

GM CROPS AND QUESTION OF FOOD SECURITY?

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Introduction:

Genetically Modified (GM) crops are an important issue that is causing much concern to Indian farmers, particularly on two basic points of economic and financial gains. It is reported that the Farmers from Haryana, Punjab, MP, Maharashtra, and Gujarat have been obtaining such GM seeds and saplings from unofficial sources and experimenting with them on their farms. Farmers under the banner of Shetkari Sanghatana from Akola District, Maharashtra protested on 10 June 2019 against “the government’s apathy and indecisiveness” in approving new technology in agriculture and defied the law by planting herbicide-tolerant (HT) GM cotton and Bt Brinjal seeds—which helps in weed control leading to lower labor costs. FIR was filed against the 12 farmers for sowing the GM seeds. A similar thing happened in Haryana in April this year (2020), where the entire crop of Bt Brinjal was uprooted by the government’s agencies, calling it illegally grown. It is also said that these seeds / saplings were supplied by GM seeds companies illegally to the farmers to establish their benefits. Some of the samples directly came from GM research labs to farmers to prove the results. We shall also examine the concern of the respective governments’ for not permitting the use of GM seeds by Indian farmers. There are other groups like Green Peace, and other Environmental NGOs lobbies, who are protesting against the introduction of GM seeds in India on the supposed grounds of unsafe to environmental bio-diversity and health hazards they may pose to society at large. A fear of psychosis about GM crops has been deliberately created by these activists and certain politicians in minds of farmers and the public. In fact, scientific issues cannot be decided by the political vested interest groups. There are scientists all over the world

who have been working hard to produce GM seeds and claiming the immense benefits for the farmers and the society as a whole, making the crops free from insects, besides fortified with vitamins and vital minerals. BT crops actually make the environment safer by eliminating a large portion of the chemical pesticides which are needed to be sprayed on cotton and vegetables. Finally, we shall examine the role of MNCs in the sale, distribution, and control of GM seeds, thereby establishing a monopoly over the agricultural sector at large for their own profit motives.

What are GM Seeds?

The farmers all over the world since the dawn of civilization have been selecting seeds and plants suitable for human consumption from wild varieties available in nature. Interbreeding method of plants and animals was long practiced by him to develop new breeds of animals and plants. Whatever food crops we have today must have been developed over a long period of the history of human civilization. With the development of science and technology, particularly the genetic engineering a new gateway has been opened for direct intervention into the DNA of plants and animals. Modification and insertion of new DNA material from one plant to the DNA of other plants for desired qualities is feasible now. “GM technology enables the plant breeders to bring together in one plant the useful genes from a wide range of living sources, not just from within the crop species or from closely related plants but from nonrelated species also. This powerful tool allows the plant breeders to do faster what they have been doing for years – generate superior plant varieties – although it expands the possibilities beyond the limits imposed by conventional plant breeding.”¹ GM technology allows breeders to cross the species barrier, so a wide range of traits can be introduced in the chosen crop plant. Not only that the “GM technology allows us to go back to the old varieties that

