India as GMO battleground: Separating myths from science

Over two decades genetic modification technologies have contributed to increased food productivity and environmental improvement due to reduced use of toxic pesticides. However, traditionally anti-GMO activists have protested against the biotechnology on the following grounds:

1. It is dominated by multinational elites with protected product ownership meant to exploit small farmers and deny them technology at an affordable price
2. It is US dominated and is thrust on other countries
3. Its safety and long term implications are unknown
4. It is detrimental to biodiversity
5. As the world can be fed with organic food why embrace any technology applications at all, proven or unproven?

At the epicenter of the Asian biotech revolution, India is one of the few countries in the world proving to the world that:

1. GM crop development is not the sole domain of four or five multinational companies.
2. GM crops bring immense economic contribution to the bottom-of-the-pyramid – the marginal farmer who grows a variety of neglected crops.
3. Biotechnology does not limit any one from pursuing the research and product delivery goals – it is accessible.
4. Intellectual property and patent controls do not present an impediment for research by small ventures and public organizations to legitimately secure technologies and deliver trait specific varietal seeds to small farmers who can grow and save their own seeds in their own right.

In India the deep engagement of the public sector and national level private enterprises and the wide recognition of the technology at the farmer end has triggered the global ire of anti-GMO lobby groups, triggering deployment of unprecedented global resources in India to the tune of several million dollars to oppose this effort. The epicenter of global anti-GMO activism rests in India currently. Let’s review three myths GMO opponents try to spread:

Myth 1: Elite multinational dominance

World over, four or five international seed companies have focused on corn and oil seeds for the trait improvement. The economy of scale provides large corporation the ability to recover high investment cost in research, validation and post release monitoring of products. However, these large corporations have not focused on crops of regional relevance for most developing countries.

In India the crops under development are predominantly grain crops, vegetables, lentils, millets, groundnut, mustard and other edibles and these are the domain of interest to multinational companies. Indian developers have licensed genes from international sources or in some cases cloned their own genes with patent filing and have pursued integration of these genes in crops of regional interest. This

provided opportunity during 2004-2009 for more than 20 crops to be developed and tested by public and private enterprises in wide variety of crops.

The focus of crop improvement is on a wide basket of crops such as brinjal, okra, tomato, rice, potato, cotton, chillies (pepper), banana, papaya, chickpea, pigeonpea and groundnut. Indian productivity in most of these crops has stagnated over the years due to inability of the genetic resources to overcome chronic pests and pathogens. Indian productivity for most of these crops is at about half or one third of the best productivity when benchmarked to the best countries.

Most chemical solutions have been less effective in mitigating pests and pathogens in these crops. Application of biological solutions externally to the plant has had only very limited success (confined to a few thousand acres forming a fraction of 1 percent of the total acreage in the country) but the success has not been uniform due to impact of the varying environment on the performance of the organism. The alternate technologies and organic farming practices have not yielded currently even a fraction of 1 percent of total produced in the country or anywhere in the world. The molecular solutions have been explored with the help of plant and soil borne bacterial genes that have proven effective in mitigating these pests and pathogens.

In other developing countries such as Brazil, Indonesia and the Philippines, independent researchers in the public research and national companies have developed products in their focus crops such as sugarcane, beans and potato. In Indonesia, the sugarcane crop has been developed by in-country researchers and has been recently approved for plant multiplication. The Late Blight Resistant Potato is in advanced stage of evaluation and should be approved for release to farmers in Indonesia within the next few months. Similarly, in Brazil, regulators have approved the transgenic bean. None of these products had attracted the interest of multinational companies. In Philippines several varieties and publicly developed Bt brinjal hybrids are under review by the regulatory authorities for release to the farmers. Similar efforts are undertaken in Vietnam as well for crops of local interest.

India was in the forefront of this effort until 2009 and has taught the model for Asian and South American countries to follow. But the dismantling of the regulatory mechanism in India subsequent to the imposition of moratorium by the then Environment Minister has put India behind by a decade in pursuing these developments. While the Central Potato Research Institute (CPRI) was the first in the world to advance the Late Blight Resistant Potato with gene transfer from another public university, University of Wisconsin, researchers were denied field validation of their crop during the last 5 years. Now the Indonesian research organization, that started the effort several years after CPRI, has taken the lead to commercialize this product far ahead of India. Even if field evaluations are permitted now, it will take another three to four years for this crop to be introduced in India in Indian potato varieties. Indian farmers will now look for the Indonesian seed producers to supply them Late Blight disease resistant seeds, as at times the late blight can be having devastating effect on the potato crop. The gene here is the potato gene itself, isolated from a native potato.

Myth 2: GM crops hurt resource poor, marginal farmers

When the technology is adopted in the public arena, the technology quickly spreads to all farmers

including the most marginal. In the case of Bt brinjal, in Bangladesh the Bangladesh Agriculture Research Institute developed nine varieties, four of which are already approved for cultivation by farmers. The farmers cultivating them have the right to save the seeds and replant them for successive seasons. Additionally, the public research organization provides seeds to the farmers growing brinjal and thereby ensuring complete affordability for the technology by all small farmers.

