

The Transgenic crop debate and food security in India

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Genetically modified crops or transgenic crops are plants used in agriculture, the DNA of which has been modified using genetic engineering methods. The aim is to introduce a new trait that does not occur in the natural phenotype, like resistance to pests, diseases or environmental conditions, reduction of spoilage, or resistance to herbicides, or improving the nutrient profile.¹ Now the question arises as to whether GM crops are safe, whether they can address the world's food needs, whether they are readily accessible to the farmers, and how farmers can wriggle out of intellectual property rights.

History of GM Crops: The first GM crop plant was produced in 1982 when tobacco plants were engineered for herbicide resistance, incorporating genes that produced insecticidal proteins from *Bacillus thuringiensis*(Bt). China first commercialised transgenic plants, introducing a virus resistance tobacco in 1992 but later it was withdrawn in 1997. The first GM crop approved for sale in the US was FlavrSavr tomato in 1994 which had a longer shelf life because it took longer to soften after ripening. European Union approved GM tobacco resistant to herbicide Bromoxynil. USA approved Bt potato, maize and canola in 1995, as well as glyphosate resistant soyabeans(Monsanto), and virus resistant squash(Asgrow). In 2000 Vitamin A enriched golden rice was developed but till date it is not in commercial production. In 2013 the World Food Prize was awarded to leaders of three teams of researchers Robert Fraley, Mac van Montagu and Mary Dell Chilton.²

Fate of GM Crops in India: The total cultivated land area of Gm crops in 1996 was 17,000 sq km which shot upto 17,97,000sq km in 2015, ie a jump of 100 times! Use of GM crops rapidly spread to the developing countries. It is claimed that there are several benefits gotten out of GM crops, like it has reduced chemical pesticide use by 37%, increased crop

yield by 22%, and raised farmers' profits by 66%.³ There is a scientific consensus that currently available food from GM crops poses no greater risk to human health than conventional food, but each GM food needs to be tested on a case by case basis before their introduction. These claimed benefits have been challenged by detractors because of the absence of randomised controlled trials.⁴

What is the stand taken by the Indian Government? This is mostly a flip flop as our regulatory bodies are themselves funding, promoting and developing as regards GM mustard is concerned. Moreover, there is no rigorous attachment to principles of food safety. Add to this the serious lack of expertise in risk assessment and we seem to be sitting on an agri biosecurity powder keg!⁵

First let us understand who the regulatory bodies are. The most important is Genetic Engineering Appraisal Committee or GEAC under the Environment Protection Act 1986 of the Ministry of Environment and Forests. At this moment the only GM crop under cultivation is Bt Cotton grown over 10.8 million hectares(m.ha.). It was introduced in India in 2002. In 2007, GEAC recommended the commercial release of Bt Brinjal developed by Mahyco but the initiative was blocked in 2010. Dhara Mustard Hybrid 11 or DMH 11 was developed by the Delhi University's Centre for Genetic Manipulation of Crop plants. If approved, it will be the first transgenic food crop to be allowed for cultivation in the country. However, in 2013 a Supreme Court panel put new crop trials on hold for the next ten years. In 2014 the UPA govt approved field trials for 11 crops including rice, maize, sorghum, wheat, groundnut and cotton. The NDA govt approved 21 varieties of GM crops. In 2016 green signal was given to GM mustard for field trial but Supreme Court stayed the order.⁶

Borlaug's Claim: Now, the question arises is what is the risk of GM crops? The scientists actually don't know what they are

looking for. And the long-term health effects like cancer will only be discernible after decades. Norman Borlaug supported GM food crops to eradicate world hunger. He was the Father of the Green Revolution and was awarded the Nobel Peace Prize in 1970. He said, "It is better to die eating GM food instead of dying of hunger." But his Green Revolution also had many detractors, though rice yield of 2 tonnes/ha in 1960 jumped to 6 tonnes/ha in 1990 and by 2006 India had become a major rice exporter in the world.⁷ The components of Green Revolution included high yielding varieties of cereal grains, expansion of irrigation infrastructure, distribution of hybridised seeds and synthetic nitrogenous fertilizers and pesticides. The IR-8 rice strain was developed in the Philippines as a cross between Peta (Indonesian) and Dee-Geo-Woo-Gen (Chinese) varieties. It yielded 5 tonnes/ha without fertilizer. But detractors say that high yielding seed varieties have low quality protein with deficiency of many essential amino acids, being high in carbohydrates, lack of essential fatty acids, vitamins and minerals. Moreover, high pesticide use has killed fish and weedy green vegetables that grew in the standing water on the paddy fields. They were an important food source for the poor farmers. Furthermore, herbicides have been accused as hormone disruptors leading to fatal diseases like:-