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were used in agriculture, but this time with added trade value, resulting in crops with higher yields or drought-resistance and other such traits.”² GM seeds are nothing but seeds and recombinant with modified DNA seeds using genetic engineering techniques by introducing new traits which does not occur naturally in species to make them resistant to insects, herbicides, drought, virus, delayed ripening, the modified color of the flower or altered composition and to make them more nutritious, fortified with required vitamins and minerals like zinc, at the same time. It is also observed that “Genetically Modified (GM) crops offer improved yields, enhanced nutritional value, longer shelf life, and resistance to drought, frost, or insect pests. Examples of GM crops include corn varieties containing a gene for a bacterial pesticide that kills larval pests and soybeans with an inserted gene that renders them resistant to weed-killers such as Round up also nutritionally enhanced. GM crops under development include varieties of wheat free of gluten, a major cause of food allergy; vegetables with higher vitamin E content to help fight heart disease”³. GM papaya was one of the breakthrough to save the papaya crop from the ring spot virus in Hawaii that had almost destroyed the crops in the 1990s. Today 70% of papaya is of GM variety in the US and China. With the further development of GM techniques “Scientists are also hoping to breed of rice varieties with a higher component of zinc which could prevent stunting and deaths from diarrhea in the rice-eating people of Southeast Asia”⁴. Before introducing such GM seeds extensive field trials are conducted by each country in its own environment to study the overall impact on animals and human beings separately to formulate the law permitting or refusing it due to fear of the impact on the people’s health and the environment of the country. The political considerations of the ruling parties are also playing a major role in taking decisions on GM crops. “GM crops were first planted commercially on a large scale in 1996, in the US, China, Argentina, Canada, Australia, and Mexico. Some countries have approved GM crops but are not actually cultivated due to public pressure and uncertainty of government restrictions, while at the same time; they had allowed the import of GM foods for consumption. For example, Japan is a leading GM food importer, and permits but has not allowed growing of GM food crops. In 2014, 28 countries grew GM crops, and 39 countries imported but did not grow them.”⁵ GM crops grown by that year were GM soybean (50%), GM maize (30%), GM cotton (14%), GM canola (5%), and others (1%). “In 2014, 181.5 million hectares of genetically modified crops were planted in 28 countries. Half of all GM crops planted were genetically modified soybeans, either for herbicide tolerance

or insect resistance. Eleven countries grew modified soybean, with the USA, Brazil, and Argentina accounting for 90% of the total Area. Of the 111 million hectares of soybean grown worldwide in 2014, 82% were genetically modified in some way. Seventeen countries grew a total of 55.2 million hectares of genetically modified maize and fifteen grew 23.9 hectares of genetically modified cotton. Nine million hectares of genetically modified canola was grown with 8 million of those in Canada. Other GM crops grown in 2014 include Alfalfa (862 000 ha), sugar beet (494 000 ha), and papaya (7 475 ha). GM Brinjal grew commercially for the first time in Bangladesh on 12ha”⁵. So the area under GM crops is increasing in so many countries every year. It is now more than 18 to 20 years since GM crops were first introduced in the USA.

Situation of GM Crops in India

As of date BT cotton is the only officially approved GM crop in India (2004). As per data available for the year 2017-18 110.75 lakh ha Bt cotton was grown in India⁶. While the area under Bt cotton seeds is rising, official data for 2018-19, Kharif season reveals that 88.27 percent of the 122.38 lakh hectares cultivation is under Bt cotton of all varieties. Productivity for cotton has gone up from 191 kg per hectare in 2002-03 to 477 kg per hectare in 2017-18 and the production of cotton in the country increased from 8.62 million bales in 2002-03 to 34.89 million bales in 2017-18 due to the adoption of Bt cotton, according to the Ministry of Agriculture⁷. Other two Crops - GM Mustard and Bt Brinjal that were recommended by GEAC (Genetic Engineering Appraisal Committee) to the Ministry of Environment, Forests and Climate Change, Government of India for consideration for environmental release and cultivation as per reply given by Minister in Rajya Sabha 31 July 2017, but final approval is yet to come. In India, the safety aspects of genetically modified crops are assessed by the Institutional Bio-safety Committees (IBSCs), Review Committee on Genetic Manipulation (RCGM) and Genetic Engineering Appraisal Committee (GEAC) constituted under Rules 1989 of Environment Protection Act (EPA) – 1986 based on Bio-safety Guidelines and the Standard Operating Procedures. Unfortunately, it takes decades before any GM crop is approved in India for cultivation.

GM Mustard DMH-11

“The GM mustard was developed by Deepak Pental, Geneticist and former vice-chancellor of the University of Delhi. His team introduced several genes from a soil bacterium, *Bacillus amyloliquefaciens*, into the mustard to

facilitate hybridization. DMH-11 Mustard is largely a self-pollinating crop and creating high-yield hybrids. A report assessing the plant's risks was released a year ago, drawing some 700 comments that were reviewed by the Ministry of Environment's Genetic Engineering Appraisal Committee (GEAC). The report concluded the mustard was safe and nutritious, and GEAC Chairperson Amita Prasad in New Delhi says the commission unanimously agreed on 11 May 2017 to recommend allowing farmers to plant the crop for the next 4 years, but then environment minister Harsh Vardhan referred it back to the GEAC which in March 2018 sought additional field trials on its impact on honeybees and other pollinators⁸. But final approval from the government is yet to come.

