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The Future of Food? Genetic Engineering, Value Capture and Dependency

By Colin Todhunter
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Theme: Biotechnology and GMO

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The following is an abridged version of the second chapter of the author's short (free-to-read) e-book Food, Dispossession and Dependency (2022)

GM crops are required to feed the world is a well-worn industry slogan trotted out at every available opportunity. Just like the claim of GM crops being a tremendous success, this too is based on a myth.

There is no global shortage of food. Even under any plausible future population scenario, there will be no shortage as evidenced by scientist Dr Jonathan Latham in his paper "The Myth of a Food Crisis" (2020).

However, new gene drive and gene editing techniques have now been developed and the industry is seeking the unregulated commercial release of products that are based on these methods.

These new techniques can cause a range of unwanted genetic modifications that can result in the production of novel toxins or allergens or in the transfer of antibiotic resistance genes. Even intended modifications can result in traits which could raise food safety, environmental or animal welfare concerns.

The European Court of Justice ruled in 2018 that organisms obtained with new genetic modification techniques must be regulated under the EU's existing GMO laws. However, there has been intense lobbying from the agriculture biotech industry to weaken the legislation, aided financially by the Gates Foundation.

Various scientific publications show that new GM techniques allow developers to make significant genetic changes, which can be very different from those that happen in nature. These new GMOs pose similar or greater risks than older-style GMOs.

In addition to these concerns, a paper from Chinese scientists, 'Herbicide Resistance:

Another Hot Agronomic Trait for Plant Genome Editing', says that, in spite of claims from GMO promoters that gene editing will be climate-friendly and reduce pesticide use, what we can expect is just more of the same – GM herbicide-tolerant crops and increased herbicide use.

By dodging regulation as well as avoiding economic, social, environmental and health impact assessments, it is clear that the industry is first and foremost motivated by value capture and profit and contempt for democratic accountability.

Bt cotton in India

This is patently clear if we look at the rollout of Bt cotton in India (the only officially approved GM crop in that country) which served the bottom line of Monsanto but brought dependency, distress and no durable agronomic benefits for many of India's small and marginal farmers. Prof A P Gutierrez argues that Bt cotton has effectively placed these farmers in a corporate noose.

Cotton harvest in India (Source: Flickr)

Monsanto sucked hundreds of millions of dollars in profit from these cotton farmers, while industry-funded scientists are always keen to push the mantra that rolling out Bt cotton in India uplifted their conditions.

On 24 August 2020, a webinar on Bt cotton in India took place involving Andrew Paul Gutierrez, senior emeritus professor in the College of Natural Resources at the University of California at Berkeley, Keshav Kranthi, former director of Central Institute for Cotton Research in India, Peter Kenmore, former FAO representative in India, and Hans Herren, World Food Prize Laureate.

Herren said that "the failure of Bt cotton" is a classic representation of what an unsound science of plant protection and faulty direction of agricultural development can lead to.

He argued that a transformation of agriculture and the food system is required; one that entails a shift to agroecology, which includes regenerative, organic, biodynamic, permaculture and natural farming practices.

Kenmore said that Bt cotton is an aging pest control technology:

> "It follows the same path worn down by generations of insecticide molecules from arsenic to DDT to BHC to endosulfan to monocrotophos to carbaryl to imidacloprid. In-house research aims for each molecule to be packaged biochemically, legally and commercially before it is released and promoted. Corporate and public policy actors then claim yield increases but deliver no more than temporary pest suppression, secondary pest release and pest resistance."

Recurrent cycles of crises have sparked public action and ecological field research which creates locally adapted agroecological strategies.

He added that this agroecology:

> "…now gathers global support from citizens' groups, governments and UN FAO. Their robust local solutions in Indian cotton do not require any new molecules, including endo-toxins like in Bt cotton".

Gutierrez presented the ecological reasons as to why hybrid Bt cotton failed in India: long season Bt cotton introduced in India was incorporated into hybrids that trapped farmers into biotech and insecticide treadmills that benefited GMO seed manufacturers.

He noted:

> "The cultivation of long-season hybrid Bt cotton in rainfed areas is unique to India. It is a value capture mechanism that does not contribute to yield, is a major contributor to low yield stagnation and contributes to increasing production costs."

Gutierrez asserted that increases in cotton farmer suicides are related to the resulting economic distress.

