming.[15] In addition, proponents claim the technology will both provide more food for the world's hungry and increase on-farm profits by reducing the work that farmers need to perform.[16] With future generations of transgenic technologies, we are told we can expect foods with higher concentrations of micronutrients, crops that thrive in drought-stricken or saline-saturated soils, resistance to a wider range of damaging pests and diseases, plants that act as incubators and delivery systems for vaccines and other pharmaceutical products, and much more.[17]

Yet such claims and promises have done little to convince the anti-GM crowd. Some are opposed to this new technology on the grounds that its likely benefits have been inflated by the biotechnology industry and that its risks have been inadequately considered. These opponents are worried, in other words, that GM foods have already caused harm, or might prove to be harmful, to people or to the environment.[18] Others are concerned about the principles at stake in the production of these novel organisms, arguing that they are "unnatural" or "against God."[19] A third line of opposition focuses on the beneficiaries of GM technologies. These opponents suggest that expanded use of GM foods relies on deeply problematic assumptions about the causes of hunger and the plight of the environment, and claim that we should be wary of the further consolidation of power in industrial agriculture, and of the interests of the biotech companies that are pushing and patenting their creations.[20]

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The Debate's Technological Roots

At the root of this debate lie some vastly different understandings of technology. A simplistic reading of the debate pigeonholes it as a disagreement between "technophiles" and "technophobes."[21] Proponents of GM foods often cast themselves in the technophile role, as pro-technological problem solvers, striving to find real, practical solutions to the world's pressing agricultural challenges.[22] By contrast, those who raise questions about GM foods are pegged as anti-technological Luddites—"skeptics" who are intent on halting even the most beneficial uses of all new technologies.[23]

There is a grain of truth to this reading. Those who are strongly for the use of GM foods tend to be optimistic about the ability of new technologies to resolve complex problems, while those who argue against GM foods tend to be pessimistic about such claims.[24] However, this caricature of the debate, though widespread, actually obscures more than it reveals. This is because it would have us believe that there are only two technological paths open to us: either we wholeheartedly embrace our present technological trajectory, or we turn our backs on all technology and wander back into the Stone Age. In this sense, both the technophilic and technophobic positions are "deterministic"—they imagine technology in the driver's seat, and assume that we are simply mute passengers along for the ride.[25]

These two extreme options, though, are not our real alternatives at all. There are a wide range of possible technological futures available to us, beyond moving ever forward on our present track or turning our backs on all forms of technological progress. Those who argue against GM foods are not really railing against all technology; they are simply pointing out problems with *this* technology (or, more broadly, with the technological system of which GM foods are a part). And they are suggesting that rather than blindly accepting all technological innovations as right and good, we must develop more sophisticated forms of technological analysis.

Too often our technological trajectory and the impacts of particular technological developments go largely unquestioned. The most common way to think about technology is, after all, to give it very little thought at all. Most of us are guilty of what Langdon Winner once termed "technological somnambulism"[26]—we are content to sleepwalk our way through technological decision-making. Of course there is always some general stir when a truly remarkable new technology finds its way into the global marketplace or imagination, as we have seen with GM foods. Once we become accustomed to any new technology, however, it is apt to become naturalized and reified through its use, such that it becomes largely immune to interrogation. The remarkable soon becomes mundane in our fast-paced world.

In part, this is because the technologies in our lives are so ubiquitous, and by now we are so used to even sweeping technological change and upheaval, that only rarely is our collective attention held for any length of time. This also reflects the immense hold of the idea of "progress" and the technophilic orientation on contemporary social thought. By this view, technology is at the forefront of the quest for steady improvement of the human condition.[27] As such, we largely take it on faith that technology has a positive or, at least, benign influence on our lives (often despite mounting environmental and other evidence to the contrary). All of this leaves little scope for raising real questions about our technologies and for the creation of alternative technological directions, since, as Andrew Feenberg characterizes this position, we tend to believe that "technology's advance is the advance of the human species."[28]

Those arguing against GM foods are asking us to question these assumptions. They are pointing out, first of all, that the idea that all technologies must be essentially good or essentially bad is a myth without foundation. Rather than adopt the technophilic assumption that every new technology is a positive thing, we should instead understand that different technologies can

have different effects and implications. At the same time, the critics of GM foods are arguing that technological artifacts are not merely neutral tools. Moving away from food for a moment, take the old adage, a favorite of the National Rifle Association, that "guns don't kill people; people kill people." This entirely misses the fact that guns are designed with killing in mind, that the availability of guns gives power to some and takes it from others, and that their widespread availability makes purposeful and accidental death more likely. Another way to say this is that guns, like every other technology, have political and social effects built into their very fabric. GM foods are no different.