GM Brinjal

"Bt Brinjal has been developed by **Mahyco (Maharashtra Hybrid Seed Company Private Ltd)** in collaboration with a number of multinational seeds like Monsanto and public sector institutions like the Indian Institute of Vegetable Research, Varanasi, Tamil Nadu Agriculture University, Coimbatore, University of Agricultural Sciences, Dharwad, Cornell University, USA, and the University of Philippines". "The genetic transformation in Brinjal was achieved in 2000 and its bio-safety was established by rigorous scientific studies and trials for more than five years"⁹. "With the green light from the Genetic Engineering Approval Committee (geac) Bt Brinjal — a genetically modified (gm) food crop developed by the seed company Mahyco — is ready for large-scale field trials and seed production" and "Mahyco (Maharashtra Hybrid Seed Company Private Ltd) has sought permission for four Bt brinjal hybrids: mhb-4 Bt, mhb 9 Bt, mhb80 Bt and mhbj -99 Bt, containing the Cry 1 Ac genetic sequence". Also "the hybrids have successfully completed bio-safety trials," says M K Khan, secretary, department of biotechnology, Union ministry of science and technology"⁹. It is claimed by Mahyco that Bt Brinjal, with its pest resistance capacity, will drastically bring down crop loss and thereby increase the brinjal yield in the country by 54 to 113 percent. Farmers are of the opinion that growing GM Brinjal would be economical for them. As per the farmers' experience in Haryana, they have told that "The GM Brinjal required fewer sprays of pesticide to keep the dreaded fruit and shoot borer pest at bay, he was told. Compared to regular ones that require one spray on every alternate day and they could do with one spray once in two to three weeks, saving about 750 for each day of spraying. A fully matured Brinjal available in the markets usually is sprayed more than 30 times with pesticides, depending on agro-climatic conditions."¹⁰. This

indicated that the vast amount of harmful chemical pesticides used to spray on brinjal crop would be unnecessary in Bt-Brinjal saving the environment from these chemicals. Now it is more than 15 years are over when the field trial was successfully completed, the Official approval for this Bt Brinjal for cultivation is yet to come from the Government of India. "The farmer in Haryana who planted it on his a half-acre plot in 2017 landed in to controversy and his crop was uprooted by the govt. officials calling it poisonous and illegal"¹⁰. The fight for GM crops in India is becoming endless due to political apathies and unscientific opposition from the quarters who have no knowledge of Genetic Engineering.

GM Crops in other Countries:

GM Golden Rice: This GM golden rice (GR2E) had been invented by the Swiss scientist, Igno Potrykus and developed by the International Rice Research Institute (IRRI) Philippines. It has been genetically modified to prevent blindness in undernourished children, was judged safe to eat. "The rice contains extra genes that make a precursor to vitamin A which is vital for preventing childhood blindness. A single helping can supply half the recommended daily intake of vitamin A, according to its developers at the International Rice Research Institute. The distinctive golden hue is also given by the genes"¹¹. However the "latest version of Golden Rice contains three added genes. Two specify enzymes in the β -carotene biosynthesis pathway and are taken from bacteria and maize. The third specifies a (non-antibiotic) selectable marker protein used in the modification process of Golden Rice"¹². US Food and Drug Administration (FDA) has given approval for this Golden rice GR2E in May 2018. "The nod by the FDA makes the US the fourth country to approve the rice this year, after Canada, Australia, and New Zealand. The approval is under process, in the Philippines and Bangladesh, since last year"¹¹. This approval is only for import to the USA from other countries and not for cultivation. However the FDA letter further points out that the "concentration of beta-carotene in GR2E rice is too low to warrant a nutrient content claim, the beta carotene in GR2E rice results in grain that is yellow-golden in color and GR2E rice is not materially different in composition, safety, or other relevant parameters from rice-derived food currently on the market except for the intended beta-carotene change in GR2E rice"¹³. This approval is based on the claims submitted by IRRI Philippines. No one has initiated this GM Golden rice for approval in India. We know that "worldwide, every year, hundreds of thousands of children die due to a lack of vitamin A and multiples thereof become permanently

