

To
The Supreme Court Committee on GM Crops

Sub: Concerns on GM Crops, Learning from Bt Cotton

Dear respected members of the Supreme Court Committee

Thanks for accepting our request to hear to our concerns over GM crops based on the learning experiences from Bt cotton in the last ten years. We are also hopeful that the process will result a better decision making on GM crops in the country

Centre for Sustainable Agriculture is working on promoting sustainable agriculture in Andhra Pradesh, Maharashtra, Punjab and Chhattisgarh.

We are regularly following the Bt cotton and other GM crops in this country from field trials stage to commercialization. We have submitted our reports regularly to GEAC and some were indeed taken notice of.

Please find enclosed our concerns on the GM crops at this point of time given the imprecise technology involved, experiences from last one decade, safety questions raised and relevance given the large alternatives existing.

Your decision is going to change the lives of many forever. We feel the issue is in safe hands.

Regards

(Ramanjaneyulu)

Concerns Genetically Modified Crops

Learning from Experiences with Bt Cotton

New Technologies often have great potential and promise much, but also need to be assessed adequately in order to establish the relevance and ensure that they are safe, as well as environmentally and socially sustainable. Genetic Engineering and Genetically modified crops are examples where, despite promises and expectations of benefits, concerns remain over their potential risks to human health and environment. Moreover there are many socio-economic considerations that need to be taken into account, particularly in a country like India where small farmers and small farms are in majority and where the farmers are already in ecological and economic distress. Therefore before taking any decision on such critical issue decision should be based on assessing

- A. **Environmental Risk Assessment:** The process of Genetic transformation is imprecise hence needs a relevant risk assessment frame work based on the ecological and socio-economic conditions of adoption.
- B. **Relevance of technology:** India being a country of small farmers and small farms, the relevance of the technology should be assessed in the conditions and against the available best technologies.
- C. **Transparent and Accountable Regulatory system:** The processes adopted by the regulatory system should be transparent and accountable for the decisions being taken in assessing the potential risks.
- D. **Socio-Economic Impact:** The socio-economic impact of any technology should be assessed in specific context. This impact assessment should also include the impacts of seed prices and the IPRs involved.

A. The Framework for Environmental Risk Assessment

The integration of foreign DNA into an established genome may have unanticipated side effects, e.g. chromatin changes, genome instability, unexpected protein products from transgene(s), and influence on overall organismal gene expression patterns in quantitative as well as qualitative terms, of the recipient organism. Therefore there is a general need for a holistic and integrated basis for assessment of the properties and effects of GMOs¹ (Haslberger, 2006). This conclusion was also drawn by a recent World Health Organisation (WHO) report (2005)².

Therefore the Environmental Risk Assessment of any GMO particularly as food is critical before releasing into the environment. In this context before deciding on any of the GM crops further, we need to review the experiences of last ten years of Bt cotton. While the governments and industries make big claims of production improvement and India raising to second position in terms of production in the world. But the reports of Planning commission on Vidharba (Planning Commission, 2005)³ Animal Deaths from

¹ Haslberger AG (2006) Need for an Integrated Safety Assessment of GMOs, linking food safety and environmental considerations, J Agric Food Chem 54: 3173-3180

² WHO (2005) Study on modern biotechnology, human health and development. http://www.who.int/foodsafety/biotech/who_study/en/index.html

³ Planning Commission (2005) Report on Vidharba <http://www.planningcommission.nic.in>

Andhra Pradesh (Animal husbandry Department, Govt of AP, 2007)⁴, Skin allergies from Madhya Pradesh (JSA, 2005)⁵, Genetic Contamination⁶ have brought in ecological risks associated with this so called big 'Cotton Revolution'. Though many promises were made on reviewing the Bt cotton performance, neither Ministry of Agriculture or Ministry of Environment of Government of India have made any beginning on this. And today, the risks posed to the people in terms of health, livelihoods, and resources are not considered in assessing Bt Brinjal and other GM food crops.

