Seeds of Suicide

The Ecological and Human Costs of Globalisation of Agriculture

Dr Vandana Shiva,
Afsar H. Jafri,
Ashok Emani
Manish Pande

Research Foundation for Science, Technology and Ecology (RFSTE)
A-60, Hauz Khas, New Delhi – 110 016, INDIA
Tel : 685 3772; 696 8077; 656 1868
Fax : 685 6795; 656 2093
e-mail: rfste@ndf.vsnl.net.in
vshiva@vsnl.com
URL : http://www.vshiva.org

CHAPTER I

The Changing Nature of Seed*

From Public Resource to Private Property

'We aim to transform Indian agriculture from a passive, conservative, traditional form, to a vibrant, progressive, scientific and enterprising one. [This] process can be described as a revolution initiated by the farmer, for the farmer, through the farmer'.

Mahyco corporate literature

'We don't sell seed; we sell profit'

Bioseed Genetics corporate literature

1. Diverse Seeds for Diversity

Farmers have for millennia studied, identified, modified, cultivated and exchanged seeds freely in order that they may provide for themselves the best for their utilisation. In this capacity the farmer has always been a scientific plant breeder. Farmers have traditionally conserved and developed this diversity in their fields through on-going cultivation of the varieties. As the farmer produced mainly for the family, the village, and then the rest of the world, with the main vision being sustainability of both lifestyle, and nature (including land and water resources), it was in his interest to conserve the plant varieties developed by him.

Genetic diversity is essential in agriculture for developing plants with characteristics to suit the ecological conditions, nutritional needs and other uses by farmers and for conferring at least partial resistance to diseases. Therefore, it is important to understand biodiversity in its totality and not just in terms of food crops alone. There exists a symbiotic relationship in the ecological niche in which the crops grow. Diversity plays an important role in nutrient cycling, controlling insect population and plant disease. Thus, on-field conservation of all diverse plant wealth is imperative for sustainable agriculture.

Seeds of agricultural crops have been developed over centuries by farming communities across the world. These seeds have been freely exchanged with other communities again across the world and have led to the development

* This Chapter is based on an article by Dr. Vandana Shiva and Tom crompton, published in the Economic & Political Weekly, 1998.

To increase soil fertility, we can take 10 kilos of cow dung and add 250gm of Ghee, stir for 4 hrs, to it add 500 gm of honey and 1 kg of jaggery then again stir for 4 hours. After that it becomes very good food for soil micro-organisms. To it add 200 liters of water. We call it Amrit pani/Sanjivini pani. Apply it to one acre of land. Then mulch it. Fourteen hundred farmers of Maharashtra, Goa are using this method to increase their wealth of earthworms in the soil. These earthworms guide other microorganism for supplying nutrient to the plants. A farmer Pandharpur in Maharashtra has a 23-acre vineyard, where he is using this method. His farm yielded grapes to a tune of 1 tonnes per acre, which is a record.

- Kunwarji Bhai Zadav,
All India Kisan Sabha

of new varieties. Today, with the entry of the multinational sector in seed production and supply as well as new technologies for producing seed, seed varieties have been given a variety of names depending on who evolved it, how it was evolved and its potential for making profits.

Farmers' varieties are those varieties which have been developed by farmers over the years to suit their ecological, nutritional, taste, medicinal, fodder, fuel, and other needs. These have sometimes been called landraces to distance them from the contributions that farmers have made towards their evolution through selection. They have also derogatorily been called primitive cultivars in contrast to elite cultivars as those evolved by scientists. Farmers' varieties like any other seed variety, are an embodiment of intellectual contribution. Farmers' varieties are perennial and sustainable. Farmers' varieties are also referred to as indigenous seeds, native seeds, organic seeds, heirloom seeds and heritage seeds, jwaari, nate, desi etc.

High yield varieties (HYVs), or green revolution seeds are misnamed because the term implies that the seeds are high yielding in and of themselves. The distinguishing feature of these seeds, however, is that they are highly responsive to certain key inputs such as fertiliser and irrigation. They are actually, **high response varieties.** Though these seeds can be saved by farmers, they are non-sustainable due to vulnerability to diseases and pests and therefore need to be replaced after one or two crops.

Hybrid seeds are the first generation seeds (F1) produced from crossing two genetically dissimilar parent species. The progeny of these seeds cannot economically be saved or replanted, as the next generations will give much lower yields.

Hybridisation is only one of the breeding techniques. It does provide high-yielding varieties, but so do other breeding techniques. It is thus like biological patenting the seed. No one else, neither the farmer nor a rival company, can produce exactly similar seeds unless they know the parent lines, which are the company's secrets. This characteristic of the hybrid seed has been fundamental to the rapid growth of the American Seed Industry. The corporate seed sector in India is also involved mainly in the development of hybrid seeds including seeds of maize, sorghum, vegetables, and foodgrains.

The hybrid seeds are also called "Sarkari" seeds as these seeds have initially been developed and distributed by the public sector in India.

Today there are three kinds of producers of seed:

a.) Farmer Seeds: the farmer has historically been the producer of perennial varieties, which could reproduce themselves eternally.

b.) Public Sector Seeds: Public sector research institutions have bred short term varieties for "high yield". These seeds could for some time be saved and used by the farmer, but their yield reduces after a few years.

c.) Private Sector Seeds: Private companies and Transnational corporations produce non-renewable and therefore non-sustainable seeds through hybrids and tissue culture, where the farmer has to return to the company for fresh seed, each time he has to sow.

The last is called biological patenting of seed. Patents give the owner of the seed the exclusive right to multiply, save, develop further varieties and sell seeds. Biological patenting effectively prevents the farmer from multiplying, saving and selling the seed.

> The main concern is that organic farming is being hijacked by corporations. The large multinational are growing crops that may be technically organic but ignore organic soil practices, farm labour justice, wild life management. The organic farmers had to put up a tough fight with multinational such as Monsanto who were planning to water down the efforts of organic farmers. The USDA considered a National Organic Legislation that would include genetically modified food, irradiated foods, and use of toxic sludge and that would be considered as bio-fertilisers. In protest, 300,000 farmers wrote letters to the agencies about it. We have to now a days go two ways; one is to defend ourselves and the other to take the movement forward.
>
> ***- Dave Henson,*** *organic farmer for 25 years and presently with Occidental Arts and Ecology Center, USA*

2. The Decline of the Public Sector

The shift from indigenous varieties of seeds to the Green Revolution (high yielding and hybrid) varieties also involved a shift from a farming system controlled by peasants to one controlled by agri-chemical and seed corporations, and international agricultural research centers. The shift also implied that from being a free resource reproduced on the farm, seeds were transformed into a costly input to be purchased. Countries had to take international loans to diffuse the new seeds, and farmers had to take credit from banks to use them. International agricultural centers supplied seeds, which were then reproduced, crossed and multiplied at the national level.

The National Seed Policy

The Royal Commission of Agriculture (est. in 1928) was the first body to recognise the necessity of the high quality seed. In seeking to promote the agriculture, Royal Commission placed emphasis on the production and distribution of the quality seed. The National Seed Corporation Ltd. (NSC) was founded in 1963 and was charged with the systematic production and distribution of seed. This action was followed by the passage of Central Seed Act, which provided the statutory support for quality control. The National Seed Review Team was constituted in 1967 to make recommendations to the National Commission on Agriculture. Among the recommendations were strengthing the power of NSC and to foster the creation of additional government organisations to produce and distribute seed, including the State Farm Corporation of India (SFCI), 13 State Seed Corporations (SSC's), 19 seed certification agencies and 26 seed testing laboratories. The passage of Central Seed Act, 1996 laid the legal foundation for present day seed industry. During the 1960s and the 1970s the participation of the private seed industry was minimal. The situation changed dramatically in mid 1980s, when the private seed industry experienced a sudden expansion; primarily by the appearance of the attractive market of hybrid sorghum and pearl millet. The specific policy reforms introduced in the 1987 further encouraged the growth of private seed industry. There was a subtle take over of the government control of the seed by the private companies. Firstly, many public breeding institutes began making

germplasm (e.g. inbred lines) more readily available to private companies. Secondly, industry licensing policy was modified to attract greater participation of Indian companies as well as companies with minority foreign ownership.

The so-called reform process further threw open in 1988 with the passing of the New Policy for Seed Development. This landmark legislation was the process of handing over the seed sovereignty of the country to the foreign participation. The New Policy for Seed Development permitted private companies to import seed of vegetables, flowers and ornamental plants, although the imported material was subjected to prior approval by the Indian Council of Agricultural Research (ICAR). Imports of the seed of coarse cereals, pulses and oilseeds were also permitted following the approval from ICAR. In the seed production and distribution the private companies are reluctant to deposit the seed to the government agencies on the pretext that these might fall in the hands of their competitors.

Policy reforms introduced in the 1980s and 1990s led to lowering of many legal barriers, which was characterised by the rapid growth in the number of companies. The MNCs by arriving with lucrative job offers and better working conditions have infact marginalised the public R&D centers of the country. The Public Sector Units (PSU) have very little of the talent as most of the professionals have gone to the other side. Although the research component still persists, but this drain has lead to the deterioration of the public breeding programme of the government.

Whilst the Green Revolution of the 1960s and '70s was orchestrated by the public sector, the so-called 'Second Green Revolution", based upon new hybrid and genetic technologies, will be driven by the private sector. Accompanying this shift is a change in motivation from one based upon the common interest (however misguided this may have proven to be in practice) to one based upon corporate profit. Who, under this new regime, will pursue research in the public interest where this does not concur precisely with corporate interest? In this section, the decline of the public sector seed industry will be charted. The next section will examine the rise of the private sector.

The Privatisation of the Public Sector

There are as yet no cases of transnational taking over public sector companies in the Indian seed industry (though there has been at least one attempt-see below). Under Structural Adjustment Programmes (SAPs), investment in the public sector, and therefore the competitiveness of this, has fallen. Its role has now diminished to:

- *Provision of open pollinated seed.* The majority of seed distributed by State Seed Corporations is open pollinated. The market for open pollinated seed is expected to decline as pressure to use hybrid seed increase. But at present, SSC sales of Open Pollinated Varieties (OPVs) do little to compete directly with private sector sales (predominantly of hybrid seed). Successful public sector pearl millet hybrids represent an exception, to this generation. However, the area planted under pearl millet (denigrated as a 'coarse cereal') is falling nationally (Ram, 1996).
- *Sale of hybrid seed in crops for which there is little private sector interest.*

Public sector bajra (pearl millet) hybrids are extolled as demonstrating the continued competitiveness of public sector research and development. However, the area of land planted under pearl millet is actually falling annually, as farmers turn to other, more commercial, crops.

- *Erosion of the public sector market share.* It is a professed aim of State Seed Corporations and Agriculture Departments to encourage the shift to increased use of hybrid seed; a market increasingly dominated by transnational companies (or national companies with tie-ups with foreign companies).
- *Production of parental lines.* Increasingly, the role of public sector research institutions is viewed as the production of parental lines to be given to private companies for further development.
- *Sale of private sector seed.* Seed from private sector companies, particularly maize and sunflower seed from transnational, comprises an important proportion of total seed distributed through some State Seed Corporations. This attracts Central and State Government subsidies, amounting to direct though unacknowledged, governmental support for the private sector.