Presenting data on yields, insecticide usage, irrigation, fertiliser usage and pest incidence and resistance, Kranthi said an analysis of official statistics (eands.dacnet.nic.in and cotcorp.gov.in) shows that Bt hybrid technology has not been providing any tangible benefits in India either in yield or insecticide usage.

Cotton yields are the lowest in the world in Maharashtra, despite being saturated with Bt hybrids and the highest use of fertilisers. Yields in Maharashtra are less than in rainfed Africa where there is hardly any usage of technologies such as Bt hybrids, fertilisers, pesticides or irrigation.

It is revealing that Indian cotton yields rank 36th in the world and have been stagnant in the past 15 years and insecticide usage has been constantly increasing after 2005, despite an increase in area under Bt cotton.

Kranthi argued that research also shows that the Bt hybrid technology has failed the test of sustainability with resistance in pink bollworm to Bt cotton, increasing sucking pest infestation, increasing trends in insecticide and fertiliser usage, increasing costs and negative net returns in 2014 and 2015.

Herren said that GMOs exemplify the case of a technology searching for an application:

> "It is essentially about treating symptoms, rather than taking a systems approach to create resilient, productive and bio-diverse food systems in the widest sense and to provide sustainable and affordable solutions in it's social, environmental and economic dimensions."

He went on to say:

> "We need to push aside the vested interests blocking the transformation with the baseless arguments of 'the world needs more food' and design and implement policies that are forward-looking… We have all the needed scientific and practical evidence that the agroecological approaches to food and nutrition security work successfully."

Those who continue to spin Bt cotton in India as a resounding success remain wilfully ignorant of the challenges (documented in the 2019 book by Andrew Flachs – Cultivating Knowledge: Biotechnology, Sustainability and the Human Cost of Cotton Capitalism in India) farmers face in terms of financial distress, increasing pest resistance, dependency on unregulated seed markets, the eradication of environmental learning, the loss of control over their productive means and the biotech-chemical treadmill they are trapped on (this last point is precisely what the industry intended).

In general, across the world the performance of GM crops to date has been questionable, but the pro-GMO lobby has wasted no time in wrenching the issues of hunger and poverty from their political contexts to use notions of 'helping farmers' and 'feeding the world' as lynchpins of its promotional strategy. There exists a haughty imperialism within the pro-GMO scientific lobby that aggressively pushes for a GMO 'solution' which is a distraction from the root causes of poverty, hunger and malnutrition and genuine solutions based on food justice and food sovereignty.

The performance of GM crops has been a hotly contested issue and, as highlighted in a 2018 piece by PC Kesavan and MS Swaminathan in the journal Current Science, there is already sufficient evidence to question their efficacy, especially that of herbicide-tolerant crops (which by 2007 already accounted for approximately 80% of biotech-derived crops grown globally) and the devastating impacts on the environment, human health and food security, not least in places like Latin America.

In their paper, Kesavan and Swaminathan argue that GM technology is supplementary and must be need based. In more than 99% of cases, they say that time-honoured conventional breeding is sufficient. In this respect, conventional options and innovations that outperform GM must not be overlooked or side-lined in a rush by powerful interests like the Bill and Melinda Gates Foundation to facilitate the introduction of GM crops into global agriculture; crops which are highly financially lucrative for the corporations behind them.

In Europe, robust regulatory mechanisms are in place for GMOs because it is recognised that GM food/crops are not substantially equivalent to their non-GM counterparts. Numerous studies have highlighted the flawed premise of 'substantial equivalence'.

Both the Cartagena Protocol and Codex share a precautionary approach to GM crops and foods, in that they agree that GM differs from conventional breeding and that safety assessments should be required before GMOs are used in food or released into the environment. There is sufficient reason to hold back on commercialising GM crops and to

subject each GMO to independent, transparent environmental, social, economic and health impact evaluations.

Regardless, global food insecurity and malnutrition are not the result of a lack of productivity. As long as food injustice remains an inbuilt feature of the global food regime, the rhetoric of GM being necessary for feeding the world will be seen for what it is: bombast.

Take India, for instance. Although it fares poorly in world hunger assessments, the country has achieved self-sufficiency in food grains and has ensured there is enough food (in terms of calories) available to feed its entire population. It is the world's largest producer of milk, pulses and millets and the second-largest producer of rice, wheat, sugarcane, groundnuts, vegetables, fruit and cotton.