1. Toxic effects on non-target organisms (including food chain and soil organisms):

a) Impact on soil organisms: The farmers growing Bt cotton were reporting that the yields of second crop after bt cotton are reduced. Studies done by Indian Agricultural Research Institute, New Delhi showed that the populations of beneficial microorganisms in the soil are reduced.

i) Expert Committee-I recommended 'Soil impact assessment study should include tests on the total microbial counts related to Rhizosphere on the soil of Bt and normal'. The studies on impacts of second crop were not done. Root exudates and enzymatic activity were not studied.

ii) The reports suggest that there is no Bt toxin identified in the soil where as many earlier studies including on Bt cotton in India by IARI and in a study by Australian university Bt toxins were found in the soils for significant time (more than 45 days). In the case of Bt Brinjal if the reports are saying no Bt toxin was detected, the methodologies need to be rechecked⁷.

iii) Data shows variations between microbial profiles between soils growing Bt brinjal and non-brinjal but no statistical analysis was done to say whether it is significant.

iv) At 30 DAT sampling point the **collembolla population was a little more, & at 60 DAT sampling point it was quite low as compared to the other time points**, and argues that it is an isolated instance.

b) Impact on sheep and other ruminants: Reports on mortality of sheep and other small ruminants after grazing on Bt cotton plants from Andhra Pradesh, Maharashtra and other parts of the country. Animal Husbandry department of Andhra Pradesh have clearly raised doubts over the biosafety tests done and impacts of bt cotton.

i) Expert Committee-I recommended that the Food / Feed Safety assessment should include foliage toxicity study in Goats'.

ii) GEAC decided to dispense with this requirement on the following grounds:

- The reports of sheep deaths due to Bt cotton were unsubstantiated.
- RCGM indicated that large mammals like goats are not used for toxicity studies using whole foods, anywhere in the world and there are no scientific references on validation of goat as a model for studying sub-chronic feeding studies.
- Brinjal leaves are not part of natural diet of goats and thus feeding protocol cannot be scientifically validated

⁴ Letter Written by Director, Animal Husbandry Department, Government of AP, to GEAC

⁵ Jan Swasth Abhayan (2005) Impact of Bt Cotton on Farmers' Health (in Barwani and Dhar District of Madhya Pradesh) , Study report by Jana Swasth Abhayan and Narmada Bacho Andolan.

⁶ The minutes of ICAR meetings on Bt Bikeneri Narma

⁷ Sarkar et.al (2008) Transgenic Bt-cotton affects enzyme activity and nutrient availability in a sub-tropical inceptisol, J. Agronomy & Crop Science

- iii) The postmortem reports by the department of Animal Husbandry, Government of AP showed that there were no known toxins (including pesticide residues) and known diseases in the caresses. The analysis showed that bt cotton plant leaves had higher nitrate content which is unusual compared to non-bt cotton leaves.
- iv) The Director, Animal Husbandry, Government of AP organized a meeting with the concerned scientists, industry and affected people and based on the discussions wrote to GEAC that biosafety tests done on cotton are inadequate and since open grazing in farms is a real situation in India and foliage studies needs to done⁸.
- v) The GEAC lied on various occasions on this issue to the nation saying IVRI has studied where as IVRI neither visited the sites nor done any studies⁹.
- vi) International Codex is only minimal set of guidelines to be followed. We need to design additional biosafety tests based on real situations.

2. Allergenicity: Genetic modification can result in production of several known and unknown compounds which can result in allergenicity.

- a) Expert Committee-I recommended that Bt brinjal being a food crop, a flavour analysis of Bt and non-Bt fruits shall be undertaken at Central Food Technology Research Institute (CFTRI), Mysore/any other NABL accredited Laboratory.
 - CFTRI, Mysore was approached for flavour study. However, they expressed their inability to conduct study on transgenic crop product at this stage.
 - EC-II says ‘There is a deviation as the **institution refused to conduct the study**. However, as per the recently adopted ‘Guidelines for safety assessments of food derived from GE plants, 2008’, such kind of studies do not form part of safety assessment. EC-II is of the view that such studies are not required as per the internationally prescribed Codex guidelines and national guidelines prescribed by the GEAC. Therefore, studies of such nature need not be a prerequisite for consideration for environmental release’.
 - The decision on a Food crop cannot be taken without doing safety assessment. The new guidelines are result of the USAID initiative in the name of harmonizing IPR systems and two of the members of the expert committee were part of that exercise. A clear conflict of interest
- b) Bt Toxin is known to have many allergic and toxic properties (Swadener, 1994). Even in India, several complaints were made by the farmers and agriculture workers in AP and other parts of the country. In Madhya Pradesh Skin, Upper respiratory tract and eye allergies were reported by persons exposed to cotton. The symptoms vary from mild, moderate to very severe to the extent that one women had to be admitted for 9 days as a result of allergy. The allergy is not restricted to farm labourers involved in picking cotton but has affected labour involved in loading and unloading Bt from villages to market, those involved in its weightment, labourers working in ginning factories, people who carried out other operations in the field of BT cotton, or