blind. Forty gram of Golden Rice per day can save eyesight and the lives of 2 million people every year.”², and this is the positive side of GM Golden Rice and hence worth trying for the benefits of millions of rice-eating populations. Vitamin A Deficiency (VAD) is also a serious public health problem affecting millions of children and pregnant women and the people who mostly depend upon rice for nourishment globally. In South and Southeast Asian countries, where two-thirds or more of daily caloric intake is obtained from rice Golden rice can help in the fight against VAD. In view of these benefits, “the attempt by Greenpeace and other NGOs to block transfer and acceptance of Golden Rice is criminal because it has been proven to be completely safe and Golden Rice will be provided to farmers in developing countries free of costs for the trait”².

Another opinion is that amount of beta-carotene in GR2E can be easily obtained from fresh carrot, Asian greens, and spinach. As per Green peace’s calculation, such low levels of beta carotene in GR2E rice would necessitate a person to eat 3.75 kg of Golden Rice per day to receive an adequate amount of beta-carotene. So, the benefits of Golden Rice GR2E as claimed by IRRI are somewhat questionable. Another point is about the retention of Vitamins A in this Rice. “In a 2017 paper published in the *Journal of Agricultural and Food Chemistry* reported that the beta-carotene content of Golden Rice GR2E at harvest is short-lived. This study found Golden Rice retained only 60% of its original beta-carotene levels after 3 weeks of storage and just 13% after 10 weeks. The apparent explanation is that the beta-carotene in Golden Rice is unstable in the presence of oxygen. Thus, under normal storage conditions, the beta-carotene in Golden Rice grains will rapidly degrade.”¹². All these factors if true must be scientifically evaluated by the third-party so that the claims made by IRRI are validated in terms of the benefits of Golden Rice GR2E and we don’t lose the sight of immense benefits it has.

Other GM Crops in the World: First GM crop was introduced in the USA in 1994 was Flavr Savr (Tomato) that had been genetically modified to slow down its ripening process, delaying softening and rotting. This Tomato is being consumed since then without any negative impact on public health. GM crops grown commercially in different countries are “-potato, squash/pumpkin (USA), aubergine or brinjal or eggplant (Bangladesh), sugar beet (USA & Canada), papaya (USA & China), oilseed rape (4 countries), maize corn (17 countries), soybean (11 countries), cotton (11 countries). This includes countries like Brazil, Argentina, and India. Within Europe, GM maize

is grown in Spain, Portugal, Czech Republic, Romania, & Slovakia, and cotton mainly is grown in South Africa, Sudan”¹⁴. From 1994 to 2015, there has been tremendous growth in the Cultivation and import of GM crops all over the world. In the year 2015, total GM crops grown all over the world accounted were “87% of soybean, 75% of cotton, 29% maize and 25% of oilseed rape”¹⁴. In most of the European countries animals feeds are from GM corn and the products from these animals like milk, eggs & meat are being extensively used without any adverse impact of GM Foods on the human beings being are reported.

Also we know that “since 1992, the EU has approved 2404 experimental GM field trials for research. In comparison, over the same time, there have been 18,381 GM trials for research in the USA. Only one GM crop, an insect-resistant maize variety is grown commercially in the EU and no other GM crops have yet been approved for human consumption as fresh fruit or vegetable. In comparison, there have been 117 commercial releases in the USA and other countries outside of Europe since 1992. There were 3 permits for commercial releases in China, 41 in Brazil and 93 in Canada” (Q.14-The Royal Society, May 2014)¹⁵.