The Structure of the Public Sector

The National Seeds Corporation

The National Seeds Corporation (NSC) was established in 1963, with the massive importation of new high yielding varieties. The NSC became the distribution arm of the public sector, responsible for the production and marketing of varieties bred at ICAR funded institutes and agricultural universities. Its role has since been largely superseded by the State Seed Corporations. However, it still grows seed, under contract to 7000 farmers, to compensate for shortfalls in seed production by the SSCs. The NSC is an important producer of vegetable seed, particularly open pollinated varieties of around 100 products, and about nine are hybrids. The director, Deepika Padda, claims that the NSC produces vegetable seed over an area of 900,000 hectares, by comparison to a total private sector production area of 1,500,000 hectares. Despite being (or perhaps because it is) such an important producer of vegetable seed, attempts were made by World Bank representatives to persuade the director of the NSC to cut back vegetable seed production. Whether or not the private sector can be entrusted with the pricing of vegetable seed in the absence of public sector competition is equivocal. Cabbage seed imported from Japan and sold by the National Seeds Corporations for Rs. 6000 per kilogram is sold by a private company for Rs. 12-15,000 per kilogram. Meanwhile, the NSC has maintained a workforce of around 600 (comparable to its strength in the 1960s), the private seed company is paying recent graduates Rs. 2,500 (or US $ 70) per month.

State Seed Corporations

Thirteen State Seed Corporations were established in 1975, under World Bank funding. These largely took over public sector seed production from the NSC. They still comprise a highly important sector of the Indian seed industry,

particularly with respect to open pollinated cereal varieties. The managing director of Andhra Pradesh SSC, for example, estimates that this provides some 75% of the seed requirements of the state; 40% of this seed is hybrid, much of it provided by the private sector.

The remainder of the seed supplied by the State Seed Corporation, in the case of Andhra Pradesh (AP), is produced by some 6000 share-holding "cultivating farmers". Nuclear seed, developed in the public sector-by ICRISAT, ICAR, and the Universities-is used in the production of breeder, foundation, and certified seed. This is then processed at one of eighteen processing units in the State, and supplied to farmers.

Some SSCs are financially profitable. The AP-SSC, for example returned an 8% dividend to shareholders last year. It seems however, that profitability is set to increase the threat from the private sector. This is not merely manifest as an encroachment upon the market share of SSCs. For example, John Hamilton, then managing director of Cargill, tried (with the support of World Bank representatives) to buy Karnataka SSC.

Research and Development

All private sector representatives concur that the competitiveness of public sector varieties and hybrids is falling. The managing director of IML Seeds estimates that 90% of maize, and virtually all sunflower seed now sold, are private sector hybrids (or varieties). Even State Seed Corporations are increasingly supplying private sector hybrids. Several contributory reasons are suggested for this:

1. The success of private-sector advertising campaigns.
2. Funding problems, both nationally, with higher education funding in crisis, and internationally (for example, withdrawal of international funding for ICRISAT in Hyderabad), leading to under investment in public sector research programs.
3. Public sector bureaucracy.
4. The failure of poorly trained SSC staff to properly maintain public sector lines, which are given to SSCs for perpetuation.

This has lead to a shift in the role of the public sector. Increasingly, public sector research establishments are seen as the providers of lines for further development and refinement by the private sector. These are made freely available to private sector breeders.

Paddy and wheat seed sales are still dominated by the public sector, although with increasing private sector interest in hybrid paddy, the public sector of sales of this seems set to diminish. Sales of public sector hybrids of pearl millet are also good, though (as mentioned above) there is comparatively little private sector competition for the market for hybrids of so-called 'coarse cereals', for which the area cropped nationally is falling annually.

Many smaller seed companies rely upon sales of public sector hybrids and varieties. Other new companies have used sales of these to maintain viability whilst developing their own hybrids. Examples are provided by J.K. Agri Genetics and IML Seeds, both of which entered the seed market in 1989, in

the wake of the New Seed Policy (1988). Initially, both companies relied upon sales of public-sector varieties and hybrids, before launching their own research and development programs. However, it is generally recognised that relying exclusively upon sales of public bred hybrids is difficult. Such hybrids are available to all small companies, and competition is stiff. Subsidies for public-sector suppliers of this same seed makes private sector involvement less attractive. Furthermore, and in response to the intensive advertising campaigns of large seed companies, farmers are moving increasingly toward use of proprietary hybrids. Many smaller seed companies will be hard-hit by the dual effects of the diminishing competitiveness of public-sector varieties and hybrids, and heavy investment in the expansion of the private sector market for proprietary hybrids.

World Bank Funding of the Public Sector

World Bank-funded National Seed Projects (NSP) were initiated in the mid-seventies, to make the Indian seed industry 'more viable and result-orientated'. That is, 'to create necessary infrastructural facilities for seed production, conditioning, storage and distribution of high quality seeds' (Chopra et al, 1995). Three such Projects (NSP I, NSP II, and NSP III) were undertaken (beginning in 1975, 1981 and 1988, respectively). The last of these three ran up until 1996. The proportion of funding for each Project offered to the private sector follows an trend representative of the shift in emphasis from public to private sector investment under Structural Adjustment Programs (Table 1.1).

In particular, World Bank policy changed in 1993, when it was concluded that investment in the public sector seed industry was unproductive. Subsequently, support was concentrated in the private sector. In the case of NSP III US $ 30 million credit was made available to private companies through the National Bank for Agricultural and Rural Development (NABARD) under favorable loan agreements. Specifically, these were made available for infrastructural improvements, germplasm import, agricultural education and seed testing (they did not cover working capital or land purchase). Recently, an FAO team recommended against a Fourth Project, concluding that the growth of the seed industry will continue without further intervention. (However, individual state governments are invited to submit applications for financial support for the private sector to the World Bank. Uttar Pradesh, where the private sector is 'under-developed', is thought to be pursuing such sources of funding).

TABLE 1.1

Proportion of World Bank funding for each successive National Seed Project earmarked for the private sector

National Seed Project	*Beginning (Year)*	*Apportioned to Private Sector (Approximate)*
NSP I	*1975*	*-*
NSP II	*1981*	*20-25%*
NSP III	*1988 (ran until 1996)*	*60%*

Source: *Personal communication by Tom Crompton with K.R. Chopra, World Bank Consultant, 1997*

3. The Privatisation of the Seed Sector

The Indian seed industry is undergoing a period of rapid change inaugurated by the economic liberalisation of the past decade including the New Seed

Policy of 1988. The structural adjustment programmes of the 1990's and the coming into force of the W.T.O. agreements on Trade Related Intellectual Property Rights (TRIPs), the New Seed Policy lifted restrictions on private sector import of foreign germplasm, enabling larger seed producers, particularly those with foreign collaborations, to access seeds from international sources. Increasingly, the public and private sectors are being delineated in terms of the type of seed they each produce. The public sector focuses on the development and production of open pollinated varieties (OPVs), which are less commercially exploitable than hybrid seeds. The private sector concentrates upon these latter and more remunerative crops (such as vegetables). This is a polarisation, which is set to continue, particularly as pressure on farmers to switch to use of high yielding hybrids intensifies. Despite this polarisation, both the public and private sectors are engaged in initiatives to increase hybrid seed usage amongst those farmers currently using open pollinated varieties.

Predictions suggest that the Indian seed industry will be worth some 20 billion rupees (around US $600 million) annually by the turn of the century. Indeed, the former managing director of Monsanto, S. D. Khanna estimates that it will be worth 60 billion rupees (around US $ 2 billion). As the commercial value of seed sales grows, the proportion of these accounted for by the public sector is diminishing, with more farmers turning to high yielding hybrid seeds produced by private seed companies. Simultaneously, there will be a continued coalescence of the industry around a few key companies, most of which will either be subsidiaries of transnational companies, or otherwise have entered joint agreements with such companies. Representatives of large seed companies (and in some instances the directors of smaller companies) admit that the future for low-turnover domestic seed enterprises looks grim.

There is uncertainty over the actual current value of the seed industry, though it is anticipated that this stands at 12,000-16,000 million rupees per annum. Estimates placed the value of the industry (both public and private) at 10,000 million rupees back in 1994. According to one such estimate, the value of seed sales broke down by market sector as detailed in Table 1.2.

This massive and continued growth is attributed to a shift in seed sales away from the public sector and towards the private sector, commensurate with an increasing demand for high-yielding hybrid seed. As K.R. Chopra (managing director of Mahendra Seeds, president of the Seed Association of India, and consultant of the World Bank) writes: "The commercial exploitation of hybrid vigor in recent years has been a crucial factor in phenomenal increase of private sector contribution to the total turnover" (Chopra et al, 1995). The managing director of Mahyco, Mr. R. Barwale, estimates that the distribution of the market has shifted since 1994 (see Table 1.2). He suggests that currently some 30% are attributable to the public sector (state seed companies), 40% to 'large' private companies, and 30% to 'small' seed companies. If he is correct, this represents a small shift away from the public sector, and a significant shift within the private sector in favor of large companies

TABLE 1.2
Estimated Value of Various Sectors of Seed Industry, as of 1994 Figures

(in Million Rupees)

Public Sector	4000
Private Sector	6000
Organised	3500
Large	2150
Small	1350
Unorganised	2500
Total	**10000**

Source: *Data complied by Mallick (1995). The operational definitions of 'large' and 'organised' are not clear.*

over the last three years. However, these figures are essentially speculative, and Barwale was unclear how he defined a 'large' (or 'small') company.

Table 1.3 shows one projection for a breakdown of the growth of the seed industry, by crop type.

Estimates of the proportion of the market accounted for by hybrid seed sales (in terms of value, rather than volume) also vary, but the suggestion by Mr. S.U. Baig (Director, Nath Seeds) that this stands at 70-75 % represents a consensus viewpoint. Baig also estimates that 25% of the market is held by 15 or 16 companies (perhaps 10% of all companies nationally). Indeed S.D. Khanna, the former manager of Monsanto suggests that there are only 15-20 'sustainable' seed companies in the country. Khanna goes further, suggesting that suppliers within the public-sector have 'only survived this long due to ignorance of farmers".

TABLE 1.3

Breakdown of the growth of the seed industry

Crop	*1994*	*1997*	*2002*
Paddy	200	275	350
Wheat	220	325	450
Sorghum	75	90	115
Maize	65	70	90
Pearl millet	35	44	60
Sunflower	10	14	20
Mustard	8	12	15
Others	87	170	400
Volume	700	1000	1500
Value (Rs million)	**10,000**	**15,000**	**30,000**

Source: *Kapoor and Sindhu, 1995.*

Note: Seed Industry growth projections (thousand tonnes). The bottom row also shows total projected sales of seed, in both public and private sectors.

The reduction in the public sector market share is difficult to document, for two reasons. Firstly, the seed production of State Seed Corporations, the main public sector suppliers of seed, continue to grow. What is not clear is whether this is growing in proportion to the expansion of the overall market. Secondly, State Seed Corporations themselves buy seed from the private sector (Andhra Pradesh State Seed Corporation, for example, buys some 25% of its seed from the private sector). This means that an appreciable proportion of seed sales by this Corporation are, in actual fact, attributable to the private sector.

Expectations for the expansion of the seed market are derived from two considerations. The first is based upon estimates that at present a high proportion of seed is saved by farmers from year to year. This may be seed saved from commercially bought open pollinated varieties, or even second generation (F2) hybrid seed. In addition, a significant proportion of this seed is taken from local 'landraces'. It is anticipated that farmers will increasingly buy new seed each year, and where they are using landraces, will turn to alternative commercial varieties and hybrids. The second consideration is that farmers are expected to increasingly turn to more expensive hybrid seed in preference to open pollinated varieties. Each of these factors will be considered further.

Farmer Saved Seed

Estimates of the ratio of farmers who replant saved seed each year vary. The managing director of IML Seeds, Mr. J.V. Laxman Rao, estimates that nationally in 1990 around 10% of farmers bought new seed annually, rising to 25% in 1997. He claims that this is now set to increase 5-6% per annum. Mr. Agrawal, the general manager of ProAgro-PGS, estimates that overall use of 'quality seed'

is 9.5% (Agrawal, 1996). The eighth five-year plan (1991-96) set a target of a 6% seed replacement ratio. The target for the ninth five-year plan (running to 2001) is 8%. Most farmer saved seed is OP or local landrace. Open pollinated (OP) seed performs well for four to five generations, with minimal selection of plants each year. In addition, some hybrid seed is planted in the second or third generation (F2 and F3). Second generation maize seed for example, is used in preference to new OP seed, according to the managing director of IML.