⁸ Letter to GEAC by Director, Animal Husbandry Department, Government of AP.

⁹ Information under RTI from Director, IIVR.

farmers who stored cotton in their homes etc. Thus the symptom is affecting people widely exposed at different places. The symptoms were not restricted to one particular farm but several farms in 6 villages spread around 4 tehsils of 2 districts. (Jana Swasth Abhayan, 2005).

c) In case of Bt brinjal EC-I recommended that the skin sensitization test of transgenic material in guinea pigs as laid down in the DBT guidelines shall be conducted

- RCGM was of the view that such skin sensitized tests on plants has **no relevance** especially when Bt brinjal has found to be safe in the feeding studies and even the purified Bt gene has been extensively studied for toxicity and allergenicity. The guidelines since have been revised and the **study is not required** as per the "Guidelines for safety assessment of foods derived from GE plants, 2008"
- Skin allergies were reported by agriculture workers and farmers while working in the bt cotton fields. Expert committee only talked about the allergenicity of the bt toxin consumed as part of the food. There are enough evidences to show that pure bt protein has allergic/toxic properties on humans and animals (Swadener, 1994¹⁰)

d) On Bt Brinjal EC-I also recommended that Additional toxicity/allergenicity/compositional/nutritional studies, if any, as recommended by Director, National Institute of Nutrition (NIN), Hyderabad shall be conducted

- No additional studies were recommended by Director, NIN regarding toxicity and allergenicity except the need for detailed compositional analysis. The same has been initiated by the applicant after the protocols was approved by RCGM in its 77th meeting held 02.05.2009
- The information from NIN under RTI shows that NIN director only looked at **data from 3 tests** and on what basis NIN Director expressed his satisfaction over the entire data sets? Earlier, he also raised questions regarding the genuinity of the samples supplied. This was not answered.

3. **Toxicity on plants:** In an article in the June 2011 issue of the Journal of Biosciences, 'Detrimental effect of expression of Bt endotoxin Cry1Ac on in vitro regeneration in vivo growth and development of tobacco and cotton transgenics,' Delhi University scientists reported that the expression of the Cry1Ac endotoxin has detrimental effects on the development of transgenic plants. The plants that showed appreciable Cry1Ac expression were phenotypically abnormal: they were malformed. This suggests preferential selection is at work while transgenic plants mature: those that express low level of Cry1Ac have better chances of coming through compared with ones expressing appreciable levels of the gene (<http://www.ias.ac.in/jbiosci/jun2011/363.pdf>).

4. **Persistence in body:** A recent study (2011) from Canada published in the Journal 'Reproductive Toxicology' has shown that Bt proteins have survived the human digestive system and passed into the blood supply and found in the unborn babies¹¹.

¹⁰ Swadener Carrie (1994) *Bacillus thuringiensis (Bt)*: Insecticide Fact Sheet, Journal of Pesticide Reform v.14, n.3 Fall94

¹¹ Aziz Arisa, and Samuel Leblan (2011) Maternal and fetal exposure to pesticides associated to genetically modified foods in Eastern Townships of Quebec, Canada, *Reprod Toxicol*. (<http://www.ncbi.nlm.nih.gov/pubmed/21338670>)

5. Effects on Biodiversity: One of the major concerns of release of GM crops into environment is the problem of impacts on the Biodiversity in terms of genetic contamination of other non-gm varieties and wild relatives, pest shifts, in addition to aggressiveness and weediness. The Mexican experience shows that the maize germplasm collection is even in CIMMYT¹². The introduction of Bt cotton in India has not only seen displacement of non bt cotton varieties/hybrids but also contamination of the non bt cotton varieties/hybrids due to outcrossing and seed mixtures. This has led to rejection of organic cotton exports from India. In addition, the sucking pests like mealy bug, whitefly and jassids have increased which resulted in similar use of chemical pesticides. The increase in sucking pests which acts as vectors have increased the incidence of viral diseases.

