The story of Bt. Cotton in Andhra Pradesh: Erratic Processes and Results

February 2005

Centre for Sustainable Agriculture (CSA)
H.No:12-13-445, Street No:1, Tarnaka,
Secunderabad-500017, Tel.No:040-27017735, 27014302,
Email: csa@csa-india.org, www.csa-india.org

CONTENTS

The Story of Bt Cotton in India and in Andhra Pradesh

The hype and propaganda put out by the companies about the unquestionable superior performance of Bollgard Bt Cotton has been proven false yet again. For a second year in three years, in 2004-05 also the government of Andhra Pradesh decided that farmers who have incurred losses by growing Bollgard Bt Cotton need to be compensated by the company. In the year 2002-03, the first year of its commercial cultivation, the then Minister for Agriculture had to announce that Bollgard performance was less than satisfactory and that farmers would be compensated.

In the year 2004-05, hundreds of farmers across different districts went on an agitation in Andhra Pradesh demanding compensation of at least twenty thousand rupees an acre for incurring losses with Bollgard Bt Cotton cultivation. Under the "MoU system" (Memorandum of Understanding between the government of Andhra Pradesh and certain seed companies for self certification), compensation has been awarded by district level committees headed by the Joint Directors of Agriculture (called the "JDA Committees") where the companies involved (Monsanto-Mahyco or Raasi) were asked to pay compensation to aggrieved farmers. The companies decided to contest the awards, predictably. However, the awarding of compensation by the JDA Committees is a statement in itself about the performance of Bt Cotton.

District, variety and area of loss for which complaint was lodged	**JDA Committee's decision**
Krishna – MECH 12 – 90.33 hectares	District Level MoU Committee passed an award of Rs. 244,400/-. The Company appealed to the State Level Monitoring Committee (which reportedly upheld the award, as per reliable sources in the department of agriculture)
Krishna – MECH 12 – 4.82 hectares	District level MoU Committee passed an award of Rs 3750/-. The Company appealed to the State Level Monitoring Committee (which reportedly upheld the award, as per reliable sources in the department of agriculture)
Mahabubnagar – MECH 12 – 80 hectares	The fields were inspected by a team of crop scientists and department officials and found that germinated was affected due to moisture stress and not due to defect in seed
Khammam – MECH 12 – 80 hectares	After negotiations with the company, the company reportedly agreed to pay the seed cost of Rs 1600/- and cultivation charges of Rs. 350/- per acre to the farmers

Complaints were received from other districts like Karimnagar, Kurnool, Guntur etc., though the decisions of the JDA Committees are not known. Discussions with reliable sources in the Commissionerate of Agriculture revealed that the Appellate Committee also upheld the awards passed by the JDA Committees in the districts. The companies, aggrieved by the decisions, are supposed to have taken the AP government to Court where the government is trying hard to make the companies accountable for the losses incurred by the farmers. This, in spite of an assurance by a Monsanto-Mahyco Biotech official (Mr Shabbir, who is the Territory Manager) in Warangal on October 16th, that the company would abide by the decision taken by the government in this case.

To understand the true picture of Bt Cotton in Andhra Pradesh and in India, it is important to know the whole story, right from the beginning of field trials. There are a variety of versions emerging about the "success" or "failure" of Bt Cotton in India making the picture unclear. However, the complete failure of regulatory framework right from the beginning, as well as the lack of protection for farmers is apparent in the story. The strategies used by the industry and

the pro-GE lobby for promoting Bt cotton become clear too from this story. What is also clear from the many versions of the story is the extremely uneven performance of this "frontier technology".

THE PRE-COMMERCIAL RELEASE STORY

Field Trials – unscientific and illegal:

During the Bt Cotton field trials itself, the future of GE crops in India was set – legal violations and unscientific studies shrouded in secrecy became the norm since then.

In March 1995, Monsanto's Indian partner imported 100 grams of Bt Cotton seed after obtaining permission from the Review Committee of Genetic Manipulation (RCGM) under the Department of Biotechnology under the Ministry of Science and Technology. Organisations like RFSTE objected to this as a legal violation since the Environment Protection Act 1986 which governs GMO-related issues in India requires that GEAC (Genetic Engineering Approval Committee) of Ministry of Environment and Forests grant permission for importing genetically engineered substances (the seeds in this case).

In 1998, Monsanto-Mahyco Biotech received approval from the RCGM of the Department of Biotechnology to conduct countrywide field trials in 85 hectares. There was also approval provided to produce seed from 150 hectares. In 1999, Research Foundation for Science, Technology and Ecology (RFSTE) field a case in the Supreme Court challenging the legality of the approval given by the RCGM since such an approval falls under the purview of the GEAC. They also challenged the lack of biosafety procedures during the trials. Even as the case continued to be heard in the Court, in 2000, Monsanto-Mahyco was allowed by the DBT large scale, multi-centric open field trials including seed production in various states of the country. These trials were done in 40 sites in 6 states. Once again, there was a legal violation in this since large scale field trials have to be permitted by GEAC and not the DBT. Further, the trials were undertaken in great secrecy. In some cases, even the farmers on whose fields the trials were undertaken did not know that they were growing a genetically engineered crop. During the trials, the isolation distances maintained were insufficient. The state governments were also not aware of the trials going on and in 1999 Andhra Pradesh government prohibited the field trials from taking place in the state. There were also serious objections raised by activists about the fact that post harvest management and safety issues were completely ignored during the field trials.

The number of years of field trials upon which to base the approval for commercial cultivation was lesser than scientifically accepted. While six years of trials are needed in other countries, in India, Bt Cotton was tested as trials for only four years.

Further, the trials were not open for independent scrutiny. Trials done on very small plots of land were sought to be extrapolated into the farmers' situation and growing conditions. This was simply unacceptable and based on a variety of objections, the GEAC also ordered one more year of trials in 2001. MMB then began trials in seven states on 100 hectares. ICAR also conducted trials in 11 locations.

Among the major lacunae pointed out in the MMB field trials were the risk of genetic pollution and contamination through cross-pollination and hybridisation (in the study of the distance Bt pollen could fly, data showed a large variation between two and 15 metres, a 7,500 per cent margin of variation), the impact of Bt toxin on non-target beneficial species (while it was pointed out that the study showed zero impact of Bt toxin on populations of beneficial species, no beneficial species seem to have been involved in the study), and emergence of resistance in the target bollworm species (no study seems to have been done on insect resistance to Bt). In socio-economic terms, Bt cotton did not compare well with other alternatives particularly in the control of such pests as the bollworm (the data submitted did not tally with the claim of increased yields and cost reductions).

Strategy of "Contamination First, Approval Next"

In a manner that is almost pre-meditated, the GE industry's advance in many parts of the world has been similar – contaminate first and then press for approval.

In late 2001, news erupted that in Gujarat, large tracts of cotton land have been planted by Bt Cotton varieties that had not received any approval for commercial cultivation. A Bt Cotton variety called "Navbharat 151" of Navbharat Seeds Private Limited was grown on nearly 10000 hectares, reports revealed. It was also revealed that this variety was in use from 2-3 years prior to that. In 2001, farmers were seen to be growing open pollinated seed collected from the variety grown in the previous season. Several seed companies of Gujarat appealed to the DBT to take immediate action against the spread of Navbharat 151 because "the spread of unauthenticated and illegal seeds carried serious risks and would have grave consequences for Indian farmers and Indian agriculture". The Ministry of Environment and Forests through GEAC got a sample of the Navbharat seeds tested for the Cry 1ac gene and the results were positive, confirming that the seeds were genetically engineered. Navbharat Seeds had not sought or got any approval for producing and selling GE seeds. It was also reported that Navbharat Seeds was also producing Navbharat 151 under the name of *Jay, Vijay and Digvijay* in Andhra Pradesh.

GEAC, after its team came back from its inspection of Navbharat seeds, ordered the uprooting and burning of Bt cotton crop to destroy it. Seed production plots and harvested seeds were also ordered to be destroyed. In its orders asking for destruction of material related to Navbharat 151 Bt Cotton, the GEAC admitted to several potential risks and said that the destruction is to ensure safety to environment and human health and to obviate any possibility of cross pollination. It also pointed out that the effect of the genetically modified cotton like allergenicity and other factors on mammals is not tested. This Order of the GEAC dated 18th October 2001 also invoked the precautionary principle and also brought up the issue of compensation payable to farmers who have unwittingly used this product.

On 31st October 2001, it was decided to procure the cotton which had already reached the market, destroy the seeds, storage the lint, procure cotton from the standing crop also, to be ginned and the seeds to be destroyed. Complete destruction of the crop residue by uprooting, burning and sanitation of the fields was also ordered.

Navbharat Seeds Pvt Ltd challenged the GEAC Order in the Delhi High Court saying that their Navbharat 151 cotton variety was developed by using conventional plant breeding method. The source of Bt in the Navbharat variety has not been resolved to this day. It has to be mentioned here that Dr D B Desai of Navbharat Company is a former employee of Mahyco. Soon afterwards, in March 2002, Bollgard Bt Cotton was given permission for commercial cultivation in six states of India. One of the arguments heard at that time was – when there is so much illegal Bt Cotton growing in several states of the country, is there any point in holding back approval for the Monsanto-Mahyco varieties?

It has to be pointed out that this phenomenon of contamination and growing of GE varieties illegally without approval even while some varieties are in the pipeline for approval has not been uncommon in recent times. Even in other countries like Brazil and Thailand, such an approach was attempted. The companies involved including the company which imported the original seeds and the government bodies regulating the import and trials have a lot to answer for about how this whole growth in illegal Bt Cotton began and spread.

Bt Cotton Approved for Conditional Commercial Cultivation in 6 States:

In March 2002, the Genetic Engineering Approval Committee of the MoEF approved the commercial cultivation of three Mahyco hybrids transformed with the Bollgard Bt gene from Monsanto. The approval is questionable since there were legal cases going on against the approval of field trials themselves. GEAC also showed a turn-around from its views expressed soon after the Navbharat illegal Bt cotton case erupted. It was also pointed out that in the meeting where the approval was granted, two important representatives – from the Health Ministry and from the Agriculture Ministry – in the GEAC were not present.

There were numerous conditions imposed for this approval uptil March 2005 (provided in this report as Annexure 1) but surprisingly, Monsanto-Mahyco was entrusted certain responsibilities related to monitoring and regulatory related aspects – there is a clear conflict of interest in these roles and it is inexplicable how GEAC could not anticipate such a conflict of interest. For instance, Mahyco will monitor the susceptibility of the Bollworm to Bt and submit data on resistance development, if any, to GEAC.

The first year: 2002-03

Bt Cotton in its Bollgard brand name was sold at Rs. 1600/- per combo pack, which consists of 450 grams of Bt and 120 grams of non-Bt seed of the same variety. The other popular non-Bt hybrids cost around Rs. 400/- to 450/-. The state-wise distribution of the cultivation of Bt Cotton in its first year of commercial cultivation is given below.

Commercial cultivation of Bt cotton hybrids in India, 2002 (hectares):

State	MECH-12	MECH-162	MECH-184	Total
Maharashtra	112	9,300	5,334	14,746
Madhya Pradesh	60	404	1,756	2,220
Karnataka	—	3,828	80	3,908
Andhra Pradesh	44	5,564	—	5,608
Gujarat	76	4,136	4,642	8,854
Tamil Nadu	—	2,042	660	2,702
Total	**292**	**25,274**	**12,472**	**38,038**

As can be seen, MECH 162 was grown in the largest extent in this year, and almost all of Andhra Pradesh and Karnataka went in for this hybrid amongst the three approved varieties. The largest extent of approved Bt Cotton grown in its first year of commercialization was in Maharashtra, followed by Gujarat.

Right from the first year, the companies promoting Bt Cotton had to go on the defensive about their product. As early as June 2002, soon after sowing, there were reports about farmers not meeting refuge criteria in many places.

Almost at the very beginning of the season, the first complaints came from Andhra Pradesh and Madhya Pradesh. While the AP reports were about the vulnerability of the Bt varieties to leaf curl virus and jassids, the MP report was about failure of Bt Cotton crop in Khargone district including the costs of Bt Cotton being exorbitantly high.