Ecological Concerns: There are few issues with GM crops. “First, if GM crops cross-breed with wild relatives, the foreign transgenes could “contaminate” the natural ecosystem. For example, pollen from Bt-corn has been known to fertilize non-Bt crops. Such genetic contamination can pose problems for certified producers of organic produce (but not to GM produce). Second, some ecologists have warned about the harmful effects of Bt corn on non-target insects, such as Monarch butterflies that feed on wild milkweed growing near cornfields. To date, these fears have not materialized and research over a longer period is needed”³. These effects are yet to be verified. In the absence of proper studies, such claims cannot be admitted. The danger of cross-breeding is equally the same both from GM and None GM crops in nature. The scientists have also developed Genetic Use Restriction Technologies (GURTs) or ‘terminator seed’ technology. “The seeds from these GM plants would be prevented from germinating, so if they breed with wild relatives there would be no viable offspring. However, this technology would also prevent farmers from being able to save seeds to plant in future years. There has been an international moratorium on the use of terminator seeds since 2000” (Q.12. I bid).

The Royal Society, UK: Similar concern on GM Crops has also been expressed by ‘The Royal Society’ in question & answers prepared by it based on an extensive survey done with a large number of groups drawn from all

sections of society in the UK. It was brought out that “there have few studies claiming damage to humans and animals health from GM foods. The claims were not about GM methods itself, but about the specific gene introduced into the crops or about the agricultural practice associated with the crop such as herbicide treatments. These statistical analyses and methodology studies have been challenged. All reliable evidence produced to date shows that GM foods are as safe to eat as non-GM foods” (Q&A-page 22)¹⁴. And “there is no evidence producing new crop varieties using GM techniques is more likely to have unforeseen effects than producing one by conventional cross-breeding” (Q&A page-15)¹⁴. As such no conclusive opinion could be formed about these studies. The history of agriculture shows that “In our natural process various genes & viruses enter into the genomes of plants leading to changes in original plants. It is also possible that genes may have come from non-plant species, that may have unknown consequences on non-GM crops. So the possibility of consequences is equal both from conventional and GM plants. With our increased knowledge in Genetic Engineering, it is possible today to avoid such negatives and safeguard our plant species” (Q&A page-15)¹⁴. The present knowledge on GM technology provides us sufficient safeguards against the unforeseen effects of GM crops.

World Health Organization (WHO) in response to questions and concerns from WHO Member State Governments with regard to nature and safety of genetically modified food has replied that “GM foods currently available in the international market have passed safety assessments and are not likely to present risks for human health. In addition, no effects on human health have been shown as a result of the consumption of such foods by the general population in the countries where they have been approved”¹⁵. Also “GM foods have been evaluated by the Food and Agriculture Organization of the United Nations (FAO) and WHO. No allergic effects have been found relative to GM foods currently on the market (Q.5).”¹⁵ In an answer to a question regarding gene transfer, it has been clarified that “Gene transfer from GM foods to cells of the body or to bacteria in the gastrointestinal tract would cause concern if the transferred genetic material adversely affects human health. This would be particularly relevant if antibiotic resistance genes, used as markers when creating GMOs, were to be transferred. Although the probability of transfer is low, as the use of gene transfer technology that does not involve antibiotic resistance genes” (Q.5)¹⁵. ‘Out Crossing’ or ‘Mixing GM Seeds’ with traditional crops is one of the possibilities which may have indirect effect on food safety and food

security. “Cases have been reported where GM crops approved for animal feed or industrial use were detected at low levels in the products intended for human consumption. Several countries have adopted strategies to reduce mixing, including a clear separation of the fields within which GM crops and conventional crops are grown” (Q.5)¹⁵. These observations of WHO are sufficient to allay the fear of GM crops and their use by the people.