- a. **Genetic Contamination:** CSA study in 2007 showed that cotton across the country was contaminated. What is sold as non bt cotton is actually having bt genes. The physical and genetic contamination is observed which makes co-existence impossible. Bt Bikeneri narma is a classical example of this problem.
- Public sector Bt Cotton was always shown as a solution by the research community for the problem of MNC Bt cotton
 - **2001:** Bt bikeneri narma was developed using event BNLA-601 which was jointly developed by UAS, Dharwar and NRCPB, New Delhi
 - **2005:** The event BNLA-106 was reported to have been contaminated with Mon-531 event and this was communicated to the then Director of CICR
 - **4th-5th May, 2008:** After commercial approval by GEAC samples were sent for testing to Awasthagen which confirmed presence of Mon-531 in eight of the samples
 - **21st May, 2008:** a meeting chaired by DDG (crop sciences) concluded that 'possible presence of Mon-531 is not an issue any more because of the strong molecular evidence produced by Dr. Anand Kumar, NRCPB
 - **2009:** MAHABEEJ, a Maharashtra State Seed Corporation reported that the BN Bt seed was not pure with respect to several traits including Cry1Ac
 - **December 2009:** Meeting chaired by DDG (CS) decides to stop production and commercial sale of BN Bt and Bt NHH-44

This brings up few questions which need to be answered before taking up decision on any of the GM crops.

- Why it was released in spite of knowing about presence of Mon-531
- if it is a false claim how come it was not detected during the regulatory testing and approval process
- if contamination is a problem what happened to the originally developed variety Bt BN-1 and hybrid Bt NHH-44?
- Instead of withdrawing these varieties/hybrids why didn't ICAR freshly multiply and supply the same varieties/hybrids?

¹² David Quist & Ignacio H. Chapela (2001) Transgenic DNA introgressed into traditional maize landraces in Oaxaca, Mexico, NATURE: VOL 414, 29 NOVEMBER, 2001.

- if contamination has happened and there is no mechanism of reviving these varieties/hybrids the following two questions need to be answered
 - If contamination has happened and is inevitable, how come the two other events of Bt cotton (one by JK Seeds and another by Nath seeds) are still in market? And why MON-531 and other events are not yet contaminated
 - The argument that contamination in hybrids can be avoided as seed is freshly produced every year also do not stand as Bt NH-44 is a hybrid.
 - If contamination is inevitable then how ICAR and SAUs working on the GM crops are going to market their GM crop varieties/hybrids in future?
- b. **Pest resistance and pest shifts:** Whether the weapons are pesticides sprayed on the crops or genetic protection built into the plant, the pest usually adapts to the new conditions sooner or later and the protection becomes ineffective. Transgenic Bt cotton plants contain genes for Bt toxins derived from the soil bacterium *Bacillus thuringiensis*. These toxins kill the caterpillar stage of bollworms; *Helicoverpa armigera* (Cotton bollworm) and *Pectinophora gossypiella* (Pink bollworm). Bollworms are known to be able to develop genetic resistance to Bt toxins as per the reports from researchers in USA, Australia and India. To prevent or delay the emergence of insect resistance to Bt crops, the biotechnology industry and the Environmental Protection Agency developed a Insect Resistant Management (IRM) strategy as a component of seed contracts biotechnology companies sign with farmers.

a. Studies on Resistance to Bt in India:

- i. A study by Fakruddin et al (2002)¹³ of Dept. of Biotechnology, UAS, Dharwad and Dept. of Entomology, Collage of Agriculture, Raichur revealed the resistance of H.armigera to Cry1Ac toxin in 11 distinct geographic populations representing the entire South Indian Cotton Ecosystem. The data shows that even before the use of Cry1Ac transgenics, the level of resistance was 8.4 fold in Nanded population followed by 8.03, 7.70, 7.13, 6.80, respectively for Guntur, Nalgonda, Madhira and Raichur. Notably, variability for response to Cry1Ac toxin does exist in the target population, whether or not previously exposed to the toxin. When the Bt cotton was permitted for commercial cultivation in India, Genetic Engineering Appraisal Committee (GEAC) had imposed refugia conditions (<http://envfor.nic.in/divisions/csurv/btcotton/bgnote.pdf>). But, the conditions were put without any basis. For example the refuge strategy should be developed only after considering (1). the recessive/dominance factor of resistance (2). the initial frequency of the resistant allele and (3). the mating behavior of

¹³ Fakruddin B *et al.* (2003) Baseline resistance to Cry1Ac toxin in cotton bollworm, *Helicoverpa armigera*(Hubner) in South Indian Cotton Ecosystem, Current Science,vol.84,no.10,pp-2-6.

the insect moth. In addition differential plans based on whether refuge crop is sprayed or unsprayed were never mentioned.

- ii. GEAC has merely borrowed the recommendations from the EPA without adequate studies done in India on refuge requirements. The Monitoring and Evaluation Committee reports clearly showed that refuge is not planted in most parts of the country. The company argued that other non bt cotton and other crops which acts as hosts for *Helicoverpa* acts as refuge and allows them to dispense with refuge requirement.
- iii. Kranthi et.al, (2005)¹⁴ reported that the quantitative levels of Cry1Ac and the seasonal decline in expression differed significantly among the eight commercial Bollgard hybrids tested. The Cry1Ac expression was found to be variable among the hybrids and also between different plant parts. The leaves of Bt-cotton plants were found to have the highest levels of Cry1Ac expression followed by squares, bolls and flowers. The toxin expression in the boll-rind, square bud and ovary of flowers was clearly inadequate to confer full protection to the fruiting parts. Increasing levels of *Helicoverpa armigera* survival were correlated with the toxin levels decreasing below 1.8 mg/g in the plant parts. Genotype-independent seasonal decline of the Cry1Ac toxin levels was observed in all the hybrids. Cry1Ac expression decreased consistently as the plant aged. The decline in Cry1Ac was more rapid in some hybrids compared to others.
- iv. A study done in Karnataka by scientists from the University of Agricultural Sciences in Raichur and the Institute of Wood Sciences and Technology in Bangalore (Ranjith et.al 2010)¹⁵ has established that the bollworm, the major cotton pest in India is not only thriving on both the single gene Bt cotton(Cry1Ac) and the double gene Bt cotton (Cry1Ac & Cry2Ab). The authors said that it has been demonstrated that the bollworms not only survive after feeding on Bt cotton plants, they are able to complete their lifecycle and reproduce and create the next generation of resistant pests.
- v. The double gene Bt cotton was introduced in India in 2006 while the single gene product, which has already shown resistance to pink bollworm, was approved in 2002. In 2008

¹⁴ Kranthi, KR , S. Naidu, C. S. Dhawad, A. Tatwawadi, K. Mate, E. Patil, A. A. Bharose, G. T. Behere, R. M. Wadaskar and S. Kranthi 2008 Temporal and intra-plant variability of Cry1Ac expression in Bt-cotton and its influence on the survival of the cotton bollworm, *Helicoverpa armigera* (Hübner) (Noctuidae: Lepidoptera) CURRENT SCIENCE, VOL. 89, NO. 2, 25 JULY 2005, <http://www.ias.ac.in/currsci/jul252005/291.pdf>

¹⁵ Ranjith. M. T., A. Prabhuraj, and Y. B. Srinivasa (2010) Survival and reproduction of natural populations of *Helicoverpa armigera* on Bt-cotton hybrids in Raichur, India Current Science, Vol. 99, No. 11, 10 December 2010

when it was reported in a study by Bruce Tabashnik (Tabashnik, 2008)¹⁶ in the US that Bt cotton had developed resistance to bollworm (*Helicoverpa zea*), officials of Mahyco Monsanto Biotech Ltd were quick to reassure that the key target pest to cotton in India had a different resistance pattern and that in addition Bollgard II was “a superior” product.¹⁷