According to FAO, food security is achieved when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Large sections of India's population do not have enough food available to remain healthy nor do they have sufficiently diverse diets that provide adequate levels of micronutrients.

People are not hungry in India because its farmers do not produce enough food. Hunger and malnutrition result from various factors, including inadequate food distribution, (gender) inequality and poverty; in fact, the country continues to export food while millions remain hungry. It's a case of 'scarcity' amid abundance.

Where farmers' livelihoods are concerned, the pro-GMO lobby says GM will boost productivity and help secure cultivators a better income. Again, this is misleading: it ignores crucial political and economic contexts. Even with bumper harvests, Indian farmers still find themselves in financial distress.

India's farmers are not experiencing hardship due to low productivity. They are reeling from the effects of neoliberal policies, years of neglect and a deliberate strategy to displace smallholder agriculture at the behest of the World Bank and predatory global agri-food corporations. Little wonder then that the calorie and essential nutrient intake of the rural poor has drastically fallen. No number of GMOs will put any of this right.

Nevertheless, the pro-GMO lobby, both outside of India and within, has twisted the situation for its own ends to mount intensive PR campaigns to sway public opinion and policy makers.

Golden Rice

The industry has for many years been promoting Golden Rice. It has long argued that genetically engineered Golden Rice is a practical way to provide poor farmers in remote areas with a subsistence crop capable of adding much-needed vitamin A to local diets. Vitamin A deficiency is a problem in many poor countries in the Global South and leaves millions at high risk for infection, diseases and other maladies, such as blindness.

Some scientists believe that Golden Rice, which has been developed with funding from the Rockefeller Foundation, could help save the lives of around 670,000 children who die each year from Vitamin A deficiency and another 350,000 who go blind.

Image on the right: Source is Flickr

Meanwhile, critics say there are serious issues with Golden Rice and that alternative approaches to tackling vitamin A deficiency should be implemented. Greenpeace and other environmental groups say the claims being made by the pro-Golden Rice lobby are misleading and are oversimplifying the actual problems in combating vitamin A deficiency.

Many critics regard Golden Rice as an over-hyped Trojan horse that biotechnology corporations and their allies hope will pave the way for the global approval of other more profitable GM crops. The Rockefeller Foundation might be regarded as a 'philanthropic' entity but its track record indicates it has been very much part of an agenda which facilitates commercial and geopolitical interests to the detriment of indigenous agriculture and local and national economies.

As Britain's Environment Secretary in 2013, the now disgraced Owen Paterson claimed that opponents of GM were "casting a dark shadow over attempts to feed the world". He called for the rapid roll-out of vitamin A-enhanced rice to help prevent the cause of up to a third of the world's child deaths. He claimed:

> "It's just disgusting that little children are allowed to go blind and die because of a hang-up by a small number of people about this technology. I feel really strongly about it. I think what they do is absolutely wicked."

Robin McKie, science writer for The Observer, wrote a piece on Golden Rice that uncritically presented all the usual industry talking points. On Twitter, The Observer's Nick Cohen chimed in with his support by tweeting:

> "There is no greater example of ignorant Western privilege causing needless misery than the campaign against genetically modified golden rice."

Despite the smears and emotional blackmail employed by supporters of Golden Rice, in a 2016 article in the journal Agriculture & Human Values Glenn Stone and Dominic Glover found little evidence that anti-GM activists are to blame for Golden Rice's unfulfilled promises. Golden rice was still years away from field introduction and even when ready may fall far short of lofty health benefits claimed by its supporters.

Stone stated that:

> "Golden Rice is still not ready for the market, but we find little support for the common claim that environmental activists are responsible for stalling its introduction. GMO opponents have not been the problem."

The rice simply has not been successful in test plots of the rice breeding institutes in the

Philippines, where the leading research is being done. While activists did destroy one Golden Rice test plot in a 2013 protest, Stone says it is unlikely that this action had any significant impact on the approval of Golden Rice.

Stone said:

> "Destroying test plots is a dubious way to express opposition, but this was only one small plot out of many plots in multiple locations over many years. Moreover, they have been calling Golden Rice critics 'murderers' for over a decade."

Believing that Golden Rice was originally a promising idea backed by good intentions, Stone argued:

> "But if we are actually interested in the welfare of poor children – instead of just fighting over GMOs – then we have to make unbiased assessments of possible solutions. The simple fact is that after 24 years of research and breeding, Golden Rice is still years away from being ready for release."