To look at a technology like a GM seed through the limited technophilia vs. technophobia debate ultimately does not get us very far. We are much better off considering and judging each technology within its social and historic context, as both a product and purveyor of politics. This means considering where a particular technology comes from, whom and what ends it benefits, and what kinds of social and ecological relations it produces or holds in place.

GM Foods and Global Hunger

For those who raise questions about GM foods, then, truly understanding this novel technology requires thinking about things like the context from which it has emerged, and the type of agricultural system that its use promotes. With this in mind, let us consider in more detail the arguments currently being made in favor of GM foods. Remember, we are being told that we need biotechnology to feed the world and slow the environmental degradation caused by mainstream industrial farming.[29] The implication is that the few multinational companies that largely control the development of GM seeds and the chemicals that they require are best situated to lead us out of our current predicament, and that hunger is at base a technical problem to be resolved by the deployment of technological fixes.[30]

In the wake of the recent food price increases, there are now more than 920 million people around the world who are chronically hungry.[31] The proximate causes of this recent spike in hunger are now well known, and can be recited briefly. In our highly industrialized global food system, crop prices are closely tied to oil prices, and with the price of a barrel of oil recently topping out at close to $150 per barrel, the fossil-fuel energy price surge has placed significant upward pressure on food costs.[32] Another factor contributing to high food prices has been the near-drought conditions seen in Australia and much of Europe over recent growing seasons.[33] These abnormal weather patterns have dramatically suppressed crop yields, particularly for wheat and rice.[34] Since commodity crops like these are now sold on global markets, a significant food production shortfall in one region has worldwide implications.[35]

At the same time, increased demand for meat in China and a handful of other rapidly expanding economies have driven up demand for grains, while the collapse of home equity markets in the United States and elsewhere has driven speculative capital into food commodities markets, inflating the value of food in futures exchanges.[36] Biofuels policies in Europe and the United States have also played a significant part in recent food price hikes by siphoning off increasing amounts of corn and other food crops for use in gas tanks.[37]

GM foods are supposed to help alleviate all of these pressures, principally by raising grain yields. If GM crops could consistently produce increased grain yields (itself a questionable assumption) then this would presumably help us overcome the relative food shortages produced by the drought, demand for meat, corn-hungry biofuels mandates, and other factors outlined above.[38]

However, there is a serious flaw in this argument. To imagine that hunger is a short-term problem, and to focus solely on technological responses to the proximate drivers of the recent food price crisis, is to miss a big part of the story. Hunger is hardly a new thing. Even in the few years before the 2008 price hikes, when food was cheap and the global food system was widely thought to be working effectively, there were an estimated 850 million chronically hungry people around the world.[39] This is something that tends to be lost and forgotten in current coverage of the food crisis. Yet try as we might to attribute conditions of hunger to short-term factors, this is clearly a long-term, structural problem.

People have been going hungry in recent years despite the fact that we have a food system that produces roughly two pounds of grain per person each day.[40] This is 3,000 kilocalories of food for each individual on the planet—more than enough to meet every person's energy requirements, even before we take into account all of the nuts, fruits, and vegetables that our food system also provides.[41] We live in a world of abundant food, yet millions go without adequate nutrition. How can this be?[42]

Here's the punch-line, and it's one that, thanks principally to the work of Amartya Sen, we have known for some time: in our age of abundance, hunger is ultimately not a function of a lack of food, but rather a function of a lack of *access* to food.[43] To push this argument further, framing hunger as something technical—to be resolved by the application of a simple technological fix—obscures the hidden workings of the global industrial food system, drawing our attention away from the means by which our food system operates to *produce* hunger. Through the dominant technophilic lens, we tend to view hunger as something short-term and inadvertent. This is a mistake. It makes more analytic sense to see hunger as something that is a *natural product of our organization of food production*.[44] When the food system produces hunger it is not failing, it is operating precisely as it has been developed to operate.

This is not to say that the people and organizations that have the most power in our contemporary food system go out of their way to create hunger and suffering. Yet in the push for profit and control that the industrial food system demands, some people win big and some people lose. The technologies we have developed to grow, process, package, and distribute food are a big part of why the food system now looks the way it does, and why its benefits accrue disproportionately to a shrinking number of large corporate actors. Certain Green Revolution technologies—combine harvesters, hybrid seeds, and chemical fertilizers

and pesticides, for instance—in combination with rich-country government policies and a range of other factors have helped to create our modern system of food production, and function now to hold it in place.[45] With these technologies and in this environment a few farmers in rich countries are now able to produce truly extraordinary quantities of food. And yet the style of farming it encourages has had tragic environmental, economic, and social consequences.[46] Intractable chronic hunger is but one product of this system—a product that GM foods can never hope to magically abolish.