Opposition to GM Crops: There are many Anti-GM groups and Organizations like Green Peace in different countries, who are opposing the cultivation and import of GM crops in the respective countries. In India also, affiliated organizations like Swadeshi Jagaran Manch and Bharat Kisan Sangh has been opposing the introduction of GM crops. Their main argument is that unless a complete evaluation of GM crops on soil, production, on consumers is done, these GM crops shall not be allowed in India. In “a meeting held on 18 July 2014, the statutory panel Genetic Engineering Appraisal Committee had recommended that field trials be allowed for 13 GM crops including rice, brinjal, chickpea mustard, and cotton. But the then Environment Minister Mr Jayashankar Prasad, had put this GEAC decision on hold as per the party’s poll promise of 2014 not to allow genetically modified foods without full scientific evaluation of its long-term effects on soil, production, and biological impact on consumers. Swadeshi Jagran Manch and Bharat Kisan Sangh drew attention to the 59th report of the Parliamentary Standing Committee on Agriculture, tabled in the 15th Lok Sabha, which recommended “stopping of all field trials under any garb. The issue of GM crops is pending before the Supreme Court, which is hearing a 2005 public interest litigation by groups of non-governmental organizations led by activist Aruna Rodrigues calling for the government to place a moratorium on biotech crops until new regulations for plant biotechnology are established. The SC appointed committee also suggested that complete moratorium be placed on GM crops until a strong regulatory mechanism is put in place.”¹⁶. As brought out in para-4 above GEAC chairman Amita Prasad in New Delhi said that the commission had unanimously agreed on 11 May 2017 to recommend allowing farmers to plant the crop for the next 4 years, but the then Environment Minister Harsh Vardhan referred it back to the GEAC which in March 2018 sought additional field trials on its impact on honeybees and other pollinators. So it is the consistent policy of the present Govt. not to allow any GM crops in India. Prior to this even ‘UPA govt. environment Minister Jayram Ramesh (Congress) had put on hold the introduction of GM Bt Brinjal on 17 Feb 2010’⁵. We are yet to come out of this political paralysis

and the farmers continue to wait & suffer from the long delay in the introduction of new technology in Agriculture.

Anti-GM Organizations: General perception of the consumers is that only traditionally grown foods crops are safe. Fact is no specific testing and evaluation is done for these crops. We accept them based on the general belief in safety. Some of the anti-GM organizations are posing the question “that growing GM crops will lead to a decrease in biodiversity. But the contrary is true: In areas where insect-resistant crops are grown, the population of non-target insects—varieties other than the ones the crops are resistant to—is much larger than in areas where conventional crops were grown. Additionally, GM technology will allow us to go back to the old varieties that were used in agriculture, but this time with added trade value, resulting in crops with higher yields or drought-resistance and other such traits.”². “Protestors against GM crop try to convince people that these crops are much more expensive for farmers. But if all expenses and yield gains of GM crops are taken into account, they are even less expensive than growing crops conventionally. As compared to conventional seeds, GM seeds are indeed more expensive, but their quality, as measured by their germination rate, is much higher, thus making them more cost-effective. And because GM seeds are herbicide and/or insecticide-resistant, less herbicide or insecticide is used to spray in the fields, effectively reducing the cost for the farmer; insect-resistant GM crops have proven to cut insecticide sprays by more than 25 percent. GM crops also require less tillage, which reduces carbon emissions and allows for the growth of a second crop in the same season, resulting in even more yield gain for the farmer. Finally, fewer patents are valid for farmers in developing countries.”². However so there are no established grounds to oppose the introduction of GM crops in India other than the vested interest of political nature.

Another argument by the Anti-GM lobby is that it will monopolize the control of MNCs and foreign agencies on Indian agriculture via GM seeds that are patented by the MNCs. Mrs Vandana Shiva is very vocal in opposing the introduction of any GM crop in our country. It will also disturb the natural existing diversity in Indian crops and fields. It is not compulsory for Indian farmers to use GM seeds from foreign MNCs, but they can selectively use GM seeds developed and approved by Indian scientists and their own seeds for the subsequent crops. But for certain GM seeds MNCs hold patents, farmers have to buy new seeds every time from them because such GM seeds cannot be saved for sowing for their next

crops. The overall cost of GM agriculture would lesser, due to saving on the cost of pesticides, insecticides, and herbicides.