That was only the beginning. Through out the season, there were reports from all the states, including from Maharashtra. In September and again in November, RFSTE (Research Foundation

for Science, Technology and Ecology) brought out findings from its survey in the three states of Andhra Pradesh, Madhya Pradesh and Maharashtra. These reports said that not only did Bt Cotton mean the emergence of new pests and diseases but that it failed to control the bollworm too for which it has been designed. The following are the findings from RFSTE's study:

- False claims of pest resistance: cases of substantial attack of bollworm in the states of Andhra Pradesh and Maharashtra were found. There was also a 250-300% increase in non-target pests like jassids, aphids and thrips. Bt cotton has been attacked by wilt and root rot in Maharashtra, Andhra Pradesh, Madhya Pradesh and Karnataka as per the study
- False claims of higher yields: Bt Cotton was sold with many promises made by the company in its propaganda with farmers. Higher yields of upto 15 quintals per acre were promised, whereas the average yields of Bt Cotton as per this study were 1.2 quintals per acre in Maharashtra and Andhra Pradesh. The study found that nowhere did Bt Cotton yields cross more than 4 quintals per acre at the end of the harvest. The average yield in Madhya Pradesh worked out to be 4.01 quintals per acre while in Karnataka it was 3.82 quintals per hectare. During the field visit time for the study, the Bt Cotton plants had leaves that turned red before dropping off
- False claims of higher income: Incomes of Bt Cotton farmers were affected not only by lower yields but because of the prices fetched by the bt cotton in the market – the staple length was lower than promised (only about 15-20 mm)

Many other studies emerged from different parts of the Bt Cotton growing states reinforcing the picture. This was the case with Karnataka, Maharashtra, Madhya Pradesh as well as Andhra Pradesh.

In Andhra Pradesh:

The following is the picture of Bt Cotton sales within the state of Andhra Pradesh in the first year where MECH 162 Bt was planned to be marketed almost exclusively with some negligible quantities of MECH 12 Bt.

Sl No	Name of the District	Number of Packets Sold	Number of Farmers	Number of Villages	Apprx Area covered (acres)
1	Adilabad	1442	866	235	1237
2	RR District/Medak	501	268	43	506
3	Vizianagaram	183	142	25	162
4	Mahbubnagar	548	196	50	427
5	Prakasam	148	124	18	96
6	Nalgonda	708	413	87	505
7	Khammam	1472	591	204	710
8	East Godavari	98	83	32	31
9	Karimnagar	1136	1286	279	1539
10	Guntur	1281	1373	208	1412
11	Warangal	1576	1284	272	1397
12	Krishna	100	184	36	139
13	Kurnool	148	119	31	126
		9341	6929	1520	8287

Source: Dept of Agriculture, GoAP

In AP, Mahbubnagar saw some farmers go in for large extents of Bt Cotton cultivation and some of the most devastating stories emerged from there by the end of the season. One of the first cases of suicide by a Bt Cotton farmer also emerged from there.

The RFSTE study worked out the economics of growing Bt Cotton in one acre, in terms of input costs, yields and output value and found that Bt Cotton farmers were incurring losses of upto Rs. 6400/acre on an average.

Cost-Benefit Analysis of Bt Cotton Vs Other Cotton in one acre in Maharashtra & Andhra Pradesh:

	Bt Cotton	Non Bt Hybrids	Desi Varieties
A. Expenditure on Inputs (Seeds, fertilizers, pesticides, irrigation etc.)	Rs. 9700/-	Rs. 5750/-	None
B. Total Yield	2 quintals	10 quintals	5 quintals
C. Output Value	Rs. 3300/-	Rs. 16500/-	Rs. 8250/-
C – A	Loss of Rs. 6400/acre	Saving of Rs. 10750/acre	Saving of Rs. 8250/acre

Gene Campaign's study:

A Bt cotton evaluation study carried out in Maharashtra and Andhra Pradesh by a Delhi-based agricultural policy think tank, Gene Campaign, reported complete failure of the crop in both the States. The study showed that 60 per cent of the farmers did not recover costs and that most of them incurred a loss of Rs.80 an acre. The input costs for Bt cotton sown on an acre are about Rs.1,000 higher than that for non-Bt cotton. The seed cost per acre is four times that of quality non-Bt varieties. The savings on pesticides is a mere Rs.217 an acre, while the seed cost, including the licence fee for using the patented Bt seeds, is Rs.1,200 higher.

Farm Type	Non Bt Cotton			Bt Cotton		
	Farmers (%)	Income/Acre (Rs.)	Net Profit/ Acre (Rs.)	Farmers (%)	Income (Rs)	Net Profit / Acre (Rs.)
Low Yielding	35	7394	2661	60	5637	(-) 79
Medium Yielding	58	12512	7779	35	9737	4021
High Yielding	07	20475	15742	05	15375	9659

According to the study, in most cases Bt cotton did not resist even the bollworm, and farmers had to spray the same quantity of pesticides for both Bt and non-Bt crops. The study also showed that cotton traders in the two States were not buying Bt cotton; they prefer non-Bt varieties such as Brahma and Banny. Some farmers seem to be mixing Bt cotton with non-Bt varieties to sell off the former.

However, the most shocking fact, according to the Gene Campaign study, is that neither Andhra Pradesh nor Maharashtra has set up the regulatory authority mandated by the 1989 Environmental Protection Act to oversee the cultivation of genetically modified crops.

In their analysis about the causes for failure of Bt Cotton, Gene Campaign attributes a few reasons for the failure:

- expression of Bt gene is uneven in the plants (with the top portions having a higher expression whereas the lower nodes are more susceptible to pest attack)
- inadequate endotoxin production under harsh environmental conditions like drought where only a sub-lethal dose is produced
- refuge maintenance for resistance management leads to wasting of land making Bt cotton non-viable especially for small farmers
- susceptibility to pink boll worm attack
- Bt varieties developed from hybrids which were themselves moderate to poor yielders

Department of Agriculture, Government of AP Study:

The Commissioner of Agriculture in the Department of Agriculture also came up with a performance report of Bt Cotton during Kharif 2002 which was submitted to the Ministry of Environment and Forests. This was a report that looked at the performance of MECH 12 Bt and MECH 162 Bt. In that year, as against 650,317 hectares of cotton crop cultivated in the state, 3315 hectares were covered with Bt Cotton (about 0.5%).

Following media reports on the failure of Bt Cotton, the department of agriculture conducted a farmer-wise survey on the performance of Bt Cotton through the Joint Directors of Agriculture in all the Bt Cotton growing districts of the state. The criteria fixed for evaluation of performance were mainly incidence of bollworm and sucking pests, yields obtained and quality of lint. The results of this survey are given in a table that follows the summary of the survey below:

Incidence of Bollworm	Low to Moderate. Incidence was less during the year and hence advantage of Bt Cotton could not be assessed correctly
Incidence of sucking pests	Moderate to high
Maturity	30-45 days earlier to non-Bt
Average number of bolls per plant and size	30-32 bolls/plant, compared to 28-30 bolls/plant in other hybrids. Boll size is relatively small (3 to 4 grams)
Yield	Low yields compared to indigenous popular hybrids. Majority of farmers got less than 5 qtls/acre whereas indigenous hybrids have recorded more than 5 qtls/acre under well managed conditions
Staple length	24-26 mm
Market Value	Majority of farmers are of the opinion that due to short staple length of lint, less price of Rs 150/- to Rs. 200/- per quintal of kapas were offered. Farmers are finding it difficult in selling their produce.

While there were 6949 farmers who went in for Bt Cotton in 2003-04 in Andhra Pradesh as per the Sales figures of Monsanto-Mahyco, the department's survey covered 3709 of these farmers. This continues to be the largest survey of Bt Cotton performance in the country to this day. For this survey, the department used the following classification for Yields: Low – below 5 quintals/acre; Medium – 5-10 quintals/acre and High – 10 quintals and above per acre. Similarly, market value was considered Poor where it was Rs. 1800 to Rs. 2000/- per quintal, and considered Good where it was Rs. 2000/- and above per quintal. The results were damning.

District	Farmers surveyed	Incidence of Bollworm			Incidence of Sucking pests			Yields compared to local hybrids			Quality of produce		Market Value	
		L	M	H	L	M	H	L	M	H	Good	Poor	Avg	Poor
Vizianagaram	58	19	12	27	30	25	3	55	3	0	0	58	0	58
East Godavari	27	5	18	4	2	5	20	24	3	19	0	27	0	27
Krishna	137	95	13	29	56	16	65	37	70	11	0	137	2	135
Guntur	967	290	468	209	340	299	328	731	213	30	0	967	6	961
Prakasam	82	70	7	5	28	40	14	70	5	10	0	82	0	82
Kurnool	92	26	33	23	18	42	32	41	36	15	0	92	15	77
Rangareddy	117	26	58	33	0	42	75	117	0	12	0	117	0	117
Medak	12	12	0	0	12	0	0	0	0	0	0	12	0	12
Nalgonda	169	79	22	68	61	12	96	95	65	9	4	165	10	159
Mahbubnagar	129	10	97	22	0	129	0	129	0	0	0	129	0	129
Khammam	291	37	152	102	55	131	106	150	117	24	0	291	25	266
Karimnagar	585	163	160	252	153	166	258	513	59	3	0	575	16	559
Warangal	891	253	204	434	191	198	502	527	314	50	32	859	278	613
Adilabad	152	140	2	10	15	86	51	143	7	2	0	153	4	148
TOTAL	**3709**	**1225**	**1246**	**1218**	**961**	**1191**	**1550**	**2632**	**892**	**185**	**36**	**3664**	**356**	**3343**

As can be seen, against the question on bollworm incidence, nearly equal numbers of farmers had reported Low, Medium and High incidence, whereas most of the farmers found the incidence of sucking pests in Bt Cotton to be on the higher side. While the marketing blitzkrieg of the company promised Higher Yields in all its propaganda material, a whopping majority of the respondents in this survey (71%) reported Low yields with Bt Cotton (MECH 162 Bt mostly). There were also issues related to the quality of produce including staple length and color of the cotton; therefore, market prices fetched by Bt Cotton were reported to be lower than Rs. 2000/- per quintal. The devastation in districts like Mahbubnagar is apparent from the table above.

Mr Jerome Reddy and Mr Chinnapu Reddy, Fatimapur village, Kothur Mandal, Mahbubnagar district (Interviewed by Greenpeace India on 2/3/03)

Jerome Reddy of Fatimapur village owns around 13 acres of land in the village, and is considered to be one of the progressive farmers of the village. Last season, he experimented with Bollgard, the Bt Cotton variety of Mahyco-Monsanto on 10 acres of his land. Looking back, he regrets the decision, and says that he does not feel good about growing Bt Cotton. His Bt Cotton crop yielded just 1 ½ quintals per acre! In all, he got 15 quintals out of his 10 acres. The exact amount that he was told that he would get, and that he had hoped to get from just one acre of his land with Bt cotton! With the economics working out very adversely, Jerome Reddy, like his brother, Thomas Reddy, is all set to experience a loss that runs into tens of thousands of rupees.

The investment per acre, as per his calculation is around Rs 10,000/- per acre, with the return being Rs 3000/- per acre (the 1 ½ quintals of yield sold at Rs 2000/- per quintal). The investment pattern was like this: on seed, for every acre: Rs 1600/-; on fertilizers (he applied 3 bags of fertilizers): around Rs 1500/-; on pesticides, for spraying Cypermethrin, Monocrotophos, Chlorpyriphos, Ekalux, Endosulfan, "Stop" etc.: Rs 5000/. He also used "tractor pumps" for spraying pesticides. Once the pests appeared, it was uncontrollable, he informed. In the earlier days, when the pest was spotted, he was advised by the company representatives not to resort to spraying. Believing them, he did not spray. But then, the pest attack became intense. Expensive pesticides like Tracer were also resorted to. In addition, he had to spend on agricultural operations like ploughing, sowing, weeding, plucking etc., in addition to spending on irrigation (he irrigated the crop twice during the season). The net loss per

acre, according to him, is around Rs 7000/-. It has failed on the very counts on which promises were made, he said: on low pesticide expenses and on higher yields.

Jerome Reddy and his son, Chinnapu Reddy have some very interesting experiences and stories to share about Bt Cotton.