- vi. The resistance development in bollgard also has an implication on other varieties and hybrids being developed by public sector institutions in cotton and other crops as well using the same/similar genes. If insects develop resistance to this toxin what would be the status of the farmers who use it? As this technology lag between public sector and private sector always happens, their research will not be irrelevant most of the times.
 - vii. **Resistance to Pink Bollworm:** In March 2010 Monsanto India admitted in a press release that Bollgard1, the Bt cotton with the single protein Cry1Ac, has developed resistance to pink bollworm (*Pectinophora gossypiella*). Resistance was confirmed in four districts in Gujarat - Amreli, Bhavnagar, Junagarh and Rajkot. They advised farmers to adopt Bollgard II their own Bt cotton with stacked genes. Pink Bollworm being specific to cotton, mono cropping of Bt cotton has led to fast resistance development. However Monsanto blamed farmers for not adopting refuge and spurious Bt cotton hybrids grown in Gujarat¹⁸.
 - viii. The issues of resistance was not discussed either by the company or CICR (which is supposed to have reported on resistance every year) or GEAC (which is supposed to have reviewed the reports) during Bt Brinjal consultations; this clearly amounts to withholding of information. Brinjal Fruit and Shoot borer is also a monophagous pest like Pink Bollworm. Hence similar resistance development can be expected if Bt brinjal is approved for commercial cultivation.
- b. **Pest Shifts:** Another problem is that the disturbance of the pest ecology by these crops has resulted in the emergence of many secondary and minor pests into major threats to the cropping system.
- i. Dr. Keshav Kranthi of Central Institute for Cotton Research has said that due to the widespread adoption of Bt cotton secondary pests like mealy bugs and whiteflies have emerged as a major problem in Bt cotton forcing farmers to spray toxic chemicals and pesticide usage in Bt cotton is on the rise after an initial decline. He said that almost 90% of the Bt cotton

¹⁶ Tabashnik, Bruce E, Aaron J Gassmann, David W Crowder and Yves Carrière (2008) Insect resistance to *Bt* crops: evidence versus theory *Nature Biotechnology* 26, 199 - 202 (2008)

<http://www.financialexpress.com/news/no-signs-of-bollworm-resistance-to-bt-cotton-in-india-mahyco-monsanto/276655/0>

¹⁸ (http://www.monsanto.com/monsanto_today/for_the_record/india_pink_bollworm.asp)

hybrid grown in India is susceptible to these two pests and reported that insecticide use in cotton increased from Rs 640 crores in 2006 to 800 crores in 2008.

- ii. A ten year study, across 1997-2008, in China revealed that Bt cotton cultivation has resulted in a 12 fold increase in mirid bugs, formerly a minor pest in cotton, making it the major pest of Bt cotton and inducing farmers to spray pesticides extensively. This jump in mirid bug population is also affecting other crops in addition to reducing cotton yields as much bollworm did in the pre Bt days (Wu et al, 2010)¹⁹.

B. Relavance

Before introduction of any new technology one need to see and the need of the technology in the ecological and socio-economic situation into which the technology is introduced.

India is the centre of origin and centre for diversity for many crops including cotton, brinjal and rice. Internationally accepted norm is that no GM technology would be tried in those crops in countries which are centres of diversity. For example China never tried GM soybean. But in India with studying these public and private sector institutions are going ahead with the GM research. While getting approvals the arguments are build to suit their case.

The Case of Bt Brinjal: While across the world, efforts are being made to own and protect the biological resources, the Bt brinjal has started a dangerous trend of disowning the claim of India as the Centre for Origin of Brinjal. The Mahyco's own first report shows that India is the centre of origin, while the later reports deny the fact. Leaving aside the debate on centre of origin one has to accept that India as one of the major Centres of Diversity. This is a criminal offence and National Biodiversity Board should initiate legal action on all the concerned.