Researchers still had problems developing beta carotene-enriched strains that yield as well as non-GM strains already being grown by farmers. Stone and Glover point out that it is still unknown if the beta carotene in Golden Rice can even be converted to vitamin A in the bodies of badly undernourished children. There also has been little research on how well the beta carotene in Golden Rice will hold up when stored for long periods between harvest seasons or when cooked using traditional methods common in remote rural locations.

Claire Robinson, an editor at GMWatch, has argued that the rapid degradation of beta-carotene in the rice during storage and cooking means it is not a solution to vitamin A deficiency in the developing world. There are also various other problems, including absorption in the gut and the low and varying levels of beta-carotene that may be delivered by Golden Rice in the first place.

In the meantime, as the development of Golden Rice creeps along, the Philippines has managed to slash the incidence of Vitamin A deficiency by non-GM methods.

The evidence presented here might lead us to question why supporters of Golden Rice continue to smear critics and engage in abuse and emotional blackmail when activists are not to blame for the failure of Golden Rice to reach the commercial market. Whose interests are they really serving in pushing so hard for this technology?

In 2011, Marcia Ishii-Eiteman, a senior scientist with a background in insect ecology and pest management asked a similar question:

> "Who oversees this ambitious project, which its advocates claim will end the suffering of millions?"

She answered her question by stating:

> "An elite, so-called Humanitarian Board where Syngenta sits – along with the inventors of Golden Rice, Rockefeller Foundation, USAID and public relations and marketing experts, among a handful of others. Not a single farmer, indigenous person or even an ecologist or sociologist to assess the huge political, social and ecological implications of this massive experiment. And the leader of IRRI's Golden Rice project is none other

than Gerald Barry, previously Director of Research at Monsanto."

Sarojeni V. Rengam, executive director of Pesticide Action Network Asia and the Pacific, called on the donors and scientists involved to wake up and do the right thing:

> "Golden Rice is really a 'Trojan horse'; a public relations stunt pulled by the agribusiness corporations to garner acceptance of GE crops and food. The whole idea of GE seeds is to make money… we want to send out a strong message to all those supporting the promotion of Golden Rice, especially donor organisations, that their money and efforts would be better spent on restoring natural and agricultural biodiversity rather than destroying it by promoting monoculture plantations and genetically engineered (GE) food crops."

And she makes a valid point. To tackle disease, malnutrition and poverty, you have to first understand the underlying causes – or indeed want to understand them.

A complex of policies that pushed the Philippines into an economic quagmire over the past 30 years is due to 'structural adjustment', involving prioritising debt repayment, conservative macroeconomic management, huge cutbacks in government spending, trade and financial liberalisation, privatisation and deregulation, the restructuring of agriculture and export-oriented production.

And that restructuring of the agrarian economy is something touched on by Claire Robinson who notes that leafy green vegetables used to be grown in backyards as well as in rice (paddy) fields on the banks between the flooded ditches in which the rice grew.

Ditches also contained fish, which ate pests. People thus had access to rice, green leafy veg and fish – a balanced diet that gave them a healthy mix of nutrients, including plenty of beta-carotene.

But indigenous crops and farming systems have been replaced by monocultures dependent on chemical inputs. Green leafy veg were killed off with pesticides, artificial fertilisers were introduced and the fish could not live in the resulting chemically contaminated water. Moreover, decreased access to land meant that many people no longer had backyards containing leafy green veg. People only had access to an impoverished diet of rice alone, laying the foundation for the supposed Golden Rice 'solution'.

The effects of IMF/World Bank 'structural adjustments' have devastated agrarian economies and made them dependent on Western agribusiness, manipulated markets and unfair trade rules. And GM is now offered as the 'solution' for tackling poverty-related diseases. The very corporations which gained from restructuring agrarian economies now want to profit from the havoc caused.

In 2013, the Soil Association argued that the poor are suffering from broader malnourishment than just vitamin A deficiency; the best solution is to use supplementation and fortification as emergency sticking-plasters and then for implementing measures which tackle the broader issues of poverty and malnutrition.

Tackling the wider issues includes providing farmers with a range of seeds, tools and skills necessary for growing more diverse crops to target broader issues of malnutrition. Part of this entails breeding crops high in nutrients; for instance, the creation of sweet potatoes that grow in tropical conditions, cross-bred with vitamin A rich orange sweet potatoes, which

grow in the USA. There are successful campaigns providing these potatoes, a staggering five times higher in vitamin A than Golden Rice, to farmers in Uganda and Mozambique.