- **in** 2001, they were all taken to a neighboring village, Reddypalem, where a large farmer called Rayapu Reddy had agreed to grow Bt Cotton of Mahyco-Monsanto on his land, as part of field trials. The crop on this 10-*gunta* plot was impressive – what was sown on this plot was Mech 12 variety however, and not Mech 162 that was later sold to the farmers; worse yet, the sowing season for the demonstrated variety was delayed by a whole month, knowingly and wrongfully by the Company. Rayapu Reddy was given the seeds only on July 22nd of 2001, while the normal sowing time is in the month of June. Incidentally, neighbors of Rayapu Reddy feel that the incidence of Heliothis was low on his crop during the field trial season because of the adjacent poultry farms with its lights on (these lights attract the insects away from the crops, according to them)
- **the** boll size of Bt Cotton was very small, and very less cotton in it. The number of seeds per boll was also less – around 6-7, compared to a normal rate of 10-15. The number of bolls for Bt Cotton was only 20-30 bolls per plant, whereas other varieties in neighboring fields had nearly 100 bolls per plant. In their crop, the non-Bt refuge did not yield any bolls at all. Further, because of the small size of the boll, the plucking activity of cotton becomes more difficult and labour-intensive. The staple length of Bt is short and they had to plead with buyers to take it. While non-Bt varieties fetched around Rs 2500/- per quintal for other farmers, Bt Cotton fetched only Rs 2000/- per quintal. While the other varieties have more weight per volume, the Bt cotton is lighter and the farmer loses out on this count too, according to them. While non-Bt varieties yielded even without irrigation, the Bt Cotton crop of Thomas Reddy, though he irrigated it around 5-6 times in the last season, yielded dismally.
- **In** fact, one other characteristic noticed on the Bt crop was that though it flowers profusely, there is a tendency for the flowers to dry up and fall. Similarly with the bolls.
- **The** company representatives have stopped visiting them once the crop started showing its true characteristics. When confronted with the utter failure, the company representatives would only ask them to go to Warangal and meet the farmers there who have had good yields.
- **Chinnapu** Reddy also narrated the story of Ranga Reddy of neighboring Mallapuram village who incurred huge losses and threatened to kill himself with the very pesticides that he had used on the crop. He reported that Ranga Reddy had to sell two of his bullocks and three buffaloes after the Bt losses of last season. Like Jerome Reddy, Ranga Reddy also tried Bt Cotton on a large extent of land, believing in the promises made.
- **"The** company guys and the dealers came to our doorstep to deliver the seeds. We should have known right then that something was wrong", points out Chinnapu Reddy. One day, before the last cropping season, Chinnapu Reddy came back from the town, to find a large gathering and much activity. There were also reporters from the local papers present. When he went closer he discovered that this was about Bollgard, the "miracle Bt cotton" seed. In this "function", the discussions on the seed were held for one and half hours and more time was spent on a big feast. As Chinnapu Reddy recalls, there was 95 kilos of non-vegetarian food cooked that day and there was biryani and chicken fry. On that very day, "bookings" for the season's seed supply were made by the dealers and the company representatives. "They had thrown parties and people like us thought there must be something in here. And we agreed to buy the seeds. Now, it has brought the farmers nearer to the gates of suicide deaths again", he remarks.

Mr Akki Ramulu of Mallapuram, Kothur Mandal, Mahbubnagar Dist.

Ramulu had grown Bt Cotton in one acre of land, expecting around 18 quintals of yield per acre as per the promises made to him. He did not get even two quintals of yield!

He, along with other farmers (this village saw around 23-25 acres of Bt cotton sown in the last season, with just one farmer, Ranga Reddy growing on 12 acres of land) were told that no pesticides would be required, he reported. "Pests could not be controlled even with pesticides, leave alone the fact that they will not appear", he remarks. "It has been a complete loss".

It is true that bollworm did not appear for the first three months, he reports, but when it did appear, there was no controlling it. He used Monocrotophos, Ekalux, Pride a couple of times and so on. Sprayed around five times in all and after realizing that the pest cannot be controlled, stopped. He counts himself as the one who got the worst experience from Bt Cotton – slightly more than one quintal from his one acre. While he calculates his expenses to be around Rs 12000/- (seed: 1600/; Farm Yard Manure of one tractorload: 3000/; 3 bags of fertilizers – one urea and 2 DAP bags: 2000/; pesticides: 2000/; other expenses of ploughing, labor, sowing etc.: 3500/), the return was Rs 2000/- only. He laughs deprecatingly, asked about the return. The net loss is around 10,000/- rupees.

Asked about what he plans to do now, he joins the other farmers around him in saying that they are waiting for the company representatives to turn up in the area again so that they can bash them up and burn their jeeps! He says that this company's objective is to make farmers lose, with varieties and technologies like this. The despair of the farmers is obvious, with nowhere to turn to. One of them says, "what can we do? Even earlier, when companies cheated the farmers and we got a top executive of XXX company arrested, did he not come out soon after? What can we do if the government is not interested in protecting us"?

Ramulu also shared other interesting information:

- the company representatives used to visit him quite often in the beginning. Then they stopped coming, once the problems started manifesting themselves on the crop. When confronted about the losses, they even promised to give compensation, only to escape and not to be seen again. Another time, they were told that the company would "adjust" the losses against the seed price in the next season and promised to give the Bt cotton seed at a lower price to them the next season. Farmers immediately folded their hands and said that they did not want to touch the seeds ever again!

- Buyers refused to buy the variety separately until mixed with other varieties and sold. The boll size was smaller and the staple length was also shorter

- One of the neighboring farmers said that it was because of the extravagant feasts that the company threw for the farmers that the farmers believed them and lined up for buying the seeds. Now, they know better.

Tirumalreddy Rayapu Reddy and his brother, Melkior Reddy, Reddypalem,
Kothur Mandal, Mahbubnagar District, Andhra Pradesh

It was Rayapu Reddy's Bt Cotton field trial plot of 10 *guntas* (1/4th of an acre) in 2001 that had drawn many other farmers to the fatal temptation of Bollgard. What they saw that year on the field trial plot was the Mech 12 variety, that too sown in the last week of July. In this country, one of the main

objections to the field trials of Bt Cotton prior to 2001, is the unscientificity especially in terms of the sowing time. That is the reason why the GEAC had asked for one more year of trials. The company, of course, resorted to wrongful procedures in 2001 too to get the approval for commercialization.

Rayapu Reddy owns 25 acres of land in the village, and between him and his brother Melkior Reddy, they had sown Bt cotton in 8 acres of land – 4 acres each. The yield has not been more than 3 quintals per acre. Worse yet, when they tried to sell their Bt cotton, the price that was quoted was Rs 1300/- only, while other varieties were fetching farmers upto Rs 2400/- per quintal. After they mixed Bt cotton variety with other varieties, buyers were willing to pay upto Rs 1800/-.

They point out that even the labourers in the village were not too keen to work in the Bt fields since the plucking activity from the small bolls is too tedious. The costs on labour for Bt cotton were double than the normal costs on other varieties.

The brothers had also sown other cotton varieties in around five acres of land, and the yield was around ten quintals on an average per acre, last season. And these varieties fetched even uptil Rs 2600/- per quintal for a couple of days in the market.

They found bollworm incidence to be excessively high on Bt Cotton after the first 60-70 days. They had to resort to using pesticides like endosulfan, monocrotophos, cypermethrin and "Tracer". In fact, a highly expensive pesticide like Tracer was used twice to control the pest incidence. They also found that the flowers and bolls would form but soon dry up and fall. Melkior Reddy also opines that the Bt plant itself is not as strong as non-Bt varieties.

The brothers reported about the fact that Monsanto-Mahyco had given them the seeds for the field trial only in the month of July (could sow on July 22nd) in 2001. They feel that with late sowing and the onset of winter, the incidence of bollworm would expectably, be lesser and that is what the company had shown. But in real growing conditions of farmers, they cannot afford to sow late because the incidence of other pests and diseases would be unbearably higher in such a case.

Rayapu Reddy and Melkior Reddy are thoroughly disappointed with the company. While the expenditure was around Rs 12000/- per acre, including the irrigation that they provided to the crop, the yield was just 3 quintals per acre, amounting to returns of around Rs 5400/-. Therefore, there was a net loss of Rs 6600/- per acre, and a total loss of Rs 52,800/- approximately in all the 8 acres.

They point out that the company representatives had stopped coming. When they were confronted by an angry mob of farmers during their last visit, they had promised to give seeds for next season at a lower price. They said, "we can't pay you money since there will be many other who will be asking us for compensation. Therefore, the company can't pay you money, but we will try and 'adjust' against next season's seed supply". The farmers ofcourse refused to get more Bt seeds. It was only the presence of senior political leaders during the last visit that prevented the company representatives from being bashed up by the farmers, they reported.

We have now experienced that the promises of the company are not true, the brothers say.

There was a huge uproar in the Andhra Pradesh Legislative Assembly with the Congress (I) government, then in the Opposition, demanding compensation for Bt Cotton farmers. Based on their own survey, on March 10 2003, the then Minister for Agriculture in the Government of Andhra Pradesh made a statement in the Assembly admitting that the performance of Bt Cotton has been less than satisfactory. He said that "overall information is that the farmers have not experienced very positive and encouraging results" and that therefore, the farmers need to be

compensated. To this, MMB (Monsanto-Mahyco Biotech) said that it will compensate farmers only for failure to germinate and for absence of genetic purity promised by the company and not for yield losses[1]. This response from the company was not questioned by the government and a bad precedent was set, as similar results from 2004-05 would show. The Andhra Pradesh government did not make any changes to its "MoU system" to prevent such responses from seed companies. The fiasco went unchallenged while the first GE/Bt Cotton farmer in the country committed suicide in Andhra Pradesh in 2003 after the very first season of the commercialization of Bt Cotton.

Acharya N.G. Ranga Agricultural University's Study:

The Regional Agricultural Research Station in Palam, Mahbubnagar district collected data about Bt Cotton performance from 100 farmers of South Telangana districts of Mahbubnagar, Nalgonda, Rangareddy and Medak districts using three main parameters for assessment – yields and market rates fetched; expenditure and net income per hectare of Bt Cotton cultivated; and Bt Cotton's ability to resist Bollworm[2]. The survey compared Bt Cotton with other hybrids like Bunny, Brahma, Veda, Savitha etc. The following were the results of this survey.

Yields and Average Market Prices fetched by Bt Cotton and other non-Bt Hybrids, South Telangana region:

District	Yields – Quintals per Hectare		Market Price – Rupees per quintal	
	Bt Cotton	Other Hybrids	Bt Cotton	Other Hybrids
Mahbubnagar	10.74	19.41	2008.00	2143.00
Nalgonda	10.96	14.50	1923.25	2962.50
Rangareddy	07.36	15.00	1908.16	2226.30
Medak	24.00	19.18	2065.00	2290.00
	10.80	16.90	2015.13	2202.41

As the above table shows, except for Medak district, the average yields of non-Bt popular hybrids were much more than the yields from Bt Cotton. The following table presents a picture of the costs and net incomes per hectare from Bt Cotton and non-Bt hybrids from the survey locations.

District	Expenditure – Rupees per Hectare		Net Income – Rupees per Hectare	
	Bt Cotton	Other Hybrids	Bt Cotton	Other Hybrids
Mahbubnagar	20538.66	20165.13	00670.00	20800.00
Nalgonda	17560.08	15849.20	04396.13	15380.16
Rangareddy	19116.68	17036.30	-04404.21	16523.00
Medak	20269.40	18965.40	25078.30	14927.40
	19319.43	18069.39	2405.72	18780.81

As the above table shows, the expenditure on growing Bt Cotton did not decrease as the projections seemed to indicate but rather increased. The net income from Bt Cotton was almost negligible compared to other hybrids. In fact, in Rangareddy district, the survey found that farmers have negative incomes from growing Bt Cotton.