Relevance of Technology: Insect resistance is the major trait which is under research in the country. There are several good examples in the country to manage crops without using chemical pesticides in organic and Non Pesticidal Management methods.

For example in India, Brinjal is grown in about 5.5 lakh acres of which majority (more than 85 %) is grown in less than half acre that in a mixed/intercrop situation. There was never a short fall in production. The high use of pesticide in brinjal for managing brinjal fruit and shoot borer is seen but it is mostly in the monocropped and high chemical used conditions. There are safer practices as Integrated Pest Management (Alam, 2003²⁰, Srinivasan, 2008²¹), and Non Pesticidal Management (which can be used

¹⁹ Kongming Wu (2010) Implementation and Impact of Bt cotton in China

²⁰ Alam SN et.al (2003) Development of an IPM strategy for eggplant fruit and shoot borer in south asia, Technical Bulletin No-28, AVRDC-The World Vegetable Centre

²¹ Srinivasan R (2008) Integrated Pest Management for eggplant fruit and shoot borer (*Leucinodes orbonalis*) in south and south east Asia: Past, Present and Future, Journal of Biopesticides, 1(2):105 - 112 (2008)

for effective management of Brinjal fruit and shoot borer. FSB being a monophagus pest and mate only once in its life time, it can be managed easily.

- a) **Efficacy compared to best management practices:** The field trials should focus on establishing the efficacy of of the particular trait against the best available practices, and in case of Bt Brinjal in managing Brinjal Fruit Shoot Borer
- Neither in the Multilocation field trials nor in Large Scale Field trials, the Bt brinjal was tested against the Best available management practices like IPM, NPM or Organic.
 - The Large scale field trails also have not included the local check.
 - Asian Vegetable Research and Development Centre, Bangkok and Natural Resources Institute, UK have established the IPM and NPM practices widely in India in partnership with Tamil Nadu Agriculture University, Gujarat Agriculture University and Centre for Sustainable Agriculture (Centre for World Solidarity earlier) during 2000-2003. The practice of NPM on large scale covering more than 35 lakh acres during 2011-12 in Andhra Pradesh in various crops clearly shows that Eco-Friendly practices like NPM are effective and possible to adopt on large scale (World Bank, 2009)²².
 - None of the data presented in the reports is statistically analyzed which therefore do not establish any merit of Bt Brinjal
 - **Refuge:** 20% of the crop area needs to be planted with non-Bt refuge. Given that the Brinjal FSB is monophagous pest the selection intensity would be very high. Managing refuge was a failure in Bt cotton. In Brinjal where 80 % of plots are less than 1/4th acre how this refuge would be managed? In US today the refuge is recommended as 40 % due to building of resistance.
 - Given the global experience with Bt crops across the world (only 22 % of total GM crops are Bt) with resistance building up and resurgence of secondary pests it could be effective only for 3-5yrs. The risk is not worth taking.
- b) **Abiotic Stresses:** In a situation where in increasing costs of cultivation are impacting farmers, and much of the crop is grown in small plots and in rainfed conditions, introduction of GM crops proves detrimental. The report of Planning Commission on Vidharba farmers Suicides clearly shows that the Bt Cotton was highly susceptible to drought situations. The GM field trials have ignored this issue.
- i) Drought Resistance, salinity resistance etc are shown as some classical cases for which GM can be used and is touted as a solution for impacts of climate change. GM research is underway even in crops like Sorghum which are naturally drought resistant.

²² World Bank (2009) T. Vijay Kumar, D.V. Raidu, Jayaram Killi, Madhavi Pillai, Parmesh Shah, Vijaysekar Kalavadonda, and Smriti Lakhey, Ecologically Sound, Economically Viable-Community Managed Sustainable Agriculture in Andhra Pradesh, India, World Bank.