Table 1.4 shows the amount of seed supplied by the industry for each of six crops, in 1994. Also shown is the estimated percentage that this represents of the total seed planted. This is calculated on the basis of average seed requirements per unit area of a particular crop. As might be anticipated, relatively little seed is bought for crops which are predominantly open pollinated (paddy and wheat). Other crops where hybrid seed is available, show higher proportions of supplied seed. In fact, the proportion of sunflower seed that is taken from suppliers is now probably far higher (estimates suggest that around 95% of sunflower seed planted is hybrid, and most of this will be re-bought annually).

TABLE 1.4

Seed supplied (in tonnes) by the seed industry in 1994, for a range of crops, and estimates of the proportion

Crop	*Seed supplied (tonnes)*	*Seed supplied as percentage of seed planted (calculated on basis of total area under crop)*
Paddy	150,000	11.7%
Wheat	200,000	8.3%
Sorghum	45,000	25.9%
Maize	35,000	29.4%
Pearl millet	30,000	71.8%
Sunflower	7,000	43.0%

Source: *Chopra et al, 1995.*

The Agricultural Commissioner for Andhra Pradesh estimates that between 10% and 30% of cereal seed planted in the state annually is of local landrace varieties. In particular, use of landraces is concentrated in:

- areas of newly-cultivated land, which tend to be farmed by novice farmers unclear of the vaunted advantages of use of commercial seed
- areas where water shortage makes investment in commercial seed less attractive
- areas where credit for purchase of commercial seed, fertilisers and pesticides is difficult to secure
- areas where local landraces are preferred due local taste preference.

The Shift Towards Hybrids

At the National Conference on Seeds, Agra (in 1993), targets were set for annual increases in the hybrid seed production (expressed as mass of seed) up until 1997 (see Table 1.5).

K.R. Chopra estimates that total hybrids use has increased from 8% (1994) to an estimated 25% (1997) of seed annually planted. The director of Nath seeds estimates current hybrid seed use as shown in Table 1.6.

Factors contributing to this remarkable increase in hybrid seed use will be considered in some detail. Chopra identifies two such factors; 1) the development (by the private sector) of short-maturing hybrids; and 2) the hiking

of grain prices, making heavy investment in hybrid seed commercially viable for those farmers who can afford it. Note the maintenance of these grain prices is determined in part by seed suppliers (Cargill, for example, who are able to manipulate maize prices, also sell hybrid seed for planting). To these two further factors might be added; 3) an intensive advertising campaign conducted by seed companies, and augmented by government-funded projects to increase farmer's acceptance of hybrid seed and; 4) according to some industry representatives, the effects of farmer-to-farmer advocacy of hybrid use. The marketing manager of Cargill, for example adopts a strategy encouraging farmers themselves to become "Cargill spokespeople".

The hybrid seed market is reputedly, highly fickle; farmer's preferences for particular brands of seed change rapidly, reflecting in part the specific marketing success of individual companies, and favoring those with a broad product portfolio. This viewpoint is corroborated by the manager of one small seed retail company, who claims that in his experience it takes just two years for farmers to switch allegiances to a new HYV or hybrid. This frequently follows heavy promotion of particular brands. He cites, for example, the case of a Western Agri cotton hybrid which was heavily promoted through the distribution of free 50gm seed packets to selected high-performing farmers, and provision for an attractive profit margin for seed retailers (see Table 1.10). However, the (possibly fortuitous) suitability of a particular hybrid to growing conditions one year will boost sales of this same hybrid the following year, to the detriment of sales of alternative seed. An example is provided by the public sector cotton hybrid NHH44, which was particularly successful in 1996 (perhaps as a result of its suitability to good rains). Future sales of the hybrid are expected to be colossal, although if the rains are poor, yields may be low, and farmer's allegiance will switch in the following year.

TABLE 1.5
Yearwise hybrid seed production plan (1992-3 to 1996-7)

Crop	*Annual growth rate (%)*
Maize	17
Sorghum	6
Pearl millet	22
Sunflower	63
Castor	14

Source: *Chopra et al (1995)/. 'Annual Growth Rate' refers to annual targeted proportional increase in hybrid seed sales.*

Notes: Yearwise hybrid seed production plan (1992-3 to 1996-7), according to National Conference on. Seeds, Agra 1993.

TABLE 1.6
Current estimates of hybrid seed sown as a proportion of the total *seed of the corresponding crop planted each year*

Crop	*Hybrid Seed Planted as a Proportion of the Total*
Cotton	23%
Sorghum (kharif)	95%
Pearl millet	50%
Maize	75%

Source: *S.U. Baig, Director, Nath Seeds, (1997)*

Public Sector Campaigns

Subsidised Seed

The State Seed Corporations (SSC) have two stated aims, summarised in the strategy document produced by Andhra Pradesh SSC. The first is to provide 'high quality seed to farmers at reasonable prices, the second is to 'coordinate with the Department of Agriculture, Government of Andhra Pradesh, in accelerating the spread of hybrid/high yielding varieties of different crops for promoting increased agricultural production'. This latter aim is addressed through both the provision of seed at subsidy, and the supply of private

sector produced seed. In fact, as discussed earlier, 25% of the seed supplied by AP-SSC is bought from the private sector (mainly maize and sunflower-crops dominated by multinational companies). This is an evident source of embarrassment for R.S. Paroda, Director General of the Indian Council of Agricultural Research (ICAR). He points out that the policy of individual SSCs is beyond the control of Central Government, and claims that instances of these buying seed from the private sector are exceptional.

Farmer's Seminars

During the kharif season, 1997, the Government of Andhra Pradesh organised a series of Statewide *Karshaka Sadassus*, or farmer's seminars. These comprised a two-day exhibition of agricultural technologies, and a programme of seminars extolling the applications of these. It was anticipated that around 30,000 farmers, representing all neighboring villages, would attend each of the 22 Karshaka Sadassus. In addition, the participation of private seed companies was invited, to 'exhibit agri-inputs and other related products'. The seminars, it was claimed, offered 'a good opportunity for exposing the latest technology in agriculture, and inputs available to farmers'.

State Agricultural Training

In Andhra Pradesh, the State Agriculture Commission has set up a network of Farmer's Training Centres, with one to each district. These organise training, both at the Centre, and through two-day training sessions in villages, for groups of 25 or so farmers. In addition, each district has several development and agriculture officers.

The Intensive Tribal Development Agency (ITDA)

In Andhra Pradesh, the State Seed Corporation supplies seed to two regional Intensive Tribal Development Agencies (based at Paderu and Utnoor), for distribution amongst tribal peoples, at large subsidies. The managing director of the AP-SSDC predicts that within 2-3 years, all residual use of local landraces by tribals will be eradicated.

In Utnoor District (350,000 people, around 80,000 families) soya-bean seed, black, green and red gram, paddy, cotton and sorghum (jowar) seed is supplied at a subsidy. Some of these represent new commercial crops for tribals (soya bean, for example). Others (jowar) are already grown as important landraces. Under a scheme that was initiated in early 90's, seed was initially supplied at a 75% subsidy. This has since been cut to a current 50% subsidy (25% subsidy is provided by the Andhra Pradesh Department of Agriculture, with the ITDA meeting the remainder). Under the scheme, fertilisers and pesticides are also provided at a subsidy, with the government providing subsidies on fertilisers, and the ITDA a 50% subsidy on biopesticides.

Only around 20% of families can be supplied with subsidised seed. These are selected at a local level by the Village Tribal Development Association. Although the ITDA hopes to do away with the subsidy in the near future, the Project Officer admits that amongst those to whom subsidised seed is no longer made available, very few are continuing to plant hybrid seed. This is attributed to the difficulty encountered by tribals in securing loans. In the past, tribals

have been forced to default on bank loans following crop failure (HYVs and hybrids are particularly vulnerable to this as a result of the more stringent growing conditions).

The Project Officer also concedes that there has been an increase in patriarchal power following a shift toward planting of commercial crops. This follows a reduction in the importance of the role of women in harvesting these crops. In an attempt to redress the balance, grant aid is simultaneously being given to women's projects, to encourage alternative enterprises (cattle breeding, or small market-based projects, for example).

Private Sector Campaigns

The private sector is predominantly concerned with conversion of farmers currently relying upon open pollinated varieties to use of hybrids. Except in the case of sunflower, where most seed planted is hybrid (estimates are that the proportion is as high as 95%), the potential for expansion of the hybrid market is seen as large. Mr. J.S. Bindra president of Shriram Bioseed Genetics, for example, summarises the attitudes of many industry representatives when he comments: "Only after farmers currently dependent upon OPVs switch to hybrids, can we foresee the development of commercial interest in farmers still relying upon landraces".

This emphasis upon market expansion means that many companies profess to concentrate upon a development of the market per se, rather than pushing their own particular hybrid brand Multinational seed companies invest most extravagantly in the development of the hybrid seed market. Cargill, for example, organise a series of 'field-days' and demonstration plots. The company has a team of 'field assistants' which have the sole job of visiting farmers and 'cold-selling'. Strategies also include mail-shots and newspaper advertisements. The marketing manager claims that the key to their sales strategy is a 'farmer advocacy' -encouraging farmer themselves to advocate Cargill seed.

Field - Days

Farmers are invited to the field of another farmer exhibiting uncommonly high yields of branded seed. These exemplary farmers may be singled out before the growing season, on the basis of their competence in previous seasons, and asked to grow the relevant branded seed. Alternatively, exemplary crops may be chosen at the end of each growing season from amongst a company's customers. Cargill adopts the latter approach, choosing around ten exemplary fields in Karnataka alone, and inviting between 200 and 300 farmers to each. Those farmers invited are not, by and large Cargill customers. ITC Zeneca adopts the alternative approach: Selected farmers are given ITC Zeneca seed to plant, alongside local varieties. At harvest time, up to 500 neighboring farmers are invited to a 'farm-day'. Here the farmer relates his experience of growing the seed to other farmers, and Zeneca technical staff are on hand to back him up.

Cargill augment field-days with 'Intensive Customer Contract Programme's (ICCPs), where Cargill staff gather together a group of farmers, and 'sit under a tree with a folio chart, to talk to them'. By the end of their first season of sales, Cargill staff had held perhaps 3000 such sessions, each attended by 20 or 30 farmers.

Sales Men

Although all Cargill seed is distributed through Rallies, the company has an extensive marketing network of its own. Each member of a seven person marketing team employs a further 10-15 temporary staff. These temporary staff are taken from farming communities local to those in which they will work. Cargill's marketing manager claims that this means sales staff appear 'more credible'.

Media

ITC Zeneca have a touring cinema which shows a short film dramatising inter-village competition for the annual trophy for the best crop. The consistent victory of one village is attributed to its use of Zeneca seed. Following adoption of the same seed by the neighboring village, both become equally successful, and the rival villagers are reconciled under the slogan 'with ITC Zeneca, it's a win-win situation'.

Cargill view their Krishi Kaipidi (or 'Farmer's Handbook") as a public-relations tool. This is published in fortnightly installments in local newspapers during the growing season, and offers farmers practical advice on maximising the yields they obtain with their hybrid seed.

In engineering their dramatic (though self-proclaimed) rise to prominence as suppliers of maize seed in the north, Kanchan Ganga sold seed at a loss for the last two years, or so in order to establish a market. Cargill also may provide small packets of free seed to farmers, particularly poor farmers in areas where use of open pollinated varieties predominates. Cargill's marketing manager claims that free seed is not used as a strategy for converting farmers from rival brands of hybrid seed to Cargill seed.

Free packets of hybrid seed may also be enclosed with larger packs of open pollinated seed. Arora (1995) claims that 'there have been instances' where the additional yields obtained with the hybrid seed have justified a complete switch to this the following season.