The most important finding of this study was that the average number of pesticide sprays with the use of Bt Cotton was only one spray lesser than non-Bt hybrids. While 61% of the farmers surveyed found that Bt Cotton was effective against bollworm upto 100 days, the remaining

[1] "A lesson from the Field", Asha Krishnakumar, Frontline May 24-June 6 2003
[2] "*Dakshina Telangana Mandalamlo Bt patthi – survey phalithaalu"*, Dr K Suhasini, Palam, Mahbubnagar in Paadi Pantalu, July 2003

farmers found no difference in this aspect between Bt and non-Bt. Since the pesticides used were of the expensive categories, the average costs did not reflect a great deal of difference. The study also found that the cost of plucking was higher in the case of Bt Cotton. Only in Medak district, Bt Cotton gave more incomes to the farmers than non-Bt hybrids, as per this survey. The study also found that Bt Cotton was unable to withstand water/moisture stress.

The report from this survey points out that even though the company would like to call the 2002-03 season as being adverse in general, other hybrids had performed quite well.

The Acharya N G Ranga Agriculture University (ANGRAU) authorities had also conducted a detailed survey to evaluate the performance of Bt Cotton which as an agro-climatic zone-wise survey. The salient findings from their evaluation include:

- In the Krishna-Godavari zone, comparison with non-Bt hybrids was not possible by the time of the evaluation since pickings were not completed in non-Bt Cotton. However, the number of sprays on Bt Cotton were more, averaging 6-7 sprays per acre. This zone includes districts like Guntur, Krishna and Prakasam.
- In the North Telangana zone, it was found that cost of cultivation in the case of Bt Cotton was slightly more compared to the non-Bt varieties. The net returns from Bt Cotton were too low compared to non-Bt Cotton (Rs. 4800/- and Rs. 14880/- per hectare respectively); here, the surveys revealed that 90% of the farmers who raised Bt Cotton during 2002 have expressed their unwillingness to raise Bt Cotton in the following season citing small sized bolls, poor vigour, lack of rejuvenation, short staple length, low yield potential and low market value as the reasons. This zone consists of districts like Warangal, Khammam, Adilabad and Karimnagar.
- The South Telangana results were similar (presented in this report in the preceding section).
- In Kurnool district of the scarce rainfall zone, farmers felt that Bt Cotton possessed resistance to bollworm but MECH 162 Bt did not have sufficient yield potential compared to other hybrids. The net returns obtained per hectare in Bt Cotton here were Rs. 16800/- whereas non-Bt was Rs. 22300/-.

There was also a brief ('preliminary') report filed by the Director of Research of ANGRAU, Dr Padmaraju, on the performance of Bt Cotton in Mahabubnagar district based on the observations of university scientists in the farmers' fields. As per this report, the difference in the average number of sprays between Bt Cotton and non-Bt Cotton is just 2 sprays. The report points out that the 'expenditure saved in plant protection is taken away by high seed cost'. This report records that Bt cotton bolls are relatively small in size, that the staple length is less in Bt Cotton and the price offered for Bt Cotton kapas is Rs. 100 to Rs. 200 less as compared to other varieties. The report admits that the pest load was not much that season (2002-03) and hence, correct assessment could not be made. The pest load was noticed to be less in initial stages of crop growth as evidenced by higher number of bolls in Bt Cotton as against refugia. Healthy growth of Helicoverpa was noticed in later stages of crop growth. The report concludes by saying that it is based on preliminary observations and that the performance has to be studied in farmers' fields for at least three years to arrive at a valid conclusion.

Telangana Natural Resource Management Group's (TNRMG) Public Hearing:

A team of eminent scientists comprising of K R Chowdhary, Prasada Rao and S. Jeevananda Reddy met with farmers from villages like Mallapur, Fatimapur, Gudur, Reddypalem, Cheguru and Narsappagudem in Mahbubnagar district along with farmers from Rangareddy and Adilabad

districts in the month of December 2002. Most of these farmers had tales of devastation to share with the scientists, after one season of growing Bt Cotton in its first season of commercialization.

Later, on 29th July 2003, TNRMG organized a public hearing in Hyderabad where farmers who cultivated Bt Cotton, agricultural administrators, agricultural scientists, NGO representatives, seed industry representatives, lawyers etc., presented their case in front of a 3-member panel. It was clear from the sharing by farmers that there was no significant reduction in cost of cultivation, no yield benefit in particular, that the bolls were small with more seeds, the lint and staple length were short as compared to other regions, that there was lower price realization and overall loss of income by farmers who opted for Bt Cotton cultivation. The Panel, in its conclusions stated that the government cannot absolve itself of responsibilities as both Central and State governments have permitted the cultivation of this variety. Under the Principle of Promissory Estoppel, the government has to come to the rescue of the farmers, the Panel judged. They clearly concluded that the situation calls for compensating the farmers for losses suffered due to the cultivation of the Bt Cotton variety.

"Did Bt Cotton Save Farmers in Warangal District?": Study by Andhra Pradesh Coalition in Defence of Diversity (APCIDD) and Deccan Development Society (DDS)

This study covered a set of farmers who were monitored for a season long study, another set for a mid-season study and a third and larger group for an end-of-the-season survey. In all, the study drew its findings from around 225 farmers who took up Bt Cotton cultivation in Warangal district.

According to the study, the Bt hybrid was most affected by the prevailing weather conditions (hot and dry). It was also evident that though the Bt cotton plants produced more bolls, these suffered from heavy premature drying as well as boll shedding. MECH Bt 162, which constituted 98% of the Bt cotton grown, appeared to be characterised by small boll size and short staple length, which affected market preference as well as the price of seed cotton. Another important finding was Bt cotton contained more seeds than non-Bt hybrids, which affected the lint to seed ratio as well as its price. In addition, pickings from the non-Bt crop extended till March, as compared with late December/early January for the Bt cotton in most areas, which reduced the yield of the Bt cotton crop.

Early sucking pests like aphids and jassids were absent in both the Bt and non-Bt plants during the first 30 to 35 days after germination, as all the hybrid seed sold in the market is pretreated with the pesticide Imidacloprid. But, from early October, when the crop was 80 to 90 days old, moderate to heavy infestation of aphids and white flies was reported throughout the area, more prominently on Bt than on non Bt crop. But from November, the bollworm infestation increased in both the Bt and non-Bt crops, with 81% of non-Bt and 71% of Bt farmers pointing the finger at the bollworm as the pest that did the most damage to their crop. Most farmers concurred that sucking pests attacked the Bt crop more than the non-Bt crop. Therefore, even though the incidence of bollworm was slightly lower, the level of pesticide use was almost identical for Bt and non-Bt farmers.

Qualitative differences in Bt and non-Bt cotton crops

Characteristic	Bt cotton	Conventional hybrid
Flowering	15-20 days earlier	15-20 days later
Plant height	90-110cm	115-130 cm
Boll size	Smaller	Larger
Number of bolls/plant	40-45 more	40-45 less
Premature drying and shedding of bolls	More	Less
Tolerance to abiotic stress	Poor	Moderate
Staple length	Short	Long
Number seeds/boll	30-35	16-20
Pest incidence –Bollworm	71%	81%
Pest incidence -Sucking pests	29%	19%
Number of pickings	Less	More

The economics of Bt and non-Bt production show that farmers who cultivated Bt cotton spent 15% of the total cost of cultivation on the seed as against 5% in case of non-Bt farmers, in the hope that it would reduce their spending on pesticide sprays and improve their yields substantially. But in reality, expenditure on plant protection was only around 25 rupees/ha less for Bt cotton farmers. Non-Bt cotton farmers averaged a yield of 276 kg/ha compared with 180 kg/ha for Bt cotton farmers, which represents a net 35% decrease in yield. So, in spite of spending 3.5 times more on pesticide-resistant seed, a Bt farmer had only a 4% reduction in pesticide costs, and ended up with a 35 % loss in final yield.

These losses were compounded by the fact that the market value of Bt cotton was lower than non-Bt. To offset the reduction in the price of Bt seed cotton, almost all farmers resorted to mixing both Bt and non-Bt cotton before marketing. In the end, non-Bt cotton farmers netted four times as much as Bt farmers from their 2002-2003 cotton crop. Some 71% of Bt cotton farmers experienced losses, compared with 18% of non-Bt farmers.

The economics of cultivating Bt and non-Bt cotton

Characteristic	Bt	Popular hybrids
Total cost of cultivation/ha	Rs 4,262	Rs 3,825
Cost of seed/ha	Rs 640	Rs 180-200
Expenditure on pesticides/ha	Rs. 1,164	Rs. 1,188
% of total expenditure spent on plant protection	27 %	31 %
Average yields/ha	180 kg	276 kg
Market price/100 kg seed cotton	Rs 2,080	Rs 2,164
Net returns/ha at the end of cropping season	Rs 518	Rs 2147
No of farmers who profited	65 (29%)	185 (82%)
* Up to Rs 5,000 ($108)	39 (17%)	67 (30%)
* Rs 5,000-7,500 ($108-162)	4 (2%)	28 (12%)
* Rs 7,500-10,000 ($162-216)	9 (4%)	20 (9%)
* Rs >10,000 (>$216)	13 (6%)	70 (31%)

The Company's response:

Following the initial reports of failure of Bt Cotton, Mahyco and Monsanto came out with a response in the month of November 2002 itself saying that "there has been no failure of the GM technology" – rather, the GM cotton like non-GM cotton hybrids has been affected by "new wilt" (also called as 'parawilt'). MMB said that the phenomenon noticed was a physiological disorder which occurred when cotton hybrids were exposed to prolonged dry spells followed by heavy showers or high temperature during the formation of cotton bolls. "Since Bt Cotton had more bolls, the environmental stress on them was more and the wilt was more evident", the company explained.

The company also discounted studies like that of Gene Campaign and presented its own survey findings. MMB had surveyed 1090 farmers in 52 districts across 6 states and found that 65% of the farmers had expressed their satisfaction with Bt Cotton, reported 65-70% reduction in pesticide usage and have also obtained a 30% increase in yields. It also claimed that there is no evidence of field level resistance to pink bollworms yet. The company also reported that a massive education programme in 6 states has been conducted with 5000 farmer meetings in the villages with trained staff.

The following is the data from the survey done by MMB[3]. As per this, a yield increase of 8.1 quintals of cotton and a reduction of 1.93 sprays result from growing Bt Cotton. These two factors contribute to an average additional income of more than Rs. 18000/ha according to the company.

Bt cotton results from kharif[a] 2002 season, June-December (yield in quintals[b]):

State	Non-Bt yield	Bt yield	Yield increase with Bt	Non-Bt sprays	Bt sprays	Spray reduction with Bt	Economic benefit per hectare[c]
Andhra Pradesh	14.42 (5-25)	20.52 (12.5-32.5)	6.10	4.81 (1-8)	2.08 (0-4)	2.73	Rs.16,747
Gujarat	19.80 (3.7-37.5)	28.35 (10-44)	8.55	3.42 (1-7)	2.09 (0-5)	1.33	Rs.18,430
Karnataka	10.50 (1.3-30)	17.82 (7.5-40)	7.32	2.53 (0-6)	1.00 (0-3)	1.53	Rs.16,170
Madhya Pradesh	15.00 (10-50)	25.82 (35-62.5)	10.82	3.29 (1-9)	0.93 (0-3)	2.36	Rs.24,000
Maharashtra	14.47 (2.5-45)	20.82 (2.5-62.5)	6.35	2.78 (0-7)	0.99 (0-4)	1.79	Rs.14,490
Tamil Nadu[d]	—	—	—	—	—	—	—
Total	13.25	21.35	8.10	3.10	1.17	1.93	Rs.18,130

Note. All figures given in the table are based on a survey conducted by Mahyco in the six states where Bt cottonseed cotton was sold in the kharif 2002 season.[a] The total sample size was 1,069 farmers. Averages are on weighted average basis. Figures in parentheses represent the range for yield (quintals per hectare) and number of sprays. [a] *Kharif* refers to a crop that is harvested at the beginning of winter; [b] 1 quintal = 100 kg. [c] Economic benefit per hectare was calculated on the basis of an average cotton rate of Rs.2,000/q and an average cost of each bollworm complex spray of Rs.1,000/ha. [d] Cotton picking still in progress in Tamil Nadu at date of writing.

[3] Barwale, R.B., Gadwal, V.R., Zehr, U., & Zehr, B. (2004). Prospects for Bt cotton technology in India. *AgBioForum*, *7*(1&2), 23-26. Available on the World Wide Web: http://www.agbioforum.org/

On 5th March 2003, the government of Andhra Pradesh admitted that Bt Cotton did not give positive and encouraging results, and that farmers need to be compensated. This was followed by the company openly announcing that it will not pay any compensation.