- c) **IPRs, farmers' rights and Seed prices:** the Bt Cotton seed prices have forced several state governments like Andhra Pradesh and Gujarat to move to court and initiate new legislations to regulate the seed prices. Even without any legally protected rights in the case of Bt Cotton, state governments and farmers and even Indian seed companies had to contend with the monopolistic behaviour of Mahyco Monsanto Biotech, the issues are going to get murkier with Mahyco owning a Bt Brinjal and technology being licensed from Monsanto. Further, public sector universities have parted with their germplasm, with the initial varieties obviously belonging to some farming community or the other, to develop Bt Brinjal varieties in a consortium project called ABSPII. In all of this, it is not clear who has the authority to regulate seed sales, pricing and royalty issues, who is claiming ownership and how on the germplasm that belongs to farmers that the public sector then developed into Bt Brinjal varieties and it is not clear who owns the Bt Brinjal varieties! And a case is already pending before National Biodiversity Authority for violating the biodiversity act.
- d) **Does Large scale adoption means farmers accepted the technology:** Adoption of a technology doesn't mean it is safe and desirable. In India 85 % farmers growing cotton have shifted to Bt cotton, this doesn't mean that it is safe are farmers are happy. Adoption of varieties/hybrids is based on the existing choices to the farmers. The situation is mainly because of
- i. Absence of good quality non bt cotton seed being not available to farmers as Agriculture Universities and State Seed Development Corporation have not produced any cotton seed in the last three years.
 - ii. From 2003 onwards the public sector majority of the public sector varieties and hybrids were systematically denotified and withdrawn from commercial cultivation. No new varieties/hybrids were released during the period.
 - iii. Farmers' choices largely being influenced more by market than performance and self understanding. Closer analysis of the dynamics of adoption shows that the pattern some see as an environmentally based change in agricultural practice actually continues the established pattern of socially driven fads arising in the virtual absence of environmental learning.

- C. **Transparent and Accountable Regulation:** The scandals seen from the day illegal field trials of food crops like Bt brinjal, Bt Okra and Bt Rice were unearthed in a remote villages of Andhra Pradesh by Centre for Sustainable which have violated all stipulated conditions to the date.
- a. None of the institutions in the country were made accountable in the case of sheep death happened in the country. The regulatory system and research not even paid interest in further exploring the causes and try to solve them.
 - b. The Expert Committee Chairperson claims that he is under tremendous pressure to approve Bt Brinjal shows industry regulating the regulatory process rather being otherway round. The Chairperson of the EC-II, Dr. Arjula Reddy made a honest confession that he only looked into compliance to rules rather than biosafety as per the changed guidelines and he is not sure of the biosafety of the Bt Brinjal.
 - c. The integrity of Dr. KK Tripathi, Secretary RCGM, on whom charges of corruption of laid and FIRs filed and an enquiry by Central Vigilance Commission is going on, is under question.

- d. Post release monitoring and accountability is also lacking with lack of proper regulation. For example in Andhra Pradesh, the cotton farmers whose crops failed since 2003 couldn't get any compensation even after the responsibility was fixed and company was asked to pay the compensation.

Who changed the regulations? Among the biosafety tests to assess the Environmental Risk prescribed by EC-I the company has not the done the critical ones like Foliage toxicity study as part of the Food/Feed safety assessment, Skin allergy Testing, flavor analysis, skin sensitization test. EC-II claims that these tests were not done because

- RCGM has suggested not to do, or
- Not prescribed by the new 'Guidelines for safety assessment of foods derived from GE plants, 2008'.

Interestingly, it was some of the members of the regulators who recommended change of the USAID project. The honesty of the RCGM secretary stands questioned as complaints were found lodged against him by the GM seed companies in Banjara hills police station, Hyderabad for demanding bribes and an enquiry from Central Vigilance Committee is still pending.

Given this situation we strongly request you to consider the following

- Relevance of a particular technology in particular crops should be assessed first before giving permission for any GM research in the country.
- The biosafety testing protocols needs to be revised as suggested by Dr. Pushpa Bhargava to ensure long term safety
- Ban all the GM field trails till all the systems are put in place and also allow open field trails only after the appropriate biosafety tests are done
- Field trials for agronomic evaluation should be made against the best possible alternatives for the problem for which GM technology is used and after assessing the socio economic and ecological impact of the technology.
- Suggest moratorium of at least 10 years on commercial release of all GM crops till all the systems are in place for independent research and regulation