When I interacted with one of the Bangladeshi farmers, he indicated that Indian farmers from West Bengal keep calling him to secure seeds. His answer to the West Bengal farmer was to buy fruits from them and not the seeds. It reflects how the Indian farmer is denied the right to secure the varieties developed by public research institutions in India which they could have sown and saved in their own right.

The Bt brinjal development effort, authorized by the government of India in 2004 as a collaborative project, has provided for the first time three national public sector research institutions–Indian Institute of Vegetable Research, University of Agriculture Sciences, Dharwad and Tamilnadu Agriculure University–the legitimate right to deploy the Bt gene licensed without royalty charge in 16 varieties that are publicly bred by these research institutions. These were varieties adopted by farmers in different regions and were most susceptible to fruit and shoot borer. Since these varieties were not resistant to pests without the gene modification, farmers were shelving them and switching to other crops.

Three public research institutions in three regions of the country developed new GM products and got them ready for delivery to resource poor farmers who can secure these seeds and save them for replanting. Public institutions releasing transgenic seed varieties is unheard of in the Western world. Numerous varieties of Bt brinjal were developed by public institutions and developed by Indian institutions for Indian farmers to grow them so they could save their seeds in their own right. In the developed world, the only other GM crop developed solely for the public good was the virus resistant papaya at Cornell University to help Hawaiian papaya growers. The Bt brinjal collaborative project was predominantly funded by the government of India and this funding was approved by a joint working group in which the Ministry of Environment was also a member.

When the Bt brinjal was evaluated and proposed for approval, varieties developed by the Tamilnadu Agriculture University and the Dharwad University were also proposed for approval and release. However, a moratorium was put in place which withheld access to these seeds by resource poor farmers in the region. Over the last five years, the three public sector institutions have totally disassociated themselves in pursuing these brinjal varieties due to the moratorium. Even if these varieties have been adopted in 100,000 farmers growing brinjal varieties it would have benefitted marginal farmers to the tune of 600 crores per annum on account of saving on pesticides and incremental marketable fruits. Currently farmers lose more than half of their produce due to poor marketability on account of fruit and shoot borer infestation.

The reality is that the technologies are not dominated by multinational companies and the Indian ability to address these crop solutions, hitherto not addressed by global multinationals. is a clear refutation of the argument of anti-GM activists. The Indian public sector has brought multiple products that benefit the resource poor farmer, preserving the rights of the farmer to save their own seed and replant the–a direct rebuke of the is myth spread by anti-GMO NGOs. In Bangladesh, the public research institution has

provided a Bt brinjal variety to the farmers, who are planting them, saving seeds, and then re-planting them. More than 100 farmers have grown seeds and the produce and the seeds of four public varieties are provided to these farmers. This has never happened in any developed country and Bangladesh could secure the technology due to Indian partner institutions, both public and private. The multinational companies don't care to ever market a brinjal variety to resource poor farmer; only the public institutions can do that.

The former Indian Minister for Environment denied the introduction of the Mahyco hybrids and put the lid on all of the varieties developed by the public research institutions. He did not end with that, however. He initiated prosecution proceedings through one of the bodies affiliated with his ministry against all the partners for supporting public researchers in adopting technology, including serving of non-bailable arrest warrant on the university administration engaged in the bt brinjal development by invoking the draconian National Biodiversity Act based on a false complaint from an NGO. The subsequent minister then denounced them as criminals in the parliament without an iota of evidence or any formal enquiry. The two ministers will go down in history for prosecuting scientists for improving crops and delivering them for public good, all with the legitimate support of their own ministry. Meanwhile, he NGO collected several million rupees by propagating this story in Al Jazeera and other international TV channels to fuel the legal proceedings and to fund their efforts.

Myth 3: Big corporations are blocking publicly financed crops

If only multinationals "own" the genes and have the competency to develop GM crops, how did Indian companies and even the Indian public research bodies develop these cutting edge seeds and foods? Gene discovery is the domain of leading global universities, large multinational companies and a few smart star-up companies. Several candidate genes have been isolated from plant and soil sources that have demonstrated ability to induce traits in crops.

Though there are only a few institutions engaged in upstream gene discovery, the access to these genes are made available to other product developers through licensing of genetic traits for specific crop trait improvement. The model is akin to the licensing of Intel chips to electronic appliance makers. There are only two or three discoverers of electronic chips in the world. Intel is largest among them. That does not deter Apple or Dell from making innovative computers.

Indian smart private sector ventures have licensed genes from global public research institutions, private enterprises and from Indian research organizations to validate the efficacy of these genes and adopt them in their crop improvement programs. Similarly, public research institutions in India have partnered with global institutions and have also on their own cloned genes for specific trait targets. Some of these have now won international patents. Several of them have been licensed to Indian companies for adoption in the crops of national interest such as chickpea, pigeon pea, groundnut, okra, tomato, karela, cassava, potato, banana, papaya and cotton.

Indeed, varieties of cottonseeds in India currently "use" a gene patented by Monsanto. Public research gene discoveries from developed countries have provided considerable access for application by Indian private sector and a host of Indian public sector for their crop improvement research. An Indian start-up

company Metahelix, isolated its own gene and secured a patent for licensing to other companies. There are other Indian private ventures too who have secured patents for their discovery.

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