Later, in the month of July 2003, under continued pressure, the then Minister for Agriculture, Mr Vadde Sobhanadeeswara Rao of Andhra Pradesh expressed his government's helplessness when it comes to seeking a ban on the sale of Bt Cotton. He was of the opinion that the state government has done its job by sending a detailed report of the failure of the crop to GEAC. "We submitted it without any prejudice or favour. We cannot go beyond it", he said.

Following this, the company and the government got into an agreement for Bt Cotton seed to be sold at the reduced price of Rs 1200/- per packet instead of Rs. 1600/-. The dealer commission of Rs. 400/- would be foregone and the company was agreeable to this, media reports indicated.

Greenpeace India's Exposé - "Government lies to the Nation":

Even before the full picture of the performance of Bt Cotton emerged from various states and even as NGOs and environmental activists were trying to highlight the losses that farmers incurred in many places, the Minister for Environment and Forests, Government of India, Mr T R Baalu gave a statement in the Parliament that Bt Cotton had shown a "satisfactory performance" in its first year of commercial cultivation. This statement is based on a few farms visited in flying visits by GEAC team members along with the state agriculture officials in the six states where approval was granted. This was a case of "rural development tourism" as described by Robert Chambers. An investigation was carried out by Greenpeace India into the GEAC team's visit and their report from the visit in the state of Andhra Pradesh. The Greenpeace team visited the same farmers as the GEAC team and found that the statement of the Minister for Environment and Forests on December 16 2002 is a gross misrepresentation of farmers' experience.

While other studies and surveys during this season tried to assess the performance of Bt Cotton, the Greenpeace investigation was about the gross falsification of data that the government was indulging in. This exposé "Government lies to the Nation" revealed that the expert team's was directed and managed by Monsanto-Mahyco, that the number of farmers who were met was very small compared to the number of farmers who grew Bt Cotton; that there was no rationale for the sample chosen or the sample size except probably convenience and guidance by the company; that farmers who have had a bad experience with Bt Cotton have not been met; that the scope of assessment was too narrow; and that even in cases where farmers have been met, data was misrepresented.

A further investigation in Karnataka revealed similar falsification of records by the government department in Haveri district.

The nexus and the pressure on the government became clearer with all this evidence.

While this was the case specifically with regard to Andhra Pradesh, reports poured in about the extremely uneven performance of Bt Cotton throughout the season from other states too. The Parliamentary Standing Committee on Agriculture had asked the Centre to re-evaluate the economic viability of Bt cotton. A six-member panel set up by the Gujarat government under Joint Director, Agriculture (Oilseeds), S.K. Sangami, to evaluate the performance of Bt cotton in the State, said that "it is unfit for cultivation and should be banned in the State".

Year II: 2003-04

Given the widespread reports of Bt Cotton failure in various parts of the country in its first year of commercial cultivation (2002-03), the second year began on an aggressive push for Bt Cotton by the companies involved. They would not admit to failure, nor were they willing to pay compensation to farmers who have incurred losses. Confronted by Greenpeace India activists who stormed the Monsanto office in Bangalore exactly one year after approval for commercial cultivation, Monsanto began backtracking on its promises and said in its interview to NDTV, "we had never promised higher yields". This is a clear lie since all their propaganda material promises higher yields to farmers.

In a desperate bid to save face and their markets, the company intensified its aggressive marketing and changed its strategies.

Free Pesticides and Propaganda: New schemes were introduced for farmers, including free gifts of pesticides along with Bt Cotton seeds and more efforts put into PR, especially with the media. A Tata Mida container was given free of cost with the purchase of Bt Cotton seed as one of the marketing strategies. There was a blitzkrieg of advertisements showing farmers claiming to have gotten very good results from growing Bt Cotton. Activists asked some basic questions about these advertisements: why is it that advertisements being put out in Warangal district, for instance, had farmers vouching for better performance from districts like Guntur and Karimnagar? How are farmers in Warangal supposed to check the veracity of such advertisements and their claims? Also, is it by intention that these advertisements were sometimes made to look like media reports?

A controversial and thoroughly discredited scientific paper was published in a reputed journal around this time (by Qaim and Zilberman, which reported an 87% increase in yield with Monsanto's Bt Cotton, using data supplied by Monsanto without collecting or analyzing any other data), with questionable data from the field trials projecting great results with Bt Cotton even as data from the farmers indicated the burden that Bt Cotton cultivation had placed on farmers who were already in distress. Many activists sprung into action to show the scientific paper for what it really was, given its timing and its questionable credibility.

Replacement of non-performing varieties: Instead of MECH 162 Bt in states like Andhra Pradesh, MECH 12 Bt was increased. A variety that is supposed to be more high yielding and with longer staple than MECH 162 Bt was promoted during this year.

Sub-licensing the technology: This year also saw Monsanto sub-license its Bollgard gene to other hybrid-cotton producing companies like Raasi, Ankur, Ajeet, Nuziveedu, Sri Tulasi etc. The sub-licensing to companies other than Mahyco is a desperate search for more acceptable varieties by Monsanto. In June 2003, Raasi Seeds was disallowed its application for commercial release of RCH2 Bt, but allowed seed production and large scale field trials of this variety on 100,000 hectares in the southern and central zones. Using the opportunity, during the 2003-04 season, Raasi Seeds readied seed that could cover 360,000 acres. GE advocates also predicted that the competition would bring down the price of Bt Cotton seed, conveniently forgetting the fact that the Indian companies which have been sub-licensed the Bt technology by Monsanto were ending up paying crores of rupees as the licence fees and would therefore like to recover the same from farmers.

In the second season of commercial cultivation of Bt Cotton in Andhra Pradesh (2003-04), 12,148 Bt Cotton seed packets were sold (Mahyco 6207 and Monsanto 5941) to cover an area of 4859 hectares. The coverage of Bt Cotton against the total actual cotton sown area of 7,85,230 hectares was 0.62% during Kharif 2003. Compared to the 9341 Bt Cotton seed packets sold in

2002-03, this meant an increase of about 30%. The increase in Bt Cotton area is nearly proportional to the increase in the total area under cotton cultivation in the state.

The district wise distribution of Bt Cotton in Kharif 2003 was:

District	No. of packets sold			Total
	Monsanto India Ltd – MECH 12 Bt	Mahyco Seeds – MECH 12 Bt	Mahyco Seeds – MECH 162 Bt	
Srikakulam	0	0	0	0
Vizianagaram	0	17	0	17
Visakhapatnam	0	0	0	0
East Godavari	160	37	0	197
West Godavari	0	42	0	42
Krishna	330	265	30	625
Guntur	1179	1205	26	2410
Prakasam	0	134	0	134
Nellore	0	0	0	0
Kurnool	229	0	0	229
Anantapur	0	0	0	0
Kadapa	0	9	0	9
Chittoor	0	0	0	0
Rangareddy	82	663	0	745
Nizamabad	0	0	0	0
Medak	228	350	0	578
Mahbubnagar	160	155	0	315
Nalgonda	424	549	9	982
Warangal	1479	900	118	2497
Khammam	1306	843	70	2219
Karimnagar	103	396	0	499
Adilabad	261	235	2	498
	5941	**5812**	**395**	**12148**

One of the strategies seemed to be to focus on particular districts like Warangal, Khammam and Guntur and reduce the area in districts like Mahbubnagar and Karimnagar from where some of the most disastrous results emerged during the previous season.

It has to be observed here that independent assessments of Bt Cotton performance in the second year were few. Even the media did not pay much attention to Bt Cotton in the second year. This was probably because of a few reasons:

- in all those cases where Bt Cotton fared poorly in the first year of commercial cultivation, it was probably expected to die a natural death; this assumption however did not take into account the aggressive propaganda to be launched by the company
- there was also a sense of disillusionment with the AP government which did not show any will to fix any liability on the company for the large scale failure
- at the Central level also, things began to be run in a more opaque manner than ever. Data or decision-making processes were not transparent to be influenced. The first year reports submitted by various independent agencies were simply ignored and disregarded.

However, Monsanto-Mahyco chose one more strategy to promote its products. This time, instead of using a Mahyco-conducted survey to talk about the performance of Bt Cotton, A C Nielson was commissioned to do a survey. A C Nielson came up with a (predictably) positive report. However, a season-long monitoring done by independent competent agencies like Deccan Development

Society, Permaculture Association of India and AP Coalition in Defence of Diversity of Andhra Pradesh has other things to point out about the second year's performance too.

"Did Bt Fail AP Again in 2003-2004?", as this report was called, also challenges the AC Nielson study commissioned by MMB, for its design and methodology in addition to the veracity of findings. This report disproves Bt Cotton failed on all its three main promises – pesticide use reduction, subsequent reduction in cultivation costs and enhancement of farmers' profits.

The study found that:

- farmers had to incur an expenditure that was 230% more for Bt Cotton seeds than Non-Bt hybrids
- total investments for Bt were 8% higher than for the cultivation of non-Bt cotton with a difference of Rs. 903/- per acre
- reduction in pesticide consumption by Bt farmers was negligible at just 12% at Rs. 321/- - the net difference across the three farming categories assessed in the study clearly shows that the net difference between Bt and non-Bt crops when it comes to bollworm management between Bt and non-Bt crops was less than Rs. 500/- which is the cost of just one additional spray
- Bt crop required more number of sprays for controlling sucking pests than non-Bt
- net profits from Bt Cotton were 9% less compared to profits from non-bt hybrids
- the benefit-cost ratio was in favour of non-Bt hybrids
- for small and medium category farmers, the yield difference between Bt and non-Bt was negligible

A comparison of the findings from AC Nielson's study (commissioned by Monsanto) and APCIDD's study is very interesting for the contrasting pictures they present.

State	**Bollworm Reduction**	**Pesticide Usage**	**Yield Increase**		**Increase in Net Profit**	
	%	**Rs**	**%**	**Quintals/Acre**	**%**	**Rs/Acre**
Andhra Pradesh : Monsanto Study	58%	1856/-	24%	1.98	92	5138/-
Andhra Pradesh: APCIDD Study	14%	321/-	2%	0.09	(-) 9%	(-) 750/-

As is apparent, the industry has claimed four times more than the actual reduction in pesticide use, 12 times more yield and 100 times more profit than the actual.

As per the AC Nielson's study, the average number of pesticide sprays on Bollgard Bt Cotton was 3.6 times in 2003-04, while on Non-Bt it was 5.2 times. A report by the State Level Committee in Andhra Pradesh during a visit on 11-11-2003 in Medak and Rangareddy districts clearly shows a different thing. Five farmers met by the Committee on that day reported an average number of 5.2 sprays on MECH 12 Bt.

Meanwhile, Gene Campaign also surveyed 136 farm families in the four districts of Warangal, Guntur, Mahbubnagar and Rangareddy for the 2003-04 cotton cultivation. The study found that like in the first year, the economics of cultivating the Monsanto variety remains adverse to the farmer. The study also found that AP was swamped with a large number of illegal variants of Bt Cotton. There is chaos in the cotton fields and nobody can say with any guarantee what has been

cultivated and how much, says Suman Sahai[4]. According to Gene Campaign, almost no one had planted Monsanto's failed MECH 162 from the earlier year. The few that did, reported the same poor results. An interesting finding from the study was that farmers who had planted Monsanto's MECH 162 last year got poor chilli crops in the same fields the next year. Other Chilli fields which were not earlier planted with Bt Cotton were not affected and this needs further investigation, the report points. Suman Sahai, speculating on three possibilities for illegal varieties by the names of Rasi Bt, Bunny Bt, Ankur Bt etc., proliferating ("one, it could be leaking of Rasi, Ankur Bt varieties before completion of official approval; two, it could be a cover up for the illegal Navbharat varieties; or three, fly by night operators are marketing spurious Bt cotton seeds which may not even contain the Bt gene") says that most local cottons carrying the Bt gene are outperforming the Monsanto varieties.

Given that there is widespread cultivation of illegal Bt Cotton in the state, Suman Sahai questions Nielson's data. "What have they actually surveyed and what do their results mean? It would be difficult to take at face value the data that A C Nielson has put out and their ringing endorsement of Monsanto's Bollgard…we are in a rather curious situation where the only people praising the Monsanto varieties are Monsanto themselves. Every other agency is reporting results to the contrary, that Monsanto varieties are the worst performers when compared to good local hybrids and illegal Bt variants", she says.