It is opined that those who are opposing GM crops in India must be helping the import of those Food crops from the international market thus in turn helping the overseas companies. Acceptability or otherwise of GM seeds shall be better left to the scientific community to judge and verify its use rather than the propaganda and psychosis fear created by the some of the foreign-funded NGOs and so-called activists who have nothing to do with agriculture and farmers’ concern. We need advance technology in the field of Telecom, Banking, Space, Military, Education, Hospitals, Media, Communication, and other fields of life, then why not in the agriculture sector? Is that farming community does not have proper representation or lobby in Government to force it to make decisions in its favor? Why we are opposing the introduction of GM crops based on hearsay and on the unscientific basis of the propaganda being done by the vested interest groups. This blind opposition is also influencing the farming community all over the country. Our political masters should base their judgments and decision on the basis of scientific evaluation and recommendations of the statutory panel Genetic Engineering Appraisal Committee (GEAC). Once it is cleared by this body, we should not put hurdles in path of introduction of GM crops if they have the really proven benefits not only to the farmers to have bumper crops, to create surplus for Indian market to ensure food security. India’s growing population needs more food crops in a smaller area, as the land holdings per family are coming down.

It must be made very clear that “No science can progress in the country if political pressure is put on scientists. Outright condemnation of technology and confusing farmers is not the right approach. Our scientists are in no way inferior to foreign scientists in many fields, as has been widely acknowledged...The degradation of science does not augur well for the healthy development of any nation. Every idea deserves a fair trial and review for a reasonable period of time before the technology is withdrawn for fear of negative impact. The activists and politicians should understand that any biological system will have some problems which can be fixed.”¹⁷. Also, Scientific matters cannot be decided by the courts as some organizations try to take up the matter to courts for settling the scientific issues. Therefore keeping in view the world experience on GM crops and their valid verification by the scientific communities shall be honored in the interest of

farmers and the society as whole as it will not only lead to the bumper crops but add to food security of the nation.

Last 15 to 20 years of experience in the use of GM products and sowing of GM crops in different countries, has not brought any adverse impact on the life of people. "The fact is that in many countries, GM crops have been successfully developed and accepted by farmers and the public alike. Obviously, the bio-safety norms were followed before the release and field test."¹⁷. "More than 2,000 scientific papers over the last 10 years have evaluated the safety of GM crops on human health and all of them have concluded that they are as safe as crops obtained by conventional breeding. Furthermore, for the past 15 years, people in the United States have been eating GM crops and, until now, not one single negative health effect has been observed"². It is not proper to have fear of GM crops as people in so many countries have used them without any indicated harm.

Ministry of Environment has admitted in a written reply in Lok Sabha on 20th July 2019, that "There is no scientific evidence to prove that genetically modified (GM) crops are unsafe"¹⁸.

"Last December, the Ministry of Agriculture had told the Rajya Sabha that the bio-safety studies conducted by ICAR Institutes indicated that there was no effect of GM cottonseed feed on animals, poultry, fishes, and goats after feeding them on cottonseed cake or green leaves"¹⁹. So Government is admitting that GM crops are safe. If that is so then why it is not giving approval for other GM crops like Mustard and brinjal, Soya, and Golden Rice for their cultivation in India. It is a double standard. At the same time, the Government has issued a directive to "All States/ Union Territories have been directed to constitute and strengthen state/UT bio-technology coordination committees and district-level committees for monitoring instances of illegal cultivation of GM crops and taking appropriate action under Environment (Protection) Act, 1986"¹². The fact is that the present government is under political pressure from its frontal organizations not to approve GM crops, although some of the GM crops like Bt Brinjal are being harvested illegally in Andhra Pradesh, Haryana, Maharashtra, and Punjab."For years, farmers were sowing HT Bt Cotton secretly. Now we will do it openly. The ban on GM crops is atrocious when farmers are reeling under poverty, says Sanghatana president Anil Ghanwat, hinting that "vested interests" were behind the opposition to Bt Cotton and Bt Brinjal. Despite the ban, unapproved HT Bt Cotton is cultivated widely in Gujarat, Maharashtra, Telangana, and Andhra Pradesh"⁷. This is how farmers have found the utility of GM seeds by experiencing

themselves in the fields. It must be noted that approval for Bt Cotton in India was given only after decades of farming unofficially by Farmers in Gujarat, Maharashtra, and MP.