4. Big Companies Getting Bigger

Tiwari (1996) estimates a total of 147 private sector seed companies, which can be broadly categorised according to whether they (1) develop, produce and market their own varieties and hybrids, (2) produce and market public sector varieties and hybrids, or (3) have no production capacity whatsoever, concentrating solely upon marketing. Agrawal (1996) estimated that of the former category, 24 companies have entered collaboration with foreign companies. In addition several multinational companies have opened subsidiaries in India.

There are several recent and discrete legislative changes which have promoted the growth of the private sector, Agrawal (1996) identifies these as:

1986 - Provision of private seed companies with breeder seed for public sector developed self-pollinated crop varieties

1988 - New Seed Policy, liberalising seed imports and encouraging foreign investment in the seed sector

1991 - Relaxation of limitations on foreign equity participation, permitting foreign companies to hold controlling stakes in industrial enterprises.

The Market Niche of MNCs

Multinational companies dominate in crops where access to international germplasm, places them at an advantage over national companies. In particular, these are maize, Sudan-grass/sorghum hybrid (SSG), sunflower and soya. Rather than developing new hybrids specifically for use in India, multinational companies have tended to focus upon the exhaustive testing of extant hybrids imported from other countries, for suitability to Indian conditions. For example, Cargill maize and sunflower hybrids (which are 'price leader's, reflecting, it is claimed, their superior quality) were imported from international sources. Of the four biggest suppliers of sunflower seed, three (ITC Zeneca, ProAgro and Cargill) are multinational, reflecting the origin of all sunflower germplasm in the US.

Now, however, multinational companies are beginning to move into crops which have been dominated hitherto by domestic companies. Cargill, for example, are poised to push sales of sorghum hybrids.

Multinational companies have a characteristic sales strategy, typified by Cargill, preferring to emphasis 'quality' and consumer confidence, rather than competitive pricing. Thus Cargill's hybrid sunflower seeds retails for Rs. 350 per kilogram, over three times the price of hybrid sunflower seed produced by a local company, Bhavani Seeds (see Table 1.7). Cargill justify this price on the basis of higher yield, consumer confidence, and after-sales back up. Besides, it is claimed, only 3-5% of a farmer's total outlay cost is expended on seed. (Cargill claim that a progressive farmer spends perhaps 8% of his cost of production on hybrid seed, but can achieve a 50% yield advantage). The local seed company concedes that the yields obtained using Cargill seed exceed those obtained with its own proprietary hybrid. However, they suggest that the yield gains alone do not justify the vastly inflated prices. The production manager suggests that typical yields obtained with Cargill sunflower seed would be 12-13 quintals per hectare, as compared to 10 quintals per hectare using Bhavani Seed's own hybrid. Cargill sales, he suggests, are maintained only through massive advertising campaigns with which smaller companies cannot hope to compete.

TABLE 1.7

Cost of contract seed production, and retail prices, for three classes of sunflower seed (1997-98)

	Buys from Contract Grower (Rs/quintal)	*Retails to Customer (Rs/quintal)*
Bhavani Seeds sunflower variety	20	40
Bhavani Seeds sunflower hybrid	40-45	140
Cargill sunflower hybrid	140	350

Source : *Figures quoted by production manager of Bhavani Seeds.*

Case-Studies of Specific Markets

The Maize Market

The maize market is growing rapidly, and is expected to continue to grow as the processed food market expands under liberalisation. Calculated upon the

basis of the total area nationally under maize, the potential seed market is reckoned to be some 120,000 tonnes. With Cargill (the price leader) selling maize seed for over US$ per kilogram, the maize market alone is viewed as being worth a potential US $ 120 million. Note that Cargill, the largest supplier of maize seed to the Indian market, also has some control over global grain prices, and hence the relative economic benefits to the farmer of investing in expensive hybrid seed. Cargill are attempting to force up the price of maize seed: The marketing manager is rueful that his company sells the seed at three times the Indian price in Pakistan (US $ 3.50 per kg). He attributes this price differential to the lower domestic production of maize seed in Pakistan. Of course, diminishing domestic production of seed by domestic Indian companies will inevitably follow the consolidation of the multinational market share. The price of maize seed is, it seems, set to increase.

TABLE 1.8

Trends in areas of maize planted, and amount of certified seed distributed, for the first half of the decade

Year	*Area of maize plante (million hectares)*	*Certified seed distributed (tonnes)*
1990-1	5.90	14,900
1991-2	5.86	15,000
1992-3	5.96	15,000
1993-4	6.00	12,900
1994-5	6.11	13,700

Source: *Ram, 1996.*

Note that whilst the area of maize planted has increased, on aggregate, over this period, the amount of certified seed supplied has fallen. This suggests a shift away from certified seed, towards private sector seed use.

It is clear that the area planted under maize is increasing annually, whilst sales of certified seed is falling (Ram, 1996) (see Table 1.8). If we assume that the proportion of farmer's saved seed is also falling from year to year, it is evident that an increasing fraction of maize seed planted, though bought commercially, is not certified. This in turn suggests a shift from public sector (generally certified) to private sector (usually uncertified) seed usage.

The director of Pioneer Dr. G Bhatia, estimates that around 90% of the maize market is in the private sector. Some estimates suggest that currently, 25% of maize seed planted annually is hybrid (25-30,000 tonnes of seed), around 60% of open pollinated variety, and 15% landrace. However, it is considered difficult to differentiate clearly between the OP and landrace share of the market. Landraces are used particularly in the north of India, in the Indo-Gangetic belt. Here cropping patterns demand a short-maturing maize. Whereas local landrace mature in 60-70 days, the quickest maturing hybrid requires 85-90 days. Although yields may be lower, maize is grown principally for domestic (as opposed to commercial) use; maturation time is prioritised over yield. The marketing manager of Cargill estimates that over half the country's maize is grown in the north, with landraces accounting for perhaps two thirds of this (note an inconsistency here with the estimate that 15% of maize planted nationally is landrace). By comparison, in the south maize is grown as a commercial crop and hybrids predominate in Karnataka, for example, it is estimates that 70-80% of maize is hybrid.

Initiatives are being taken by seed companies to develop the market for hybrid maize in the north. Ultimately, it is believed that the full market potential will be realised only when short-maturing, high-yielding hybrids become available. Kanchan Ganga Seeds claim to have developed such a hybrid, which has seen their maize seed sales leap from 5 tonnes in 1995 to 1,300 tonnes in the first half alone of 1997. Such examples of the direct targeting of hybrid seed at farmers who currently rely upon landraces is uncommon, at least at

present. However, in this instance, many of the farmers sowing local landrace varieties of maize are simultaneously using proprietary hybrid seed in other crops.

The alternative approach is to encourage the planting of maize as a commercial crop in the north. Cargill have entered an agreement with Anil Starch, which has a production unit in Ahmedabad requiring large quantities of maize. Under the agreement, Anil guaranteed to buy Cargill maize from nearby Rajasthan farmers, dramatically boosting Cargill sales in the State.

The Sorghum Market

It is estimated that the total area under sorghum is in the region of 12 million hectares, of which approximately 3.5 million hectares is under (accounting for annual hybrid seed sales of around 25,000 tones). Most of the remaining 8.5 million hectares is thought to be under landraces, with sales of OP sorghum low. There are two important sorghum seasons, kharif (autumn) and rabi (spring). 95% of sorghum seed planted in the kharif season is hybrid. This is used principally for fodder. The rabi crop is planted for domestic use (human consumption) and relies upon local landraces, which are tastier, and which are more resistant to the shoot fly than proprietary plants.

Hitherto, private companies have had difficulty entering the sorghum market, particularly for the rabi planting. This is for several reasons :

1. The yield benefits of hybrids over open pollinated varieties are low;
2. Sorghum flour is used for making rotis, and farmer's preferences lie firmly with the taste of local varieties;
3. Public-sector seed is good and of course, cheaper.

However, there is increasing commercial interest in rain-fed crops, like sorghum and pearl millet. Hitherto, these have been relatively neglected by the private sector, because research was easier on irrigated crops, and gains in yield higher. The business manager of Hindustan Lever foresees imminent replacement of rained landraces in remote and tribal areas with hybrids, and Nath Seed has recently introduced a hybrid sorghum, targeting the rabi market. This has a high grain and fodder quality, resistance to shoot fly, and a claimed (though seemingly improbable) four-fold advantage in terms of yield. The hybrid is derived from local landraces, which Nath Seeds found no difficulty in securing. (Even had this presented problems under farmer's increasing awareness of the commercial exploitation of landraces by seed producers, similar germplasm could have been freely obtained from the ICRISAT germplasm bank). Mahyco, too, have developed sorghum for the rabi season, claiming a more modest yield advantage of 25% and Cargill have also launched sorghum hybrids. Although farmers are known still to prefer the taste of their own varieties, Cargill hope that they can develop a commercial market in hybrid seed. They envisage farmers planting two discrete sorghum crops, one (of the local landrace) for domestic use, and one hybrid crop for sale.

Despite this increasing interest in rain-fed crops, hybrid coarse cereals are sold mainly in assured rainfall areas. In areas where rainfall cannot be assured, farmers are reluctant to invest heavily in expensive seed and the additional

inputs required for cultivation of hybrids. Company representatives recognise the market potential for low-input intensive hybrids in areas where rainfall is not assured, but cannot foresee the development of this in the near future.

The Vegetable Market

The market in seed of temperate vegetables far pre-dates the green revolution. However, the first hybrid vegetable seeds were introduced much later than cereals, with the release by Indo-American (which, despite its name, is wholly an Indian company) of tomato and capsicum hybrids in the mid 70's. Hybrids purportedly extend the possible cropping season, offer improved disease resistance, uniformity of size, and improved transportability. Table 1.9 lists estimated proportions of hybrid vegetable in total cropped area for the year 1993-4. These national figures obscure more dramatic adoption of hybrid seed in some state. Dr. R.S. Arora, the managing director of Century seeds, writes that "there has been 100% replacement of open-pollinated varieties with hybrids in major parts of Karnataka, Tamil Nadu, Maharashstra and West Bengal (Arora, 1995).

TABLE 1.9
Estimated proportions of hybrid vegetable in total cropped area for the year 1993-4

Crop	*Proportion of hybrids*
Brinjal	4.03
Cabbage	21.14
Cauliflower	0.59
Chilies	0.45
Gourds	1.18
Melons	2.10
Okra	0.77
Tomato	24.22

Source: *Arora, 1995.*

According to Arora, public sector institutions have been handicapped by poor seed distribution networks, and have tended to focus upon lower value crops like okra and peas. He claims that 'their [the public sector's] mindset is still not tuned to the high risk involved in demand/supply uncertainties and sudden varietal obsolescence. While public bred hybrids, barring a few, have not been able to get into the farmer's fields, private hybrids are spreading at a much faster pace' (Arora, 1995).

Opportunities for multinational companies in the Indian vegetable seed market are different from those in cereals. In the case of the latter, foreign companies can rely upon selling hybrids developed elsewhere, but found to be appropriate to the Indian market (take Cargill, for example, which spent two years checking existing hybrids for suitability to the Indian climate and market). In the case of vegetable seed production, however, greater adaptation of extant hybrids is needed in order to tap the Indian market. In practice, this means that multinational companies (like Peto and SVS Seminis) is then relied upon as the basis for development of hybrid suited to the Indian market.

Response of National Seed Companies to MNCs

Representatives of large Indian seed companies (for example, Nath, Mahendra, Mahyco, Indo-American) identify several areas where competition from multinational companies will not greatly impinge on their own market shares. Firstly, in the case of cereals, they do not foresee serious competition from MNCs in the sale of sorghum or pearl millet, for which access to international sources of germplasm is of little value. (Note, however, that MNCs are poised to move into the sorghum market-see previous section). Secondly, it is felt that, even where the hybrids offered by multinational companies are accepted as good

(principally, maize and sunflower) these companies simply do not have the marketing base, production infrastructure or distribution system to capitalise upon this. These sanguine expectations may be ill founded, or simply affected. K.R. Chopra, the managing director of Mahendra seeds reports with a note of optimism that multinational companies 'only' have half the maize market. He goes on to say 'the widespread fears of the effects upon domestic companies of the Seeds Policy of 1988 and the opportunities this has opened up for multinational companies have proven ill-founded'. But with half of maize seed sales, according to his own estimates, going to multinational companies, can he really be so complacent?