- i) Phenoxy acid herbicides have been linked with soft tissue sarcomas(STS) and other malignant tumours.
- ii) Organochlorines----- STS, Non Hodgkin's Lymphoma(NHL)
- iii) Organophosphorus---- NHL and Leukaemia
- iv) Triazone---- Ovarian cancer.⁸

Even PGIMER, Chandigarh has shown the relationship between these chemicals and an increased incidence of cancer in this region.⁹

Malthusian Principle: So, the Malthusian catastrophe has been avoided, but at what cost. Thomas Malthus had predicted in 1798 an impending famine. The world population doubled by 1923 and again by 1973 but Malthus's prediction has not come about. Actually, the great economist Dr Amartya Sen has said that historic famines were not caused by any decrease in food supply but by socioeconomic dynamics and failure of public action by the government of the day.⁹ The problem in Indian agriculture could be addressed by closing the urban-rural income gap, integration of small holders into value chains, and maintaining competitiveness in the market by proactive measures from the local government. Because we have to keep the farmers in good health if we want to have our regular supply of food. After all, they are our 'annadatas'.

Pental Versus Rodrigues: The Parliamentary Standing Committee on Science and Technology, Environment and Forests led by Congress MP Renuka Chowdhury submitted its report on GM crops to the Rajya Sabha Chairman in August 2017. The panel claimed that the success of Bt cotton was mostly due to an increase in the area under cotton, significant increase in irrigation, and fertile groundnut cultivation areas shifting to cotton. Also in the 5 pre Bt cotton years, from 2001 to 2005, India's cotton yield increased by 66%, while it increased only by 10% in the 10 years from 2005 to 2015. They pointed out that govt data speaks only about production and not the average yield of Bt cotton. Hence the success story of Bt cotton is more of a myth than reality. The Committee also noted that 21 years after the introduction of GM crops in the world, only 6 countries account for more than 90% of all GM crops globally:- US 40%, Brazil 23%, Argentina 14%, India 6%, Canada 6%, China 2%. Moreover, 17 of the 20 most developed countries in the world do not grow GM crops, which includes most of Europe, Japan, Russia and Israel.¹¹

Trilochan Mohapatro, DG of Indian Council of Agricultural Research, New Delhi says that approval of GM mustard (Brassica juncea) would be a significant moment for the agri-biotechnology industry in India. In October 2017 a PIL was filed by Aruna Rodrigues in the Supreme Court asking for a moratorium on the approval of GM crops until it undergoes an independent evaluation. She claims that GEAC and Pental have exaggerated the benefits of transgenic mustard, and that non-GM mustard could be just as high yielding. She claimed that it was not pitted against the best competitors. So herein lies the deliberate deception. Pental dismissed these criticisms saying the trials were designed to test health and safety, not stringently compare the yields against all competitors. It may be that his GM generation may prove to have lower yield than non-GM mustard. He says that the value of GM mustard was it introduced useful traits like resistance to Blight or Stem rot. About the accusation of fudged data he says it was a simple mistake in data reporting.¹¹

Rodrigues is also worried about an herbicide-tolerant trait bred into the crops. The trait helps in the production of hybrid seeds, but Rodrigues points out that it could lead farmers to spray more herbicides in the field. Though Pental refutes saying the Agricultural Ministry would have to give permission farmers for spraying herbicide, but others say that it will be hard to stop unlicensed spraying. Rodrigues adds that DNA from GM mustard might contaminate other nearby plants. Scientists are clearly divided on this issue. In

some states, anti GM farming organizations have already laid down ultimatums. Rakesh Tikait, a spokesperson for Bharatiya Kisan Union, a leading farmers' organisation in North India has said that his group will not allow GM mustard to be planted.¹¹

Conclusion: It can be said that the issue of GM food crops in India is far away from any immediate solution. WHO and FAO should come forward with evidences from RCT trials that GM crops are not only safe for human consumption but also safe for the environment. Only then can responsible governments solve the question of food security for the future generations.

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