As can be seen, 2003-04 once again brought home the utter failure of the regulatory mechanisms in this country.

[4] "It's time govt probed some Bt facts and many Monsanto fictions", Suman Sahai, Civil Society, August 2004

Year III: 2004-05

On 6th April 2004, conditional approval was granted by the GEAC for commercial release of RCH2 Bt of Rasi Seeds for South (Andhra Pradesh, Karnataka and Tamil Nadu) and Central Zone (Gujarat, Maharashtra and Madhya Pradesh) from Kharif 2004 upto March 2007. The approval was granted after only two years of large scale field trials. The conditions were similar to those imposed while approving the three MECH Bt varieties for commercial cultivation earlier in March 2002. Approval was also granted for large scale field trials in Kharif 2004 for other Raasi varieties like RCH 20 Bt (in the southern zone), RCH 138 Bt and RCH 144 Bt (in the central zone). The total area for the large scale field trials in farmers' fields was not to exceed 150 hectares, at the rate of 50 hectares for each hybrid in the respective zones.

The table below shows the state-wise breakup of Bt Cotton seed sales (packets sold, with one packet equivalent to one acre of land) in 2003-04 and 2004-05:

State	**Kharif 2003**	**Kharif 2004**
Andhra Pradesh	13500	190000
Gujarat	103000	320000
Karnataka	7500	45000
Madhya Pradesh	33000	207000
Maharashtra	54000	525000
Tamil Nadu	19000	13000
Total	**230000**	**1300000**

Source: Monsanto India, quoted in Financial Express, 29/11/04

The total acreage of Bt Cotton increased by around 6 times from the previous year. This included four varieties including a very popular local hybrid from Raasi (which is a popular variety in the states of Andhra Pradesh and Karnataka). The Bt Cotton area is still a negligible part – 5.7% - of the total cotton acreage of 22.5 million (or 225 lakh) acres in the country. These seed sales are alone worth Rs 208 crores of rupees for the companies involved.

The following is the extent of Bt Cotton seed sales in Andhra Pradesh during Kharif 2004:

District	**Mahyco Seeds Ltd**			**Rasi Seeds Ltd**	**Total**
	Mech 12 Bt	**Mech 162 Bt**	**Mech 184 Bt**	**RCH 2 Bt**	
Vizianagaram	230	0	0	30	260
East Godavari	230	0	0	80	310
West Godavari	50	0	0	0	50
Krishna	2340	0	0	3310	5650
Guntur	8163	0	10	14500	22673
Prakasam	370	30	0	100	500
Kurnool	1580	240	0	350	2170
Cuddapah	0	0	0	0	0
Rangareddy	8625	25	0	2525	11175
Nizamabad	125	0	200	100	425
Medak	4770	0	0	1290	6060
Mahbubnagar	7330	0	0	8220	15550
Nalgonda	5911	0	0	70	5981
Warangal	15100	550	4300	26110	46060
Khammam	9170	170	40	8510	17890
Karimnagar	14960	0	20	6720	21700
Adilabad	14400	0	1850	9170	25420
Others	20	0	0	290	310
TOTAL	**93374**	**1015**	**6420**	**81375**	**182184**

The projected sales in Andhra Pradesh before the beginning of the season was put at 228,000 seed packets whereas the actual sales were to the tune of around 182000 packets. This covers an area of nearly 72,874 hectares. From 4859 hectares in 2003-04, this shows an increase of around 14 times. Out of this, RCH2 Bt alone contributes to a 6-fold increase.

In April 2004, GEAC approved large scale field trials and seed production of 12 more Bt hybrid varieties – Rasi seeds was allowed to conduct trials with RCH 368 in South India and RCH 316 in North India. Ankur Seeds was allowed to go ahead with Ankur 651 Bt and Ankur 2534 Bt in North India, and Ankur 651 Bt and Ankur 09 Bt in Central India. Nuziveedu's NCS 145 Bt and NCS 207 Bt for Central and South zones were also allowed. Mahyco has been allowed field trials and seed production with MRC 6301 Bt and MRC 6160 Bt in central India, MRC 6301 Bt and MRC 6322 Bt in South India. The seed production for each variety was allowed on a maximum extent of 100 hectares.

Early in the season in 2004, there were some unfounded statements made by the Andhra Pradesh Minister for Agriculture and Commissioner & Director for Agriculture on the excellent performance of Bt Cotton in the state.

Also as early as November 5 2004, the Minister for Agriculture, Mr Sharad Pawar made a surprising media statement saying that the "*Bt* cotton yield was definitely better in quality and quantity, boosting production by 30 to 35 percent in areas it was sown,". He also noted that relatively low infestation levels of cotton's principal pest, the bollworm, and favorable monsoon rains helped produce the bumper cotton crop. This statement is surprising given that there was no data with the officials about the share of Bt Cotton in the total production of cotton – the harvesting season had just begun for many cotton growing states, in fact.

Meanwhile, in the month of October 2004 itself, the Minister for Agriculture in Andhra Pradesh Mr Raghuveera Reddy had to announce that there is prima-facie evidence to indicate the failure of MECH 184 Bt in Warangal district. He informed that farmers have sown this seed on an extent of around 25000 acres.

A six member expert team from the government, which examined the standing crop of nine farmers in Atmakur and Chennaraopet mandals of the district, found only 15 to 20 cotton bolls in the first stage and no cotton boll in the second stage of Mech-184 Bt cotton. On the basis of this report, 50 teams had been formed which would visit the field of every farmer who had sown Bt cottonseed in the district and submit report within a week, the Minister announced. The Minister also announced that compensation to farmers would be given on the basis of these reports within the 15 days stipulated by the MoU the State Government had entered into with the seed companies.

The Minister was forced to make a second statement in the State Legislative Assembly in the middle of December on the performance of Bt Cotton. According to him Bt Cotton seed was resistant to bollworm but it has not been found free from other diseases. He once again announced that compensation could be claimed through the MoU system. There is a background to the Minister's statements on both these occasions where he clearly backtracked from an optimistic statement he put out early on in the season.

Bt Cotton Farmers begin agitating in different districts:

Just days after the Commissioner, Agriculture in the Government of Andhra Pradesh made positive remarks about Bt Cotton in the state (October 4, 2004, The Hindu Business Line "Bt Cotton crop likely to create problem of plenty in AP"), farmers went on a rampage in Warangal

district fearing that they might have been sold spurious seeds by the local traders. What has triggered the panic is the failure of Bt Cotton in yet another season…

It is estimated that out of 160 thousand hectares sown in Warangal district with cotton, around 25 thousand hectares are under Bt Cotton (the sales of 450 gm packets of Bt Cotton touched the 25000 mark this year, as per media reports). Starting from 12th October, farmers started their protests across the district of Warangal where they raided shops and imprisoned seed company employees and are demanding compensation ranging from Rs. 10,000/- to Rs. 25,000/- per acre for the losses incurred.

On 12th October hundreds of farmers turned up on the streets of Warangal town where the seed and pesticide dealer shops are located. They were demanding at least ten thousand rupees per acre as compensation for the losses they incurred by growing Mech Bt 12 and Mech Bt 184 varieties. They raided Vasavi Fertilisers and Seeds shop, from which they had bought the expensive Bt Cotton seeds. The dealer tried to assure them that he would get the company officials to come to the villages and assess the damage, and get them to pay compensation if needed. The farmers were not ready to accept this. They staged a sit-in on the highway holding up a long chain of traffic. The farmers wanted the officials to visit their village and see the damage for themselves. A group of officials and the seeds dealer went to the village along with the farmers and checked the cotton crop there. Later, the Deputy Director of Agriculture, Warangal district assured the farmers that there would be an inquiry and after submitting the report to the government, any compensation to be paid would be arranged.

An assurance from the district officials that a wider field investigation would be taken up calmed the farmers. Following this, on Wednesday, agriculture department officials and Mahyco Company Area Manager and other officials went to Mogilicherla village where more than 500 acres of Bt Cotton had been sown. Here, the farmers like farmers in other parts of Warangal had spent Rs. 1650/- on procuring seeds (450 gms of Bollguard Bt Cotton – Mech Bt 12) and had sown the seed. They found that the crop grew well but did not flower well or yield more than ten bolls. Representatives of Mahyco company who had come to the village to inspect the fields by themselves were imprisoned by the farmers for more than three hours in the village, demanding immediate payment of compensation. The employees were freed when they assured the farmers that they would bring senior officials of the company to the village on the 14th.

On the 14th of October, hundreds of more farmers once again raided seed shops in Warangal town demanding compensation and accountability from the company, the dealers and the government. They came with Bt Cotton plants which did not yield either flowers or bolls on their fields. Farmers from various blocks like Atmakur, Sangem, Jafargad, Parvathagiri, Parakala, Geesukonda, Hanmakonda, Dharmasagar, Mogullapalli etc., soon joined the agitating farmers in huge numbers. They attacked the shop of Vasavi Seeds and Fertilisers, the supplier of Bollguard seeds to them. By this time, all the seed, pesticide and fertilizer dealers in Warangal town had closed their shutters down and ran away from the scene, fearing the wrath of the farmers. A Committee was formed with one representative each from each village, along with some local officials (who came to placate the farmers) to look into the matter by visiting the fields. After this, the farmers withdrew their protest for the day. The District Collector had meanwhile sent word to the company representatives to hear their explanation. The Collector is making preparations to send teams consisting of the company representatives, officials and the farmer representatives to all the villages from where reports of losses were obtained, as per media reports. Meanwhile all Bt Cotton farmers who have incurred losses due to the failure of crop have been asked to register their name and other details with the concerned agriculture department officials.

Around this time, there was news of a suicide committed by a Bt Cotton farmer in Warangal district who killed himself unable to bear the heavy losses incurred.

This was only the beginning of the season. Soon, agitations from other districts started. Farmers in Sathenapalli of Guntur district imprisoned a company representative and demanded compensation for the losses that they incurred. Karimnagar, Nalgonda, Krishna and Khammam had similar scenes with irate farmers agitating for compensation.

Meanwhile the vernacular media, especially the district editions of newspapers and telugu television channels started covering the problems of Bt Cotton farmers in a widespread manner. There were regular news reports as well as special feature programmes run by them and hundreds of farmers were heard to report their losses and their dismal crop performance witnessed.

All of this built tremendous pressure on the government to take some action and protect the interests of farmers who have incurred losses. However, the MoU system that the government of Andhra Pradesh had adopted began to come in the way of farmers securing justice. Like in the first year of Bt Cotton commercial cultivation, one of the arguments heard this year too was that losses incurred do not fit into the MoU framework which only talks about germination failure and lack of genetic purity.

Government survey's findings:

No information is forthcoming from the government on the performance of Bt Cotton in the state though 50 teams are supposed to have visited the field and compiled a report on the same. The admission by the Minister about Bt Cotton being susceptible to diseases and other pests tacitly seems to say that Bt Cotton was found to be effective against bollworm (which is questionable as other reports point out). He also acknowledged that the reason for the rapid spread of Bt Cotton was false propaganda about the ability of the seed to withstand all pests and diseases.

Joint Directors of Agriculture who have been approached for information of the survey results in their own districts have also refused to part with the reports. Once again, the question of transparent procedures and processes comes to the fore. It is as though the government wants to protect the companies and their products from independent scrutiny.

In November, the agriculture officials in Warangal admitted that out of 20,000 hectares of Bt Cotton grown in the district, 65% of the crop was damaged. According to the Joint Director of Agriculture, Monsanto-Mahyco's seed created losses in all the places surveyed whereas Raasi Bt was found to be damaged upto 15%. The reason was wilt where the flower, bolls and the plants dried up resulting in very low yields.

The MoU system fails to protect farmers:

The stand of the government that the MoU system will take care of such Bt farmers who have incurred enormous losses does not lend hope to the already-distressed cotton farmers in the state.

This is due to several reasons:

- Firstly, there has been no large scale campaign taken up so far to educate farmers about their rights either through the MoU system or through the Consumer Courts and what they are required to do under these systems to secure justice. The MoU system comes with its own set of problems including the fact that farmers are expected to report in a

time-bound manner and that the companies usually go in Appeal against the JDA committee's awards in cases where awards have been passed in favour of farmers. This is reflected in the current Bt Cotton cases also. At the Appellate level, farmers have very little chance to defend themselves directly.