Dr. M. Attavar, president of Indo-American Hybrid Seeds is more candid in his criticism of multinational companies. He has seen the market share of Indo-American seeds decline since 1988, and is bitter about the aggressive marketing policies of multinational companies, 'with the investment potential to support low pricing'. (Note, however, that this is not an avowed marketing strategy of most MNCs, which tend to be price leaders). To his chagrin, Indo-American Seeds has also lost key staff to multinational companies. Attavar's response has been to look for tie-ups with foreign companies. Seminis Seed, for example, is produced and sold by Indo-American, and capsicum seed grown and exported for Peto. Indo-American has recently completed a huge capsicum seed production facility at Bangalore. This comprises one hundred greenhouses, each 40 meters by 10 metres, with a total capacity of 18kg of seed per greenhouse. In a celebration of a showcase of Indian industry, the site was opened by then Prime Minister, Deve Gowda, for whose visit, the road up to the site was tarmaced. There is some irony to the fact that the unit is in fact used for the contractual production and export of capsicum seed for a large multinational.

Indo-American is not the only large Indian private seed company to have seen its market share eroded following multinational competition. Mahyco, for example, enjoyed an 85% share of the market for sunflower seed in 1988. Today, their share (of an albeit expanding market) has fallen to just 10%. This is attributed by multinational company representatives to poor genetic practice, and careless seed production.

It seems clear that, at least for the immediate future, the size of the Indian seed market is set to increase dramatically. Whilst this growth is sustained, direct competition between seed companies may be averted. Whilst the plateauing of the market, it is generally accepted that competition between companies will intensify. K.R. Chopra (who says he has already seen off attempts to buy Mahendra Seeds by both Cargill and Monsanto) foresees more mergers and takeovers, particularly in the wake of the increased competition that will accompany market saturation.

Small companies

The managing directors of several small Indian seed companies are evidently very concerned to form collaborative links with foreign companies. One, having solicited a member of Research Team to look for potential UK collaborators, remarked melodramatically 'we must join hands with them [foreign companies] or die'. Whilst this director had tried out fifty or more

varieties of foreign seed, in the hope of interesting companies with successful hybrids in a joint venture, none took him up. Despite his own difficulty in finding a foreign collaborator, he foresees increased collaboration between smaller Indian seed companies and MNCs, 'after companies like Mahyco and ProAgro have all been taken'. Smaller companies will, he feels, fulfill a role in the distribution of new varieties, and possibly in the provision of Indian germplasm. Furthermore, smaller companies (and certainly Indian companies generally) are allegedly more aware of the importance of appeasing middlemen in the distribution chain. In some instances, seed passes through three such middlemen between producer and customer (a distributor, a dealer, and a retailer). Whereas multinational of Bejo Sheetal, claims that it is these middlemen who really establish sales. Consequently, it is important, he claims, to provide these with appreciable margins. The director of Nath Seeds also recognises the importance of the role of dealers, claiming 'farmers blindly follow dealers'.

In addition, some foresee a continued market for cheaper open-pollinated seed varieties. Those poorer farmers who cannot afford hybrid seed, or higher input levels, and are vulnerable to increases in the prices of fertilisers and pesticides, are seen to present a secure market for small domestic companies. It is also claimed that these farmers are becoming increasingly aware of the accumulative and deleterious effects of saving seed from open pollinated varieties from year-to-year. (Contamination from neighboring crops leads, it is suggested, to a diminution in yield). Such farmers are therefore increasingly rebuying open pollinated seed on an annual basis.

Small companies also derive sanguine hope from their conviction that open-pollinated varieties have a longer projected marketable life expectancy. Hybrid varieties derived principally from Western germplasm are, it is claimed by representatives of companies specialising in open pollinated varieties, more susceptible to pests and disease. Indeed, most company representatives admit that hybrid seed has a commercial longevity of around just five years.

Hybrid seed use represents a higher risk, which many farmers are not prepared to take. Note however, that some MNC representatives specifically identify poorer farmers with smaller holdings as being those who could benefit most clearly from a switch to hybrid seed. Such a shift would, they claim, maximise the yields, and therefore profits, of smaller holdings. That many poorer farmers have not switched to hybrids is attributed, they claim, to a caution born of ignorance, and to the difficulty experienced by small farmers in securing bank-loans. In the case of tomato for example, hybrid seed may be ten times more expensive than open pollinated seed (in terms of price per seeded acre). So, for example, open pollinated tomato seed sells for perhaps Rs.300 per kilogram (sowing between 500 grams and one kilogram per acre). Hybrid seed sells for up to Rs. 50,000 per kilogram (sowing perhaps 40 grams per acre).

One alternative role for smaller seed companies is the contractual production of seed for larger companies (Sandoz, for example, contracts out seed production to smaller domestic companies). Unicorn Agrotech Ltd is one such seed producer. This company concentrates mainly upon the production of seed for foreign companies, under contract. The managing director claims

that there are perhaps five other similar companies which focus upon contract seed production, and there are still others which would like to move into this area. The vice-president of Bhavani Seeds, for example, is also looking for a foreign collaborator. He foresaw a dual role in such a collaboration. Firstly Bhavani Seeds would produce seed for foreign companies, under contract, and for export. Secondly, he envisaged that foreign companies could sell their own hybrids through Bhavani Seeds marketing base. However, it is evident that smaller seed companies are indeed caught between pillar and post. Whilst Bhavani Seeds looks for opportunities to move toward contract seed production for foreign companies. Unicorn Agrotech is trying to move away from contract growing, toward production of its own hybrids. Under relaxation of the restrictions on investment of foreign companies in India in 1991, two foreign customers of Unicorn Agrotech Ltd have set up their own subsidiaries for seed production. Unicorn is feeling that its market is threatened, and has responded by increasing investment in development of its own hybrid varieties for sale on the domestic market.

Some small companies allude to difficulties they experience in producing sufficient seed to meet supply. Bhavani Seeds, based in Bangalore, for example, contract production of their hybrid sunflower seeds out to local farmers. Bhavani retail their seed for around Rs.140 per kilogram (by comparison to Cargill's retail price of Rs.350). Thus whereas Cargill are able to pay their seed producers Rs.60 per kilogram, Bhavani Seeds offer only Rs 40-45. Bhavani allege that this means they have difficulty finding local growers, and have had to contract their seed production out to farmers in the interior). As a result, Bhavani Seeds claims that it is unable to meet demand for its hybrid sunflower seed.

Representatives of smaller seed companies recognise that they are squeezed, increasingly, between a reliance upon a diminishing market amongst poorer farmers for open-pollinated varieties, and direct competition with multinational companies. Representatives of multinational companies are well aware of the effects of their increasing market share upon smaller domestic companies. The managing director of ITC Zeneca foresees that as farmers increasingly turn to more expensive seed, 'a shake out will happen', with many smaller companies going to the wall. A former managing director of Cargill is still more categorical: "small companies have no real role; they have passed on their chips".

Seed Production

By and large, seed is produced under contract to small farmers. Sandoz, which attempts to minimise both its infrastructural and staffing investments, 'contracts' out to local seed companies. Arrangements for re-buying seed from growers vary. Sandoz takes the most laissez faire approach, refusing to enter written contracts with farmers or guarantee a price. The company does however guarantee that farmers will receive a 'profit' (i.e. that seed will be bought for a price above the market value of the grain). The only incentive for farmers to resell to Sandoz, rather than on the open market, is the threat of being dropped as a contractor. Indeed, the managing director is proud of his no-fuss relationship with his seed producers, quoting them as saying "Gokhale may skimp on the butter but he guarantees our bread". This approach contrasts

sharply with that adopted by Cargil. Here, it is claimed, emphasis lies upon a transparent agreement with growers, (albeit initially produced only in English) who are guaranteed a fixed price for the seed. There are strict criteria for accepting a farmer as a 'Cargill grower'. Farmers are required to follow stringent land management and fertiliser use guidelines. However, John Hamilton (the former managing director of Cargill) claims a 95% repeat grower rate.

Bhavani Seeds, a small seed company, is embittered, that the prices paid for hybrid seed produced under contract for multinational companies are significantly higher than they themselves can afford to pay (see Table 1.7). Bhavani pay twice as much for production of their hybrid seed as their open-pollinated sunflower seed. This is attributed to the increased stringency of growing conditions for hybrid seed. Farmers are expected to cooperate with their neighbors, such that if adjoins farms also want to produce sunflower seed, they too may be provided with Bhavani foundation seed. Bhavani do not guarantee purchase of the seed, which is first purity test. Failure of this test will entail farmers having to sell the seed on the open market.

Seed Retail

Profit margins are low, according to retailers. The management of a small retail outlet in Jalna claims thar ProAgro hybrid maize seed, which is bought wholesale for Rs 33 per kilogram is retailed for Rs.35-37 per kilogram. Similarly, chili seed is bought wholesale for around Rs.14,000 per kilogram, and sold for 15-18,000 per kilogram. Open pollinated chili varieties are sold at a greater proportional mark up. For example, one public sector variety was bought wholesale for Rs.225 per kilogram, and sold for between Rs.275 and 300 per kilogram (see Table 1.10). The company also sells second generation open pollinated varieties (a market which would become illegal under Plant Variety Protection Law). In the case of chili seed, this retails for Rs.150 per kilogram (approximately half the price of first generation seed). According to the manager, these only achieve some 50% of the yield of the previous generation. This seed is apparently bought mainly by farmers with smaller holdings (note that there is general consensus that there is no correlation between the size of a holding and proportion of farmers buying hybrid seed).

TABLE 1.10
Wholesale and retail prices of a range of seeds (1997)

Crop	*Price of seed to retailer*	*Price to farmer*
ProAgro hybrid maize	Rs.33 per kg	Rs.35-37 per kg
ProAgro hybrid chili	Rs.14,000 per kg	Rs.15-18,000 per kg
Public sector OPV chili	Rs.225 per kg	Rs.275-300 per kg
Second generation OP	-	Rs.150 per kg
RASI hybrid cotton	Rs.265 per 450gm	Rs.275 per 450gm
Western Agri hybrid cotton	Rs.250 per 450gm	Rs.300 per 450gm
OPV cotton, produced by retailer himself	Pays growers Rs.25-27 per kg.	Rs.30-35 per kg

Source: *R.T. Karwa, Tryambak Krishi Kendra seed retailers, Jalna.*

The Brand-Name Effect

It is typically claimed by multinational companies that the premium prices charged for their hybrid seed are justified (and indeed only sustainable) on the basis of the superiority of their products, rather than reflecting heavy investment

in sales strategies. One approach to testing this claim is to consider instances where several companies sell the same hybrid seed. Here, widespread disparities in the pricing of the same seed may be attributable to the differing advertising policies and promotional strategies of specific companies. In practice, it is difficult to control other factors which may lead farmers to prefer one brand over another (for example, seed production standards, proximity of the company to its customer base, or after-sales service and complaints handling). Such comparisons are necessarily based upon sales of public-sector developed hybrids and varieties, which tend to be sold by smaller companies. These may be marked with the same certification code despite packaging by several different companies. Disparities in pricing can be large. For example, the managing director of Navalakha Seeds claims that he is able to sell a university developed cucumber variety ('Hemangi') for twice the price of some other competitor companies. (Mr. P. Navalakha claims sales at Rs. 140 per 50 grams, as opposed to competitor sales at Rs. 70. In fact, the Navalakha listed price prove to be Rs. 105 per 50 grams). In another example, the business manager of Hindustan Lever makes the more modest claim that they are able to sell a public-sector hybrid of sorghum ('Paras') for some 15% more than other competitor companies, something that is attributed to 'the reputation of Hindustan Lever for high quality seed production'. Variation in the pricing of the public sector-developed cotton variety NHH44 is shown in Table 1.11.