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Viewing the food crisis through this lens raises big questions about the claim that spreading biotechnology will feed the hungry and spur development in the world's poorest regions. Instead, this analysis suggests that the more widespread use of GM foods *may actually make things worse*. Even should GM foods raise levels of food production, the structures and dynamics of food production and consumption that are currently producing hunger go unchecked, and will in fact receive a boost from biotechnology. How will GM foods tackle the political roots of hunger and underdevelopment if through their development and deployment they serve to further entrench the very industrial food system that is giving rise to these problems?

Some officials and commentators have described the recent food price hikes as a "silent tsunami."[47] There is some truth in this description. For one thing, the manner in which rising food costs have decimated lives and livelihoods calls to mind a marauding natural disaster.[48] And, like the Indian Ocean tsunami of 2004, the tragedy of global food riots has temporarily refocused attention on some of the world's poorest regions.[49]

After that, though, the metaphor breaks down. The global hunger and economic inequality that the food price crisis has exacerbated are not new things, brought on by a sudden catastrophe. Rather, they are old things made worse by new circumstances. Further, these recent food price increases are not acts of God. Instead, they represent a human-made tragedy. What I mean is that blame for the food price crisis lies not with nature or with other forces beyond our control, but ultimately with the constitution of our political and economic systems. Through political choices, institutional development, and technological design, we have developed a global food system that provides bountiful food to some while condemning others to lives of suffering and deprivation. In this sense hunger is not natural; hunger is *always* political. GM foods ultimately do nothing to address these political roots of our food crisis.

Understanding Technology

Let me try to be clear that this is *not* meant to be an anti-technology commentary. I think it's abundantly obvious that for humanity to thrive in ways that respect the rest of the natural world, we need a widespread technological revolution. In industrialized countries and around the globe, we must find or recover more effective ways to produce and use energy, land, water, and the earth's other scarce resources and sinks, in agriculture and in all other areas of life. The myriad challenges we face demand technological transformation on scales never before seen and experts and innovators to develop and distribute these new systems. Technology will always be front and center in any action to create a better world.

However, *our current forms of technological engagement are insufficient to achieve global sustainability.* The notion that there are just two extreme options open to us—unhindered technological development along our present path or a retreat into our ancestral caves—is a dangerous misinterpretation of what technology is, how technological change works, and what our options really look like. Instead of perpetuating this notion, we need to craft forms of technological engagement that are at once receptive to the promises of technological development and cognizant of challenges. This starts with understanding technology as an object not just of technical but of political study. It then means asking tough questions about contemporary technological life, and developing institutions that support such questioning. At the broadest level this means asking, what kind of world are we trying to create? What kinds of technologies will best help us create that world?

There is no such thing as a one-shot, sacrifice-free solution to the food crisis, environmental crisis, or to any of the myriad other crises that contemporary life throws at us. And if the technological horrors of the twentieth century, from nuclear accidents and the proliferation of weapons of mass destruction, to genocide and environmental devastation, have taught us anything, it is that with technological promise often comes great peril. Self-professed technophiles promise that through the application of technological fixes we can consistently overcome ecological limits.[50] A far more promising tack, though, may be to appreciate ecological limits and strive for rich lives within them. This is not an argument against technology and "progress," as much as technophiles may wish to paint it in those terms. Rather, it's a reiteration of an old environmental argument for technology in the service of a progress differently defined.[51]

This means that instead of employing technologies to work against natural processes and bring them under a human yoke, we

can and must strive to develop technologies that help us engage with natural processes in ways that are productive and restoring. Consider that the fastest-growing segment of the food economy in the United States is farmers' markets, and particularly those markets that support local and regional organic produce.[52] The farmers who grow food for these local organic markets are not scratching in the ground with sticks. Many of these operations are incredibly high-tech.[53] However, rather than depending on industrial technologies like GM crops, successful farms in this ilk depend on a mastery of the local, and on the development of technologies that accommodate cooperation with the land.[54]

Some of this growing movement relies on the rediscovery of technologies and techniques from long ago. Intercropping different plant species and their successful rotation, managing the interplay between different aspects of the farm, drawing on local resources to develop and sustain the fertility of land through time—all are basic to the organic farmer's tool kit.[55] These are things that were known by the successful societies that came before our own, but have been largely lost in an age of industrial farming. These are lessons that are slowly being relearned, as a new wave of eager farmers taps into knowledge from a disappearing breed, and the repositories of knowledge that exist in other places.[56]