- Secondly, the MoUs cover only two aspects related to seed performance: germination failure and genetic impurity.
- With regard to germination, when it comes to crops like Bt Cotton with around 20% dedicated to non-Bt varieties for refugia, the germination that a seed producer/supplier could be allowed to show can be as low as 53%, given that cotton crop itself is allowed around 67% germination rates.
- When it comes to genetic impurity, the MoU that the government has signed along with several seed companies does not specify anywhere what constitutes genetic impurity. Genetic impurity is defined against morphological and genetic parameters obtained during registration. However, as Bt Cotton farmers are witnessing across this state, the rate of flower fall or wilt or other problems is much higher in this crop than other cotton hybrids. Studies elsewhere have also shown that while Bt Cotton might initially take care of bollworm infestation, other pests and diseases which are hitherto secondary, take on the role of primary pests and diseases. This is being seen in Andhra Pradesh. Genetic Impurity does not however cover these aspects.
- The farmers who incur losses in Bt Cotton inevitably lose out more than ordinary cotton farmers given the expensive rates at which the seed is being sold. Therefore, their distress levels now are that much more acute.

The MoU Committees investigating the crop performance in the field are reporting that things are fine as far as the MoU framework goes [since they do not see germination failure or genetic impurity] even as Agriculture Officers who have verified fields have testified that there has been large scale flower and boll drop, which would imply losses to the farmers.

Meanwhile, the company has announced in the month of October itself that it is not responsible for the failure of the crop since there has been a general failure of all varieties and hybrids of cotton. This is however not true as is reflected in the large scale excessive production of cotton this season, as well as from fact finding visits to Bt Cotton and other hybrid cotton fields in Warangal and Kurnool. These fact finding teams have found that other hybrids are not affected in neighboring fields.

Fact-finding visits in 2004:

By Centre for Sustainable Agriculture and AP Rythu Sangam:

Scientists from Centre from Sustainable Agriculture, Dr. Ramanjaneyulu and Mr. Ali, along with Mr. Sarampalli Malla Reddy, Secretary AP Rythu Sangam, Dr. Venugopal, Entomology Department, Acharya NG Ranga Agricultural University, Dr. Abdul Qayum, Consultant with MARI and DDS, Mr. Kiran Sakkari, Permaculture Association of India and Mr. Krishna Reddy, AP Rythu Sangam Warangal unit, visited villages in Geesukonda Mandal of Warangal district. The following are the findings.

In Rattiram Tanda, a small hamlet of Kommala village, various Bt cotton hybrids are being grown in more than 100 acres. The villagers purchased the Bt cotton hybrids from Warangal market hoping to tackle the dreaded Bollworm. But shattering their hopes the Bt hybrids failed. Mr. Veeraswamy, has grown Bt MECH-12. The plants are small, with only few bolls. Insects are eating away the bolls, despite the so-called new technology. More than 30% of the plants in the field have dried up. When split open, wilt symptoms are clearly seen. The story is repeated with Ms. Vankloth Vijaya who grew Bt RCH-2 of Raasi seeds, or Vankloth Balaraju who grew Bt MECH-

184. Till now farmers have spent around 8 thousand rupees on pesticides like Avaunt and Tracer besides Rs. 1600 on seeds. When the suffering farmers contacted the dealers, they were told that the dealers were not responsible and were asked to meet the scientists of the Agricultural Research Station, Warangal. The company team never visited and advised the farmers.

In Elukurthi Haveli, Mr. Yadava Reddy has grown Bt RCH-2. The crop has not performed as expected. The plants suffered wilt. The bolls are infested with bollworms.

In Konayamakula Mr. Narasinga Rao has grown Bt MECH-12 and has a similar experience to narrate.

The wilt symptoms in Bt cotton started appearing in the initial year itself. The company and the government had turned a deaf ear to the apprehensions raised by several investigating teams closely following the Bt cotton performance. The scientists said that the weather fluctuations have caused the damage. It is surprising to see that all other cotton hybrids in the neighboring fields are better, given the same weather conditions. What is more striking is that wherever gap filling was done with non-bt cotton hybrids, the plants are healthy.

By Jana Vignyana Vedika:

These fact finding visits were conducted in eight blocks of three districts of Kurnool, Mahbubnagar and Warangal, covering 25 Bt Cotton farmers. This fact finding mission revealed:

- the incidence of bollworm is not very high this season. In the fields visited, both Bt and non-Bt have shown about 5-8% impact from Bollworm attack
- Upto November, even Bt Cotton had witnessed around 6 to 10 pesticide sprays on an average per acre. Only 2 of the 25 farmers met had used only 4 sprays
- Farmers have used very expensive as well as toxic pesticides on Bt Cotton – these include quinalphos, profenophos, imidacloprid, monocrotophos, lambda-cyhalothrin, indoxacarb, everpectin, thiodicarb etc.
- In Warangal and Mahbubnagar districts, both in MECH 12 Bt and RCH2 Bt, around 10-25% of the plants were damaged by wilt. These plants cannot yield anything.
- In addition to approved varieties, farmers in Kurnool and Mahbubnagar are found to be using illegal Bt varieties too. The main attraction seems to be the lower cost (lower by around 200-300 rupees)
- Since there are no other commercial crops available, it has been found that farmers opt for Bt Cotton even in unsuitable soils
- In three quarters of the fields, aphids, white fly and spodoptera are likely to increase
- In all Bt varieties, drying up of the square and subsequent falling has been observed

By TNRMG (Telangana Natural Resource Management Group):

A team of 6 members including agriculture scientists visited four villages in Atmakur and Geesukonda mandals of Warangal district in the month of October – these villages include Lingamadugupalli, Peddapur, Akkampeta and Mogilicherla. Findings are:

- it was found that fields of MECH 12 Bt and MECH 184 Bt consisted of unidentical plants which indicates spurious seeds to some extent.
- The flowering and cotton pod dropout rate is high and the crop looked dried up
- It was claimed that pesticide usage is not required for a period of 90 days but since the fields were infested with Helicoverpa and white fly, at the behest of pesticide dealers, farmers had sprayed pesticides like Tracer, Avaunt and Confidor.

- Farmers were lured to purchase the Bt seeds by coercive persuasion and demonstration of great returns. One way of luring the farmers is through advance bookings in the month of January itself, and by taking farmers to some "model farms" of the said varieties

One of the main points stressed by the TNRMG fact-finding visit report is the complete failure of regulation of aggressive marketing and spread of illegal varieties by the government and about the way farmers are being lured towards Bt Cotton.

SUMMING UP THE THREE YEARS

Hasty approval for commercial cultivation: The experience in the past three years with Bt Cotton shows the lack of comprehensive assessments at the trials stage itself, in addition to the legal violations of those trials. Data from elsewhere which needed India to take a precautionary approach to GMOs was conveniently ignored. Now, experimentation seems to be happening on which varieties would be suitable and so on, at the expense of hapless farmers.

More fundamental questions about the agricultural research priorities in this country – how they are set and implemented – arise from this experience.

Complete failure of regulatory mechanisms: There has been a complete failure of regulatory mechanisms right from the stage of field trials. The approval conditions demonstrate the non-practicability of certain conditions as well as the conflict of interest embodied in certain conditions where the company promoting Bt Cotton was also given the responsibility to monitor and so on. Currently, there is no accountability at the field level either for lack of monitoring or for failure of crop.

What farmers are reporting:

- Bollworm incidence has been experienced in Bt Cotton also in some instances; even otherwise, bollworm infestation comes back more aggressively after 90 days
- Incidence of sucking pests is higher in Bt Cotton
- Economics are proving to be adverse in Bt Cotton especially if yields do not increase given the high seed cost and small difference in pesticide sprays
- after bt cotton is harvested, the soil conditions deteriorate to the extent that a crop like turmeric cannot be grown afterwards
- farmers have begun noticing that after 3-4 successive years of bt cotton, the incidence of bollworm as well as the need to spray pesticides are increasing
- farmers have begun using non-bt seed to do gap-filling; fewer and fewer farmers are taking care of refuge criteria
- other problems like wilt, drying up of Bt Cotton plants, flowers and bolls etc., are reported
- monitoring by company representatives or government officials is not present in most cases

Even in cases where damage to the crop (where such damage is not reported or witnessed with the local non-Bt hybrids) has been established officially through survey teams, compensation could not be ensured for even one farmer. It is often heard by not just the seed industry people but even by the government representatives that paying compensation to even one farmer opens up a floodgate of demands from others – however, this is no reason why farmers who have genuinely incurred losses cannot be identified through a suitable system and why they cannot be compensated.

The spread of illegal and unapproved varieties of Bt Cotton is another major evidence for the failure of regulation. These varieties are proliferating unchecked without paying heed to medium and long term impacts of bollworm resistance to Bt Cotton building up. In the immediate term, farmers cannot make anyone accountable for any losses that they incur with these varieties.

Monitoring systems highly questionable: The monitoring of Bt Cotton that has happened over the past three years is highly questionable. On the one hand is evidence of patent falsification of records. On the other hand is the media hype that the company has created with results that its commissioned surveys have 'revealed'. There is a general non-transparent way of

functioning that the government itself is adopting. There is no independent assessment happening and no recognition to data produced by other agencies.

On top of this are questions related to broad-based assessment of the GM crop in all its implications. The sampling being used by the monitoring systems is questionable as well as the times at which such monitoring is being done.

Extremely uneven performance by the crop and failure of the technology: The experience with Bt Cotton in the past three years has shown extremely uneven performance across different states, across different districts within each state, across varieties and also across the past three years. Bt Cotton, as per AP government's official data, has failed in the first year. In the third year also, compensation has been ordered for loss-incurring farmers. A variety of agronomic and other problems have been witnessed with Bt Cotton including increased outbreak of pests and diseases, compared to other non-Bt hybrids. Their ability to withstand stress has also been found to be low. There are informal reports from farmers that in those cases where Bt Cotton has been grown in all the past three years, bollworm incidence is noted to be increasing indicating resistance build-up.

What "Bollgard" says and promises:

- "All the methods we have tried so far to control the bollworm have not given us a satisfactory solution"
- After having said that Bollgard has an internal strength to fight Bollworms, the company goes on to add that "Bollworms include American bollworm, pink bollworm and spotted bollworm"; however, we know that Bollgard is not effective against Pink Bollworm which comes later in the season, when the expression of Bt toxin weakens
- "Retention of bolls on Bollgard cotton is more"
- "Control of bollworm is done through lesser number of pesticide sprays in Bollgard compared to regular cotton"
- "Quantum of pesticide sprays on Bollgard will be around 65-70% lesser than other cotton varieties"
- "Yields of Bollgard are higher than yields of other cotton varieties"
- "Bollgard gets harvested around 20-25 days prior to other varieties – this allows for another crop to be grown afterwards"
- "Longer staple is available in MECH 12 and MECH 184 hybrids"
- "Bt Cotton has been tested and proven with lakhs of farmers over many years"
- For best results with Bollgard….: "Like in the case of other cotton varieties, pesticide sprays should be taken up in Bollgard also for the control of sucking pests"; "Bollgard cotton fights against only three kinds of bollworms – American, pink and spotted. Like in normal cotton varieties, there could be a number of pests which attack the Bollgard cotton. To control these, pesticides as recommended by experts should be used"
- "For assessing the need for pesticide spraying, bollworms on the bollgard field should be counted twice a week in the mornings"
- "In Bollgard cotton, yields would be higher in the first picking itself. This is because other hybrids cannot destroy bollworms"

There are official reports which illustrate the fact that there are broken promises on almost all fronts with Bt Cotton

Any variety or technology that is not stable or uniform is a failure and Bt Cotton has therefore failed in India.

Safer and better alternatives ignored: Bt Cotton was introduced by conveniently ignoring safer and better alternatives that exist in this country. There is very successful experience with organic and Non-Pesticidal Management (NPM) approaches to crop cultivation in states like Gujarat, Maharashtra, Andhra Pradesh, Tamil Nadu and Karnataka. These approaches are both eco-friendly and economically viable. The very pest management paradigm that the scientific

establishment has adopted first with pesticides and now with a crop like Bt Cotton needs to be recast.