TABLE 1.11
Wholesale prices of the public-sector developed cotton variety NHH44 (1997)

Supplier	*Wholesale price of Cotton Variety NHH44*
Mahendra	Rs.280 per 750g
ProAgro	Rs.225
Zuari	Rs.255
Sandoz	Rs.210

Source: *R.T. Karva, Tryambak Kendra seed retailers, Jalna.*

Farmers are apparently becoming increasingly aware of brand name. The manager of Tryambak Krishi Kendra seed retailers, claims that Mahendra Seeds were the first to commercially release the NHH44 variety in the market. They now command a large market share in the variety, despite high pricing.

Another approach to assessing the role of marketing strategy in fixing prices is to look at regional variation in the price of the same seed, produced by the same multinational company Pioneer Hybrid, for example, admit to high pricing of their maize seed in Bihar, where the company profile is high. Elsewhere the same seed is sold at lower prices. Pioneer staff openly attribute this to the success of their advertising campaigns in the state, rather than the particular suitability of Pioneer maize seed to the local climate conditions and cropping patterns prevalent in Bihar.

Mr. Agrawal, the managing director of ProAgro-PGS, foresees that 'The brand-name will become more important. Farmers will ask more and more for branded seed. The same hybrid or variety (imported from public institutions and international agricultural centres) sold under various brand names will compete with each other and a strong brand name is expected to capture a large market share'(Agrawal, 1996).

5. Legislating For Privatisation

Under the Trade Related Intellectual Property Rights (TRIPs) arrangement of the World Trade Orgaisation (WTO), signatories are required to legally confer

The recent experience of the United States with plant intellectual property laws is especially relevant, as that's the model that is now being imposed on India and the rest of the South through the WTO / TRIPs. Over the past 30 years our experience is every time plant intellectual property laws have been amended, it expands the rights of industrial breeders at the expense of farmers, diversity and communities. It is clearly in the interest of those with money and power to amend any intellectual property system to strengthen their legal monopoly. Today under US patent law, it is illegal for farmers to save patented seed and re-use it. Monsanto requires farmers - its customers to sign a Gene Licensing Agreement before they can buy the company patented genetically engineered seeds. If the farmers are caught infringing the patent, Monsanto is "vigorously prosecuting" them in court. It is no exaggeration to say that farmers in North America have been turned into criminals and rural communities are becoming corporate police states.

- Hope Shand, *RAFI, USA*

exclusive property rights to seed producers. If these are conferred through 'legislation consistent with the International Union for the Protection of New Varieties of Plants, 1991 (UPOV91), farmers will be divested of their rights to exchange seed, and even to save seed for their own use. UPOV 91 thus "effectively extends the rights of plant breeders to all harvest derived from the original seeds". It amounts to legislation for the further privatisation of the seed industry-a process which has already been described as resulting from increased use of hybrids, and a decline in public sector seed development and production. In the UK, enforcement of plant breeder's rights has led to the progressive restriction of seed potato production. To begin with, holders of new plant variety rights demanded royalties from farmers producing seed potato from their products. Subsequently, permission to produce seed potato was restricted to farmers operating under contract to the plant breeder. Gradually, the acreage allocated to growers was reduced, contracts stipulated tighter specifications for seed potato production, and the prices paid diminished. Seed potato production became concentrated in the hands of a few companies who colluded to manipulate prices, and limit supply.

Regulations

Several company representatives alluded to the need for 'simplification' of mechanisms regulating the development of transgenic crops: "Regulation to commercialise the transgenic seed/products are quite strict, time consuming and far from transparent. In many countries in the world, one is not required to seek permission from the regulatory department to conduct trial with transgenic seeds, but simply to inform about the intention to conduct such a trial... India should become more transparent with respect to introduction of transgenic seeds and regulations should become more simple" (Agrawal, 1996)

In fact, the Department of Biotechnology Guidelines for Safety in Biotechnology covering recombinant DNA technologies in micro-organisms, large scale industrial processes, field trials of transgenic plants, and quality control of biological material obtained by recombinant DNA processes, runs to just fourteen pages. Whilst these guidelines are mandatory, K. Kumar of the Centre for Cellular and Molecular Biology in Hyderabad, notes that there are as yet no mechanisms for penalising those found to be contravening them.

In practice, however, it seems that the agribiotech industry has precious little ground for complaint. The former managing director of Monsanto, whose trials of transgenic cotton have reached large acreage stages, has remarked at the ease with which permission was granted for each stage of the development of the crop in India. Department of Biotechnology permission was required, or will be required, for import of the Bt construct, transfer to Mahyco cotton lines,

outdoor planting, large acreage trials, and commercial release. At no point during this process was Monsanto's schedule interrupted by deals in permission being granted. Indeed, in another context (development of BST for commercial release in India), approval was obtained by a single part-time employee within just twelve months.

Extending Hybrid Technology

Compounding one technology superfluity with another, the range of crops amenable to hybrid development is being extended. This is achieved through genetic contrivances which introduce male sterility to previously self-fertilising plants. Examples are provided by ProAgro -PGS's SeedLink system, which has been introduced to mustard, or SPIC's male sterile rice. There is growing private sector interest in the paddy market, following the development of hybrid rice (ProAgro, for example, have recently set up Rice Hybrid International).

Summary

There are several grounds for expecting that the seed industry will coalesce under the control of a few large companies, with foreign interests. (1) Hybrid seed is produced principally by larger seed companies, and its use is set to increase following the decline of the public sector; public sector efforts to increase farmer's acceptance of hybrid seed, and decreased use of farmer-saved seed; and private sector promotions and advertising strategies. (2) Smaller companies will experience increased difficulty to compete because; the market is fickle, smaller companies may find difficulty surviving a swing in favour of competitors' seeds; and plant variety protection will scotch a market in second and subsequent generations of both open pollinated and hybrid seed. (3) There will be an increased use of transgenic crops, which are produced only by those companies able to meet the high development costs. Small companies will thus be excluded from a market sector, which is likely to grow.

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CHAPTER II

Genetically Engineered Seeds

The Case of Transgenic Cotton Trials in India

Introduction

The Indian seed industry is rapidly moving into a phase of "corporate control over the seeds" with the introduction of genetically engineered / transgenic crops. In this corporate control the technology and investments are made by the transnational / multinational corporations and the Indian counterparts provide the Indian germplasm and a marketing base.

Farmers' acceptance and dependence on hybrid seeds in the Green Revolution era makes the corporate strategists to foresee wide acceptance of genetically engineered seeds by Indian farmers.

> Twenty years ago there were thousands of seed companies, most of which were small and family owned. Today the top ten global seed companies control one third of the 23 billion dollar of the commercial seed trade. Twenty years ago there were about 65 agrochemical companies involved in the manufacture of crop chemicals. Today the top ten pesticides manufacturers account for over 90% of the global market. Twenty years ago the top twenty pharmaceuticals corporations controlled about 5% of the world pharmaceutical market. Today the top ten account for over the 44% of total sales. And today the top ten firms hold the 61% of the animal veterinary market. If you look at the dominant companies, all of these different sectors in plant breeding, pesticide, veterinary medicine and pharmaceuticals, you find the same companies dominate in all sectors. And these are the gene giants and they include the world largest agrochemical and pharmaceutical corporations. In the field of genetic engineering of agriculture, there essentially five corporation which dominate globally. These are Syngenta, Aventis, Monsanto, Dupont and Dow.
>
> **- Hope Shand,** RAFI, USA

Building of corporate empire in seed sector is thus relatively a new phenomenon, which started off since 1998, when Monsanto entered into an exclusive agreement with Mahyco (Maharastra Hybrid Seeds Company) and formed a joint venture, to introduce genetically modified (GM) Bt cotton in India. In 1998, Monsanto-Mahyco Biotech (India) Pvt. Ltd. (MMBT). MMBT started the first ever open field trials of genetically modified crop in India. They introduced Bt cotton in 40 locations across the country.

Ten companies now own 30 per cent of the $23 billion annual commercial seed trade, according to recent estimates, and four of those — Monsanto, Syngenta, Aventis and DuPont — control virtually all GM crops. If the mergers and acquisitions continue as it is going on, by the early part of next century less than a handful of companies will possess control over the entire agricultural foundation for every society. A glimpse of up-to-date mergers and acquisitions that have taken all around the world is presented in Table 2.1.

Genetically modified crops have been introduced to Indian seed industry without understanding and assimilating the inherent adverse impacts of such crops at a time when the science of genetic modification of plants is in its infancy and lot of

genuine research needs to be undertaken before it is deemed fit for commercialisation.

The sixties revolution of cultivating monocrops of hybrids / HYVs has caused tremendous loss to our genetic diversity. This revolution has not only increased the dependence on chemicals in agriculture but also increased the risks to farmers in the form of vulnerability to diseases and pests' attacks.

Today the stage has been reached where the looming prices coupled with unreliable quality of agri-chemicals is threatening the very process of agriculture. The cost of cultivation of different crops has gone far beyond the average farmers' affordability. To add to this, genetic engineering in crops is being put forward as the solution to farmers.

Genetic engineering (GE) revolution in the seeds and crops is not the solution to farmers, instead it is a revolution to deteriorate the farmers and robe them economically, socially and ecologically.

The present chapter puts in place the economic, socio-ecological, and legal aspects of the genetic revolution in seeds and crops in India. Also shows how the corporate empire is trying to commercialise the technology before it is obsolete and meet the same fate as the green revolution technology. The genetic technological revolution is not for the farmers to benefit but for the corporate to reap the profits.

TABLE: 2.1

Mergers and Acquisitions of major Biotechnological companies involved in agriculture

Year	*Company*	*Specialisation*
2000	Novartis and Astra Zeneca merged to form SynGenta	Agrichem
2000	Monsanto's pharma business merged with Pharmacia & Upjohn	Health care
2000	BASF AG acquires American Cyanamid	Crop Protection
2000	Monsanto Chemicals acquires Monsanto Technologies & Monsanto enterprises	Crop Protection
2000	AgrEvo India & Rhone Poulenc Agrochemicals merged to form Aventis Cropscience	Crop Protection
1999	Aventis CropScience acquired ProAgro Group	Seed Operation
1999	Panoli Agrochem of Novartis with Hikal Chemicals	Crop Protection
1999	Cyanamid Agro with American Cyanamid	CropProtection
1999	Pioneer Hi-Bred & Mycogene acquired by DuPont	Seed Operations
1999	Holden acquired by Monsanto	Seed Operations
1998	Cargill acquired by Monsanto	Seed Operations
1998	Dekalb acquired by Monsanto	Seed Operations
1998	Mahyco acquired by Monsanto	Seed Operations
1998	Unilever acquired by Monsanto	Seed Operation
1998	EID Parry acquired by Monsanto	Seed Operation
1997	Holden acquired by Monsanto	Seed Operation
1997	Semetes acquired by Monsanto	Seed Operation
1997	Millenium acquired by Monsanto	Seed Operation
1996	Agracetus acquired by Monsanto	Seed Operation
1996	Calgene acquired by Monsanto	Seed Operation
1995	Kelco acquired by Monsanto	Crop Protection
1996	Roche acquired by Monsanto	Women's health care

Source: *Compiled from Monsanto (RFSTE), 1998; the Hindu, 21st December 1998; & the Hundu Business Line, 2nd April 2000.*

1. Economics of GE Revolution

Genetic engineering in agriculture has been seen, as economically viable option for hybrid agriculture of green revolution. Theories have been put forward to advocate the merits of this technology and the benefits which the farmer will reap through adoption of this technology in their practices.