Blindness in developing countries could have been eradicated years ago if only the money, research and publicity put into Golden Rice over the last 20 years had gone into proven ways of addressing Vitamin A deficiency.

Value capture

Traditional production systems rely on the knowledge and expertise of farmers in contrast to imported 'solutions'. Yet, if we take cotton cultivation in India as an example, farmers continue to be nudged away from traditional methods of farming and are being pushed towards (illegal) GM herbicide-tolerant cotton seeds.

Researchers Glenn Stone and Andrew Flachs note the results of this shift from traditional practices to date does not appear to have benefited farmers. This is not about giving farmers 'choice' where GM seeds and associated chemicals are concerned (another much-promoted industry talking point). It is more about GM seed companies and weedicide manufactures seeking to leverage a highly lucrative market.

The potential for herbicide market growth in India is enormous. The objective involves opening India to GM seeds with herbicide tolerance traits, the biotechnology industry's biggest money maker by far (86% of the world's GM crop acres in 2015 contained plants resistant to glyphosate or glufosinate and there is a new generation of crops resistant to 2,4-D coming through).

The aim is to break farmers' traditional pathways and move them onto corporate biotech/chemical treadmills for the benefit of industry.

Calls for agroecology and highlighting the benefits of traditional, small-scale agriculture are not based on a romantic yearning for the past or 'the peasantry'. Available evidence suggests that smallholder farming using low-input methods is more productive in overall output than large-scale industrial farms and can be more profitable and resilient to climate change. It is for good reason that numerous high-level reports call for investment in this type of agriculture.

Despite the pressures, including the fact that globally industrial agriculture grabs 80% of subsidies and 90% of research funds, smallholder agriculture plays a major role in feeding the world.

At the same time, agri-food oligopolies externalise the massive health, social and environmental costs of their operations.

But policy makers tend to accept that profit-driven transnational corporations have a legitimate claim to be owners and custodians of natural assets (the 'commons'). These corporations, their lobbyists and their political representatives have succeeded in cementing a 'thick legitimacy' among policy makers for their vision of agriculture.

Common ownership and management of these assets embodies the notion of people working together for the public good. However, these resources have been appropriated by national states or private entities.

Those who capture essential common resources seek to commodify them – whether trees for timber, land for real estate or agricultural seeds – create artificial scarcity and force everyone else to pay for access. The process involves eradicating self-sufficiency.

International bodies have enshrined the interests of corporations that seek to monopolise seeds, land, water, biodiversity and other natural assets that belong to us all.

Technocratic meddling has already destroyed or undermined agrarian ecosystems that draw on centuries of traditional knowledge and are increasingly recognised as valid approaches to secure food security.

Under the guise of 'climate emergency', we are currently seeing a push for the Global South to embrace the Gates' vision for a one-world agriculture ('Ag One') dominated by global agribusiness and the tech giants. But it is the so-called developed nations and the rich elites that have plundered the environment and degraded the natural world.

To say that one model of agriculture must now be accepted by all countries is a continuation of a colonialist mindset.

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*Renowned author **Colin Todhunter** specialises in development, food and agriculture. He is a Research Associate of the Centre for Research on Globalization (CRG) in Montreal.*

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Read Colin Todhunter's e-Book entitled

Food, Dispossession and Dependency. Resisting the New World Order

We are currently seeing an acceleration of the corporate consolidation of the entire global

agri-food chain. The high-tech/big data conglomerates, including Amazon, Microsoft, Facebook and Google, have joined traditional agribusiness giants, such as Corteva, Bayer, Cargill and Syngenta, in a quest to impose their model of food and agriculture on the world.

The Bill and Melinda Gates Foundation is also involved (documented in 'Gates to a Global Empire' by Navdanya International), whether through buying up huge tracts of farmland, promoting a much-heralded (but failed) 'green revolution' for Africa, pushing biosynthetic food and genetic engineering technologies or more generally facilitating the aims of the mega agri-food corporations.

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Articles by: **Colin Todhunter**

About the author:

Colin Todhunter is an extensively published independent writer and former social policy researcher. Originally from the UK, he has spent many years in India. His website is www.colintodhunter.com https://twitter.com/colin_todhunter