Conclusion

GM crops are being grown all over the world in different countries and the area under it is increasing every year. Newer countries are joining in support and cultivation of GM Crops. It has benefitted millions of farmers and society at large in making the availability of Food crops all over the world. Traditionally developed countries and European nations have taken full advantage of GM crops. An important factor that cannot be ignored is that the GM seeds make the crops resistant to insects, herbicides, drought, virus, delayed ripening, and modified or altered composition, and make them more nutritious, fortified with required vitamins and minerals like zinc. It is the only country like India that is hesitant due to political considerations to approve GM crop cultivation in India. The scientific community and various committees set by the Government like GEAC have concluded that GM crops are safe and have recommended their cultivation but due to strong lobbying by foreign-controlled NGOs, activists, and organizations like Swadeshi Jagran Manch and Bharat Kisan Sangh, it has failed to take decisions on it. This opposition really has no proven scientific basis against GM seeds and their cultivation other than vested political interest. Maybe some of the GM crops have patents with Foreign MNCs, but their benefits outweigh the cost that we have to pay for buying GM seeds from them. Indian farmers have the capability to reuse the seeds from the same GM crop and no need to buy them every time. Another option for Indian farmers is to use GM varieties developed by our scientists and universities. We are paying heavily for the import of soybean and Corn, and Oilseeds from other countries. Scientific matters cannot be left to the whims of vested interest politicians and scrutiny of the judicial system. Even insignificant matters are landing in the Supreme Court nowadays. It is unfortunate that India is having more than 60 agricultural universities and colleges in India, and has failed to make any revolutionary mark on the development of GM Seeds. Farmers in India suffer every year from draughts, heavily depend upon pesticides, and are affected by floods, and even after hard work and bumper crops they fail to get a due price for their crops- MSP, because of middlemen and traders who control the wholesale markets. Distress sale is the order of the day. Thus they are exploited to the core. Suicides of farmers are increasing every year, with

no support coming from Government quarters... Under the circumstances, GM crops can give definite relief to the farmers with lesser input costs. BJP's government had given poll promises in 2019 to double the farmers 'income by 2022, but it cannot be achieved on the basis of traditional methods of crops. It is only with GM crops farmers can really fulfill this dream. The changing environmental and climatic conditions in the world, more frequent droughts, shortage of water for crops, and the estimated growth of the world population up to 10 billion by 2050, definitely need fast-growing crops even in harsh climatic conditions like African and Asian countries to feed such a large population. Fast-growing nutritious GM crops along with interbred traditional crops could be the answer for world food security in future depending upon the climatic conditions of the respective countries. "It is proven that GM crops result in much higher yields per hectare and fewer pesticides and herbicide use. In order to obtain the same kind of yields for conventionally bred maize or soybean, even more land and pesticides will be needed."² Those, opposing GM crops in India must be helping the import of those crops from the international market thus supporting the overseas companies? Acceptability or otherwise of GM seeds shall be better left to the scientific community to judge and verify its use rather than the propaganda and psychosis fear created by the some of the foreign-funded NGOs and so-called activists who have really nothing to do with agriculture and farmers concern. In India, the safety aspects of genetically modified crops are assessed by the Institutional Bio-safety Committees (IBSCs), Review Committee on Genetic Manipulation (RCGM) and Genetic Engineering Appraisal Committee (GEAC) constituted under Rules 1989 of Environment Protection Act (EPA) – 1986 based on Bio-safety Guidelines and the Standard Operating Procedures. These multiple levels of safety would definitely ensure that only certified, completely tested, and proven field trials GM crops are introduced. □

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