Developing genetically engineered crops is not an easy task for everyone. The first and foremost important reason for this is the heavy investment, which the technology demands in research and development. So far private companies in the world are able to develop genetically engineered crops.

Secondly, this technology is out of the public domain. If at all developed by public sector it has to be funded by major agri-corporate. Already in the North the agri-corporate are controlling major research centers in renowned Universities.

Once the products are monopolised by agri-corporate, there will be no price bargain and the farmers have to be at the mercy of these corporate.

Industry representatives, in calling for Plant Variety Protection (PVP) legislation in India, identify several "commercially significant" concerns in monopolisation of agri products :

- the prevalence of the use of lines stolen from one company by another which may not have its own research and development programme. These parental lines are then used for the production of hybrid seed. By and large, such thefts are attributed to ephemeral 'fly by night' companies. Some credence is lent to this viewpoint by small companies themselves. For example, the managing director of one well-established though small seed company alluded to a fear of "retrospective royalty claims". However, the most notorious example followed the large-scale exodus of staff from Pioneer. Many employees left for other large companies, reputedly taking parental lines with them. It is claimed by the former managing director of Cargill that 'all' long-maturity maize currently planted in India is derived from this dissemination of Pioneer's parental lines. The manager of Nath Seeds commented that India is recognised by the International Seed Trader's Association staff as "the global capital for securing [other companies'] parental lines".

- the interception of seed between contract grower and seed company, by small seed retailers. Such retailers may offer contract growers a higher price for hybrid seed than agreed contractually with the owner of the foundation seed from which this was produced. Presently, the only sanction which large companies can take in this instance is to drop offending farmers as contract growers in subsequent seasons.

- the sale by smaller companies of second generation open pollinated seed, and F2 hybrid seed. This is widespread. One seed retailer in Jalna, for example, sold second generation open pollinated chili seed at around half the price of the proprietary seed.

Some companies attach relatively little commercial significance to the lack of PVP. Absence of protection for open pollinated varieties is of little concern to many larger companies (which deal mainly, or exclusively, in hybrid seed) and reuse of hybrid (F2) seed is not perceived as an important issue. The managing director of Cargill, for example, suggests that PVP is an irrelevance with respect to two-and three-cross hybrids. He does concede, however, that introduction of single-cross hybrids will be postponed pending legal protection of these. Furthermore, one of his predecessors at Cargill claims that the

company would introduce open pollinated varieties of rape seed if legislation guaranteed protection of this. The director of Pioneer also indicated that his company would have introduced single-cross hybrid maize seed, were this protected by PVP legislation. Indeed, he claims that none of the eighteen companies selling hybrid maize seed in India are selling higher yielding single-cross hybrids.

However, other representatives of large companies call for immediate legislation to address these infringements (as they see things) of their intellectual property rights. The business manager of Hindustan Lever, for example, sees the lack of PVP legislation as a major restriction upon commercial hybrid production, and predicts a rapid invigoration of the private sector market following such legislation. He emphasizes the current risks of development and production of hybrids due to theft of parent, breeder or foundation seed.

It seems probable that the widespread replacement of local land-races with high yielding varieties was at least in part dependent upon farmer's freedom to save and reuse seed from season to season, without the obligation to repurchase from seed suppliers. This practice is particularly prevalent in the case of open pollinated seed (though F2 hybrid seed may also be saved). Seed producers, however, profess to be uninterested in legislating against either the seasonal retention of seed, or the exchange of this non-commercial basis between farmers. Deepak Mullick, the managing director of ITC Zeneca, speaks for the Associated Seed Industry (ASI) (a body representing the interests of the private sector seed industry in India): "What is a farmer's right? The farmer has a right to access to the best available seed. Saving seed for his own use, and exchange with his neighbours is not important to ASI; sale by small seed companies is".

It is clear that this attitude may be more pragmatic than magnanimous. Some estimates put the proportion of saved seed planted at over 90%. Farmer saved seed can therefore hardly be considered a commercial irrelevance. Rather, many managers agree that it would be impractical to litigate against farmer's use of saved seed, even were this to be made legally possible, given the prevalence of seed reuse. This amounts to tacit acceptance of the fact that legislation based upon UPOV 91 is inappropriate in an Indian context. In the West, most farmers are consumers, on an annual basis, of proprietor seed. In these countries, the legislation can be enforced - and indeed already has been enforced in some instances.

Plant Breeder's Use of Local Landraces

Under UPOV 91 stipulations, the role of farmers as innovators in the development and constant refinement of local landraces is unrecognised. There is a fundamental asymmetry in the UPOV 91 recommendations. Industrial breeders are permitted to incorporate traits from landraces in their lines. These traits then become subject to plant variety protection, which is extended retrospectively to landraces exhibiting these same characteristics. This provision does not take effect reciprocally, however, the use of proprietary varieties in farmer's own breeding programs is of course prohibited. This generates a ratchet effect, by which landraces become subject to variety protection as their traits

are incorporated in proprietary varieties and hybrids. The pool of landraces free from such restrictions will thus progressively diminish as plant breeders accumulate control over farmer's own varieties.

To what extent this scenario will be realised depends in large part upon the dependency of plant breeders upon local landraces as sources of 'new' and desirable traits. Plant breeders are able to access land-race germplasm either through public germplasm banks, or directly, by prospecting down on the farm.

Public Sector Germplasm Banks

Plant breeders in India have access to public germplasm banks, subject only to a small administration charge. The National Bureau for Plant Genetic Resources (NBPGR) holds a total of 165,000 accessions, of which 104,000 are landraces. It also holds many varieties and hybrids generated by public sector research institutions. Problems are encountered in encouraging private companies to deposit their germplasm with the bank-a scheme has been suggested whereby companies can use locked boxes, to which they alone will be granted access for some fixed time period.

Prospecting For Landraces

By and large, multinational companies are not presently dependent upon local germplasm in the development of their seed. As discussed above, the multinational market niche is centered upon selection of extant seed, globally, and production and marketing of this for the Indian farmer. In the case of typical seed sold by MNCs (sunflower, maize, soya, sorghum sudan grass or cotton, for example) there are no important resources of Indian germplasm upon which to draw.

However, producers of seed for crops which have a long history of arable exploitation in India are more highly dependent upon germplasm from local landraces for their research and development. In the case of national Indian companies, which may not have the access to international sources of germplasm available to multinational companies, use of local landraces is more prevalent. Century Seeds, for example (an Indian company specialising in development and production of hybrid vegetable seed) admits to heavy reliance upon local landraces. These are acquired on an informal basis. Whether or not farmer's heightened awareness of intellectual property rights issues has affected the availability of local landraces to commercial plant breeders is equivocal. Some company representatives, A. Mangat, Director of Century Seeds for example, report that demands for payment are increasingly made by local farmers for access to their germplasm. The director of Century Seeds failed to see the basis for farmer's demands for payment, feeling that they should have no rights to their landraces. Otherwise, he observed, "royalties should be paid to the Iraqis for wheat, and to the Mediterraneans for cauliflowers". The basis for discrimination between farmer-developed landraces (a "national resource") and Century Seed's latest tomato hybrid, based upon such a landrace (and guarded possessively by Century), is unclear.

Others point to the case with which local landraces can be collected, and the difficulty of policing their exploitation. Seed can simply be recovered, for

example, from produce bought at local markets. This points to the difficulty of safeguarding farmer's rights to their germplasm, even in the event of such rights becoming recognised by law. Some large seed companies (SPIC, for example) are investing in biotechnological approaches to identifying their germplasm (screening at the level of DNA sequence), allowing this to be traced in the event of suspected use by other companies. Such technology is of course not available to local farmers who may experience corresponding difficulty in demonstrating the unacknowledged use of their landraces in proprietary hybrids.

This dependency upon local landraces does not translate into a concern for their preservation in the field. Rather, crop researchers allude to the convenience of public sector germplasm banks, and foresee no reason why free access to comprehensive banks shouldn't replace prospecting for germplasm in the field.

Land Ceilings

On the whole, private sector seed companies produce parent seed and breeder seed on their own farms. This is principally for reasons of security. Farmers are then supplied with foundation seed and produce hybrid seed under contract. Few company representatives identified landceilings as presenting a problem in seed production. This was partly because circumventing restrictions upon land ownership (or at least leasing) was considered straightforward. Also however, all company representatives said that, even in the event of landceilings being abolished, they still envisaged contracting seed production to farmers. Large areas of land are required for the production of hybrid seed, and it was considered uneconomic to attempt this on corporate owned holdings. That land-ceilings are not considered an issue by many companies is demonstrated by the ignorance of company representatives of actual land-ceilings. In Andhra Pradesh, for example, manager's estimates of the maximum possible land holding ranged from 45 acres to 550 acres.

But there is a further incentive for companies to continue contracting seed production to small farmers. B.D. Sharma, Former Commissioner, Commission on Schedule Cast & Schedule Tribes, Govt. of India, points out that "the embodiment of labor in agricultural produce has been devalued by treating family farm labor as of zero value, because it is free" (Shiva, 1996). This attitude is confirmed by the general manager of ProAgro PGS, "his whole family at minimal expense, whereas on corporate farms, management staff would need to be employed at additional expense". Great care is exercised over cultivation of small areas of crop by a farmer and his family, not least because their very livelihood depends directly upon the productivity of their land.

Some managing directors take the opposite view, however, Deepak Mullick, the managing director of ITC Zeneca, sees it as highly problematic that "seed production over an area of a thousand acres entails dealing with a thousand farmers". Apart from the administrative problems this generates, there are problems of isolation of the seed production crop. Company land ownership, he feels, is a priority, particularly for production of breeder seed. The issue of land-ceilings is also important for the president of Indo-American Hybrid Seeds.

Mr. Attavar, who in addition to his own farms, produces seed through contract with between seven and eight thousand farmers. He has appealed for an exception to the Karnataka State landceiling. He expects to secure this, he claims, setting an important precedent.

2. New Technologies

In addition to the encouragement of foreign capital inflows, liberalisation overtly courts the transfer of new technologies from industrialised countries. It is anticipated that imports of new technology will precede the diffusion and assimilation of these by domestic industries, boosting international competitiveness in the global marketplace. However, such transfer cannot be expected to occur on the basis of deregulation of technology import alone. State intervention to nurture domestic research and development projects may also be needed. According to Bhaduri and Nayyur 'the assumption, strongly advocated by the government, that direct foreign investment will transfer technology automatically, is both simplistic and dangerous". They claim "..it is clear that market structures and government policies have not combined to provide an environment that would encourage the absorption of imported technology...., or create a milieu that would be conducive to diffusion and innovation". The failure of liberalisation to encourage technology transfer of Monsanto, for example, does not consider technology transfer to be an important factor in the liberalisation of the Indian economy, and does not foresee transfer of Monsanto technology to domestic companies. He says that it was made clear before Monsanto developed its agricultural biotechnology business in India that this would be controlled solely by the multinational and that there would be no agreements for licensing the technology to others. Indeed, Monsanto's collaboration with Mahyco leaves little room for optimism that it will lead to increased competition and technology transfer. Monsanto has signed an exclusive deal with Mahyco, which would require the approval of the latter if Monsanto's technology were to be made available to other Indian seed companies. Although one such company is apparently prepared to pay Rs.400 million for the incorporation of the Bt construct into their own cotton hybrids, under contract, it is to be anticipated that Mahyco will veto any such arrangement.

But if exclusive agreement (such as that forged between Monsanto and Mahyco) seem to leave few opportunities for broader dissemination of technology, such opportunities are still less easy to foresee in some other cases. Nath seeds, for example, has entered in an agreement with Royal Sluis, a Dutch company owned by SVS Seminis. Biotechnological development of vegetable hybrids is expected to proceed through a joint venture recently forged between SVS Seminis and Monsanto. Nath anticipates benefiting from this without needing to enter direct contracts with Monsanto itself, and quite possibly without any initial research and development being conducted in India. According to one possible scenario, parental lines would be sent by Nath to Monsanto laboratories in the US for incorporation of the Bt construct, and returned for subsequent field testing in India.