Much of the success of this emerging food system, though, depends not on the recovery of older farming forms, but on entirely new research. Finding alternatives to rampant industrialism is not just about turning backwards, but looking forwards along a new path. For instance, Wes Jackson and his team at the Land Institute in Kansas have developed highly productive perennial crop growing systems that provide a host of ecological benefits, without fostering a dependence on irreplaceable fossil fuels.[57] Urban farmers across the United States are discovering new ways to grow food on roof-tops, on fire escapes, and on abandoned lots, and in the process are revitalizing neighborhoods and transforming communities.[58] More and more consumers are discovering new connections to other people and to the environment through the simple act of eating delicious foods light on processing. This is a set of technologies—indeed, an expanding technological system—turned to a very different set of ends than that suggested by GM foods. This is technology in the service of human well-being, rather than a dangerous, shortsighted industrial ideology.

Conclusion

We are, as Harriett Friedman has reminded us, eating animals.[59] The search for sustainability is rooted in our food system. With that in mind, our goal should not just be short-term fixes via an entrenchment of industrial farming methods. Rather, we should be striving to build an agricultural economy that gives us abundant healthful food while creating meaningful jobs, respects the land and the human and non-human organisms that depend on it, and views food as sustenance rather than simply as a collection of nutrients. To achieve this goal requires a technology-based revolution that, at the same time, considers the deep contradictions in our social and economic condition. GM foods, in their present guise, as products of expanding corporate power, offer nothing of this sort. Rather, GM foods promise to further the present industrial food system, by affording more and more control to fewer and fewer players, by increasing the dependencies of farmers and consumers, and by further clouding the relationships we have with our food and those who grow it.

The GM foods debate reminds us that all technologies are ultimately products of political contestation, operating to the benefit of some and the exclusion and detriment of others. The more particular lesson is that hunger and the other problems that characterize the industrial food system are not the products of a shortage of food production, but rather a shortage of prudent, democratic engagement with the technological systems that comprise modern life. To build a sustainable food system, we need to find wiser ways to engage with our technological systems. Wisdom demands that we appreciate and work within the conflict between the contradictions of modernity and the comforts that it affords.[60] There is no benefit in turning away from all of technology and all of the wonders that technological life provides us with. Nor is there real benefit in uncritically accepting all technological developments. Either option is to deny our ability to shape our technological future.

Transformation of our food system is basic to the revitalization of our material economy, and of our moral sensibilities. Technology must be at the heart of this transformation, but the form that this technology will take is not set in stone. The choice is not between bioengineering or mass starvation. Instead, there is a rich array of options open to us, ours for the making.

Endnotes: Genetically Modified Organisms and Global Hunger

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ENDNOTES: GENETICALLY MODIFIED ORGANISMS AND GLOBAL HUNGER *continued from page 61*

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[13] *Id.*

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[16] *See* BAILEY, *supra* note 15.

[17] *See* VANDANA SHIVA, STOLEN HARVEST: THE HIJACKING OF THE GLOBAL FOOD SUPPLY (2000).

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[27] FEENBERG, *supra* note 25, at 2.

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[44] *See* Jenny Edkins, *Mass Starvations and the Limits of Famine Theorizing*, 33 IDS BULL. n. 4 (2002).

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[54] *See generally Id.*, *supra* note 52.

[55] *Id.* at 69.

[56] *Id.*

[57] *See, e.g.*, Jerry D. Glover, *The Necessity and Possibility of Perennial Grain Production Systems*, 20 RENEWABLE AGRICULTURE AND FOOD SYSTEMS 1 (2005); *see also* Raylene Nickel, *Fields of the Future: Perennial Grains Promise Viable Yields and Soil Conservation*, SUCCESSFUL FARMING (2006).

[58] Adrian Higgins, *Pedaling the Local Food Movement*, WASH. POST, July 24, 2008, at H01, *available at* http://www.washingtonpost.com/wp-dyn/content/story/2008/07/23/ST2008072301683.html (last visited Oct. 26, 2008).

[59] Harriet Friedmann, *What on Earth Is the Modern World-System? Food-getting and Territory in the Modern Era and Beyond*, 11 J. WORLD-SYSTEMS RES. 480, 480 (2000).

[60] *See* Theodore Roszak, *Foreword: In Defense of the Living Earth*, *in* TURNING AWAY FROM TECHNOLOGY: A NEW VISION FOR THE 21ST CENTURY (Stephanie Mills ed., 1997).