Bt Cotton was conveniently sought to be fit into an IPM framework by the government and the company. However, the constant release of an endotoxin at lethal levels for a major part of the season is itself antithetical to the IPM approach. IPM is a knowledge-intensive approach whereas Bt Cotton as its cultivation is being practiced shows a large level of ignorance in the farmers' understanding of the Bt technology. There are a variety of understandings with regard to Bt Cotton.

No accountability being fixed: many of the promises being made by the companies as well as sellers of illegal varieties do not get covered by the existing legislations which are ostensibly existing to protect farmers' interests. The current failure of Bt Cotton in Andhra Pradesh, if there is political will, can be brought under the purview of the PVPFR Act or the MoU system. However, governments are finding it difficult to do so. Similarly, for a farmer to take protection under the Consumer Act is very difficult. There are a variety of propaganda and marketing mechanisms being used by the companies which cannot be easily controlled by the government.

On the other hand, there are issues related to bio-safety too. Refuge criteria laid down during the approval are being violated openly given the practical constraints that Indian farmers face. This might mean a faster building up of resistance which would affect both Bt Cotton farmers and non-Bt cotton farmers. Who is going to be accountable for these medium and long term effects?

Farmers' true needs not being met: what the farmers need are seeds that perform well on all fronts. While bollworm resistance is only one additional parameter that the Bt Cotton companies offer to farmers, should not varieties be judged by their overall crop performance? Does it help the farmer that there is less bollworm incidence but that the crop is lost since there has been heavy flower/boll fall, even after having paid exorbitant prices for the seed? There are Indian studies also done by the official bodies concerned about secondary pests being higher in Bt Cotton. Therefore, does it help that the farmers might reduce their pesticide costs on bollworm but increase it on other pests and diseases?

Finally, before we end the report, we would like to counterpose our arguments to a few arguments thrown at people who are demanding a revoking of the approval of Bt Cotton in this country. The industry as well as the government have found a few convenient arguments with which to arm themselves, despite several studies and reports showcasing the extremely uneven, unpredictable and erratic performance of Bt Cotton.

What they would like to argue in their defence, even as the Bt crop failed…..	**What we say…..**
XYZ problem has been seen across all varieties, including conventional hybrids this year and it is not just in Bt Cotton	This is simply not true as official surveys in 2002-03 also indicate – Bt was found to be more susceptible to stress conditions and there was large scale drying up noted; in the third year, the bumper crop in cotton cannot be explained if all varieties including conventional hybrids had failed with the problems that afflicated Bt Cotton
"Bt technology" has not failed since it has been seen to be effective against bollworm – Bt crop could have failed here and there	An argument mostly heard from the scientific establishment where they think that performance of Bt cotton had suffered because of the insertion of the Bt gene into not-so-well-performing hybrids.

	Our question to them is: • Can the technology be termed as successful if bollworm has been controlled to an extent but results in a resurgence of sucking pests and diseases? • Can the technology be termed a success if resistance in the pests is already showing even in layperson observations by farmers? • Can the technology be termed a success if farmers end up using the same amount of sprays for pesticides, now to control increased pests? The difference in pesticide sprays even for bollworm in various studies was found to range between 1-2 sprays. • Finally, how does this "success" explain the continued incidence of bollworm too in many fields visited by several fact finding teams? How about the comeback by the pesticides after 90 days or so? Is it enough that a seed that a farmer buys has one prominent characteristic (resistance to bollworm) but fails in many other ways? How does this fit into the conventional assessments and decision-making that farmers have made about which seed to use? Any technology and product that is not uniform and stable, - and even by the definition used for the registration of plant varieties, any variety that does not exhibit uniformity and stability, - is a failure. Given the extremely uneven performance of Bt Cotton, including two years of large scale failure in Andhra Pradesh, it has to be declared as a failure.
Why is it catching up so much if it was not popular? Hasn't the worldwide extent increased? Haven't the markets of these companies increased? Have not other companies started inserting the gene too under license from Monsanto? Has not the spread of illegal Bt Cotton been phenomenal?	• Even the Minister for Agriculture in Andhra Pradesh had something to say about the vested interests and false propaganda surrounding the spread of Bt Cotton. • In India, approved Bt Varieties occupy less than 6% of the cotton area. If the area increases, it is because of a multitude of corporate strategies including sub-licensing of the Bt technology to many local companies that the farmers trust. • The aggressive marketing strategies of Bt Cotton companies are worth taking note of. On a product that is supposed to bring down the use of pesticides, free pesticides are given as an incentive! There are carefully identified seed agents and representatives in each village where marketing happens – often times, they are the relatives of seed dealers who, after having paid huge advance deposits with the companies, have a stake in selling off their stocks. 2003-04 has also witnessed seed being sold on credit, to be settled in cash paid in regular instalments, in some places in Warangal district. Advertisements that look uncannily similar to news reports, lauding the performance of Bt Cotton are placed in the local papers. • Initial propaganda – written as well as unwritten – makes a variety of promises to farmers including on increased

	yields and better quality of produce. Farmers are lured by such propaganda. • It is important that the government regulate such propaganda and that the companies come out with data on how much monies are being spent on propaganda and marketing at all levels in the Bt Cotton supply chain.
Why would the farmers be willing to spend Rs. 1600/- per acre if it Bt Cotton not effective?	• farmers are being lured by a variety of means to go in for Bt Cotton • given the high-value, low-volume pesticides that are popular in the market now, farmers believe that investing in expensive seed which could bring down pesticide use is better • but as experience shows, farmers ultimately end up spending a lot on the expensive seed as well as on expensive pesticides
Isn't RCH2 Bt's success an evidence for the success of Bt Cotton?	A much hyped reasoning heard throughout the season is that Raasi's RCH2 Bt has performed extremely well and that farmers are very happy with it. • If RCH2Bt is working better than MECH Bt, then obviously it is a varietal characteristic • Our own fact finding visits contradict this uniformly superior performance of RCH2 Bt. RCH2 Bt seemed to show better results when it comes to yields, given that it is a high-yielding variety but when it comes to vulnerability to pests and diseases, there was not much difference seen between RCH2 and other Bt Cotton hybrids and the number of pesticide sprays on the crop. The overall economics favor RCH2 Bt slightly but this is not to say that its performance is better than some of the best performing non-Bt hybrids • in Nalgonda district, the JDA Committee received complaints on the failure of RCH2 Bt and after investigations, the Committee ordered the company to pay compensation. This is an indicator of its performance
Why should farmers worry about resistance when it is 10-15 years away? Isn't that the average age of pesticides too?	• Except for the CICR study, other resistance studies even within India point out to resistance building up much earlier than 10 years, and probably within 5-6 years; such resistance is likely to build up much faster given that resistance management strategies are not followed on the ground. Gujarat farmers are reportedly now seeking 2-gene Bt Cotton to solve their problems • Farmers are already reporting that in their own observation, they found that Bt Cotton grown continuously for three years meant higher and higher incidence of bollworm • It is not just the farmers who are growing Bt Cotton who need to worry about resistance but farmers who are their neighbors too Ultimately, more than the farmers it is a responsible government that has to worry about resistance and therefore, take a precautionary approach. Also, it is the companies which

	are jumping on the Bt Cotton bandwagon which will ultimately lose out in this story
Farmers are free to go in for, or reject Bt Cotton	• There is no informed choice happening • The choices are getting narrower and narrower with many companies going in for Bt technology from Monsanto. In effect, there would be no choice soon.
There are adequate mechanisms in place to protect farmers' interests	• Experience right from the first year has shown that there are no mechanisms to fix accountability on the company in the existing laws or systems like the MoU system of Andhra Pradesh. Even in cases where the government's own data reports failure, farmers' interests were not protected.

In this scenario of erratic and illegal Bt Cotton proliferation, we demand that the government look seriously at its pest management paradigm and at successful, sustainable alternatives. Rich experience with alternatives is present all over the country with many farmers and non-governmental organizations and it is not too late for the government to revoke its approval of Bt cotton cultivation and to focus on promoting and supporting such alternatives. The government should also hold the company accountable for all the losses incurred so far.

References:

1. "A Lesson from the Field": Asha Krishnakumar, May 24 – June 6, 2003, FrontLine
2. "Background Note on Bt Cotton Cultivation in India", on the website of the Ministry of Environment and Forests
3. "Bt Cotton – Bitter Harvest": Debashis Banerjee and Mihir Shah, The Hindu, August 24, 2002
4. "Bt Cotton – Confusion Prevails", Suman Sahai, EPW, June 19, 2002
5. "Local Pests Take the Bite out of Bt Cotton", Financial Express, August 10, 2002
6. "Preliminary Report on the Performance of Bt Cotton in Mahbubnagar District", internal document from the Director of Research, ANGRAU, Hyderabad
7. "Prospects for Bt Technology in India": Barwale et al, Maharashtra Hybrid Seed Company, 2004
8. "Status of Bt Cotton and its Performance": internal document of the Department of Agriculture, Government of Andhra Pradesh, submitted to the Legislative Assembly by the Minister for Agriculture
9. A lesson from the Field", Asha Krishnakumar, Frontline May 24-June 6 2003
10. Barwale, R.B., Gadwal, V.R., Zehr, U., & Zehr, B. (2004). Prospects for Bt cotton technology in India. AgBioForum, 7(1&2), 23-26. Available on the World Wide Web: http://www.agbioforum.org/
11. Corporate Hijack of Biodiversity": Dr Vandana Shiva, Radha Holla Bhar and Afsar Jafri, Navdanya, December 2002
12. Dakshina Telangana Mandalamlo Bt patthi – survey phalithaalu", Dr K Suhasini, Palam, Mahbubnagar in Paadi Pantalu, July 2003

Annexure 1:

Conditions Stipulated by GEAC:

(i) The period of validity of approval is three years from April 2002 – March 2005.

(ii) Every field where Bt cotton is planted shall be fully surrounded by a belt of land called 'refuge' in which the same non-Bt cotton variety shall be sown. The size of the refuge belt should be such as to take at least five rows of non-Bt cotton or shall be 20% of total sown area whichever is more.

(iii) To facilitate this, each packet of seeds of the approved varieties should also contain a separate packet of the seeds of the same non-Bt cotton variety which is sufficient for planting in the refuge defined above.

(iv) Each packet should be appropriately labeled indicating the contents and the description of the Bt hybrid including the name of the transgene, the GEAC approval reference, physical and genetic purity of the seeds. The packet should also contain detailed directions for use including sowing pattern, pest management, suitability of agro-climatic conditions etc., in vernacular language.

(v) MAHYCO will enter into agreements with their dealers/agents, that will specify the requirements from dealers/agents to provide details about the sale of seeds, acreage cultivated, and state/regions where Bt cotton is sown.

(vi) MAHYCO will prepare annual reports by 31st March each year on the use of Bt cotton hybrid varieties by dealers, acreage, locality (state and region) and submit the same in electronic form to GEAC, if asked for by the GEAC.

(vii) MAHYCO will develop plans for Bt based Integrated Pest Management and include this information in the seed packet.

(viii) MAHYCO will monitor annually the susceptibility of bollworms to Bt gene vis-à-vis baseline susceptibility data and submit data relating to resistance development, if any, to GEAC.

(ix) Monitoring of susceptibility of bollworms to the Bt gene will also be undertaken by an agency identified by the Ministry of Environment and Forests at applicant's cost. The Ministry has entrusted Central Institute for Cotton research, Nagpur to carry out the above monitoring.

(x) MAHYCO will undertake an awareness and education programme, interalia through development and distribution of educational material on Bt cotton, for farmers, dealers and others.

(xi) MAHYCO will also continue to undertake studies on possible impacts on non-target insects and crops, and report back to GEAC annually.

(xii) The label on each packet of seeds, and the instruction manual inside the packet should contain all relevant information.

(xiii) MAHYCO will deposit 100 g seed each of approved hybrids as well as their parental lines with the National Bureau of Plant Genetic Resources (NBPGR).

(xiv) MAHYCO will develop and deposit with the NBPGR, the DNA fingerprints of the approved varieties.

(xv) MAHYCO will also provide to the NBPGR, the testing procedures for identifying transgenic traits in the approved varieties by DNA and protein methods.