The benefit of joint ventures with foreign companies which is most

frequently extolled by representatives of such enterprises, is the availability of foreign germplasm. Indeed, one is left with the impression that had the exchange of germplasm from the West to India been as fluid historically as it has been in the reciprocal direction, there would be little benefit accruing from foreign investment in the seed industry.

Other company representatives do not even identify access to international germplasm as a benefit of foreign collaboration. The business manager of Hindustan Lever, which is controlled by a 51% stake held by Unilever, was unable to identify any area of technology transfer from the parent company to Hindustan-Lever. This latter company has produced some 80-90% of its product range in-house, independently from Unilever. The managing director of Kanchan Ganga Seeds is also seeking tie-ups with foreign companies, though emphatically not for technology transfer (the company claims to be a leader in hybrid maize technology, with its short-maturing hybrid). Rather, Kanchan Ganga has experienced difficulty in securing loans (although its current loan ceiling is 10 million rupees), driving it to the sale of some parental lines, and seeks foreign collaboration as collateral for further investment.

In another area, multinational companies claim effective technology transfer to the farmers themselves. This, it is claimed, has been particularly significant in encouraging better cropping and planting practices. In 1988, for example, public sector experts were recommending planting of sunflower seeds at a density of 3 kilograms per acre. Cargill found better yields were obtained by planting at the far lower density of one kilogram per acre. Yet Cargill can lay claim to no unique area of expertise qualifying them to make such recommendations. It would clearly have been equally possible for property funded public sector research institutions, able to finance research in commercial hybrid crops, to have reached the same conclusion.

Biotechnology

Biotechnology development of new transgenic crop varieties in India relies heavily upon western technology and investment. Development proceeds either through branches of transnational companies, or a marriage of convenience between western biotechnology firms and national seed companies. Under this latter scenario, the western collaborator provides biotechnological expertise and investment, whilst the national company provides Indian germplasm and a marketing base. Already, representatives of smaller seed companies are concerned that, limited as they are to classical breeding technologies, they will be progressively excluded from the market. Increasingly, this market will be dominated by a small number of large companies with the financial resources to invest in biotechnological research.

Projections for the growth of the transgenic seed market vary. Some company representatives point to the difficulty experienced by the industry in persuading farmers to switch to hybrid seed, despite the first introduction of this more than years ago, and are correspondingly pessimistic about the acceptance of transgenic crops. The marketing manager of Cargill predicts that Bt-maize seed will sell for perhaps five times the price of hybrid seed, and foresees that it will be a decade or more before transgenic crops are generally

TABLE 2.2

Some releases (in India) of transgenic crops expected within the next few years

Company	*Transgenic Crop*	*Timescale for Introduction*
Monsanto/ Mahyco	Bt-cotton	Imminent
	RoundUp Ready soybean	Next two years
	Bt-maize	-ditto-
SPIC	Male-sterility in paddy	Next few years
ProAgro-PGS	Brinjal-insect resistance	-ditto-
	Cauliflower-insect resistance	-ditto-
	Cabbage-insect resistance	-ditto-
	Tomato-insect resistance	-ditto-
	Cauliflower-nuclear male sterility	-ditto-
	Mustard-nuclear male sterility	-ditto-
Nath Seeds	Nath has entered joint agreement with Seminis and Peto, who in turn have entered agreements with Monsanto for the introduction of Bt technology to vegetables	Unknown
Bejo Zaden	Bt-cotton	Next few years
Cargill	Bt-cotton	-ditto-
Sandoz	"Genetically modified crop"	Unknown
Indo-American	Leaf-curl resistance in tomato	-ditto-

Source: *Agrawal, 1996, and personal communications.*

accepted. Others however express the opinion that the source of the farmer's inertia to moving toward use of hybrid seed stems from a reluctance to pay for seed purse. Having developed a high level of acceptance of hybrid seed, corporate strategists foresee that acceptance of genetically engineered crops will be far easier to effect. Indeed, Mahyco, who have formed a company jointly with Monsanto, hope that generically modified cotton will account for entire sales of hybrid cotton seed within 7-10 years. Sales of RoundUp Ready soybean and Bt modified maize are expected to follow within the next two years (see Table 2.2).

In their corporate literature, ProAgro are buoyant about the possibilities of developing longterm biotechnological solutions to the problems of insect pests, writing that they are developing "...a proprietary strategy to prevent or delay the development of resistance in insects to Bt proteins". Privately, however ProAgro representatives concede that the projected commercial life expectancy of their products is just 4-5 years. After this period, it is expected either that the disease or insect resistance of the crop will have been superseded by more effective products. This rapid obsolescence is viewed as being advantageous for several reasons.

Firstly, as pointed out by the former managing director of Monsanto, it will be difficult for rival companies to acquire the technology, and develop and release competitive products, whilst there is still demand for these. This is viewed as an important consideration in the absence of Indian PVP legislation. Secondly, it will ensure that the biotechnology industry continues to be highly technology-intensive. Technology transfer to domestic companies will be delayed as a result of the fast pace of Technology transfer to domestic companies will be delayed as a result of the fast pace of technological change. This will effectively reserve the market in transgenic crops for multinational companies with the financial muscle necessary to remain competitive in the field.

3. Illegal Trials of GE in India

In 1998, private seed company – Mahyco in collaboration with Monsanto started the first open field trial of Bt cotton with the intention of commercialising it in India. In the process all the rules and regulations of transgenic trials have been taken over by this corporate venture. Concerned government departments

were also not serious on the implications. The department of Biotechnology provided the clearances and the field trials were given green signal.

For the field trials Mahyco contacted the individual farmers based on prior acquaintances. Mahyco has been supplying farmers with new hybrid seeds for initial testing. Based on the performance of these new seeds, farmers patronised Mahyco over the years and established good rapport.

The genetically engineered Bt cotton seeds were also tested in the similar way. At most of the trial sites, farmers selected were the exemplary farmers who were singled out on the basis of their past performance in getting good yield of major crops in the previous cropping season. **For instance, Sri Bassanna at Sindhanur district in Karnataka, was selected for the trial based on performance for best yield in paddy.**

In some of the trial sites, Mahyco's own seed dealers were given to test Bt on their fields and for recommendation to other farmers through these dealers. Mahyco agreed to meet the expenditures incurred on the cultivation of the Bt crop on their fields.

In order to attract other farmers, Mahyco-Monsanto organised khestra utsav to show the crop performance to other villagers from neighbouring villages. This has been the strategy of many companies on market expansion through concentrating upon development of market *per se*, rather than pushing their own particular brand. Farmers are invited to the trial fields for exhibition of uncommonly high yields of branded seed. However, during shows organised by the Monsanto-Mahyco, the cost of technology has not been revealed to the farmers, which is associated with sale of genetically engineered seeds. Thus, cost of such technology becomes important in the context where farmers had been exposed for exchange of saved seeds to purchase of hybrid seeds at much lesser price than the Bt would cost.

As long as the genetic engineering is taking place in labs or in farms that are totally contained, the Review Committee on Genetic Manipulation (RCGM) of the Department of Biotechnology (DBT) governs the approval. The moment trials are conducted on the open environment, as the case is with these trials, the Genetic Engineering Approval Committee (GEAC) governed by the Ministry of Environment and Forests (MoEF) become active under the Environment (Protection) Act (EPA) 1986. In what follows, we present how these trials are illegal, unscientific and fraudulent.

> It is very clear that the state is helping the private seed companies. Dr. Vandana Shiva and I met the state agriculture minister and presented our Bt case, which resulted in setting up of a fact-finding committee. However, not single paisa has been paid as compensation to the farmers for their crop loss. Consumer courts were approached for the failure of the cotton crop but of no avail. 17,000 acres of Cargill's maize failed. In 20,000 acres of cotton crop no cotton bolls formed, resulting in a major loss of crop and money. 15 groundnut farmers committed suicide in Anantpur in 1998 due to a Rs. 600 crore loss. The government has taken no steps.
>
> **S. Malla Reddy,**
> Andhra Pradesh Rytu Sangham

The Chronology of Illegal Field Trials of *Bt* Cotton

The sequence of events, which took place in implementing the illegal trials in India, can be briefly outlined as :

24th	**April 1998**	Mahyco files to Department of Biotechnology for field trials
	May 1998	Joint venture between Mahyco and Monsanto formed

13th July 1998		Letter of Intent issued by DBT without involving Gentic Engineering Approval Committee (GEAC).
15th July 1998		Mahyco agrees to conditions in letter of intent.
27th July 1998		Impugned permission by DBT for trials at 25 locations granted.
5th August 1998		Permission for second set of trials at 15 locations granted.
6th January 1999		PIL filed by Research Foundation for Science Technology and Ecology in the Supreme Court of India
8th February 1999		RCGM expresses satisfaction over the trial results at 40 locations.
12th April 1999		RCGM directs Mahyco to submit application for trials at 10 locations before Monitoring and Evaluation Committee.
25th May 1999		Revised proposal to RCGM submitted by Mahyco.
	June–Nov 1999	Permission granted for different trial fields
	Oct–Nov 1999	Field visits
	May 2000	Mahyco's letter to GEAC seeking approval for "release for large scale commercial field trials and hybrid seed production of indigenously developed Bt cotton hybrids".
	July 2000	GEAC clears for large scale field trials on 85 hectares and seed production on 150 hectares and notifies through press release.
	October 2000	RFSTE filed an application for amendment in the petition challenging the fresh GEAC clearance.

The stamp of clearances for all the trials of genetically modified cotton came through the advisor, Review Committee of Genetic Manipulation (RCGM) through its letter dated 27th July 1998 and 5th August 1998 to Maharashtra Hybrid Seeds Company (Mahyco) to carry out multicentric trials on transgenic cotton *(Bacillus thuringiensis)* initially at 25 locations by permission dated 27th July 98 and thereafter 15 locations by permission dated 5th August 98 making 40 locations in 9 states. The date of sowing obtained from the individual farmers' by the RFSTE team show that the crop has been sown before the trial permissions were obtained in July 1998.

The field trials of Bt cotton on 40 locations in 9 states are totally unscientific and illegal. The permission granted to Mahyco-Monsanto for the open field trials is in category of organisms with potential ecological risks. Environmental risks under this category need to be assessed and regulated in accordance with the Rules called the "Rules for the Manufacture, Use, Import, Export and Storage of hazardous Microorganisms Genetically Engineered Organisms or Cells, 1989" framed under the Environment (Protection) Act, 1986 (hereafter referred as "Rules").

The permission has been granted for carrying out multicentric field trials without assessing ecological impact on biodiversity, protection of environment, danger to the agriculture and health hazards to the human beings and animals. The said permission has not only been granted in violation of the provisions

of the above mentioned Rules which clearly stipulate that any such permission can be granted only by the Genetic Engineering Approval Committee under the Ministry of Environment and Forests, but even the guidelines of Department of Biotechnology which have been framed under these Rules go contrary to these Rules besides being totally inadequate to deal with the present state of genetic engineering requiring stringent measures and precautions to be taken in such trials. The permission has been further vitiated by reason of the concerned nine States not being consulted before granting such permission when "agriculture" is a state subject and such experimentation has direct impact on the agriculture of a particular state. In fact, the two committees viz. State Biotechnology Coordination Committee (SBCC) and the District Level Committee (DLC) were not informed in advance before the grant of permission as these Committee are concerned with biosafety of such genetically engineered trials in the State as well as in a particular district. Therefore the permission which has, therefore, been granted is violative of Article 14, 19 and 21 of the Constitution; it is also violative of the provisions of Environment (Protection) Act, 1986 and the Rules framed under section 6, 8 and 25 of the said Act.

Fresh Clearances by MoEF Despite Supreme Court Case

The GEAC which has been totally absent in the approvals of the field trials of the last two years has suddenly become active and gave fresh clearances in July 2000 to undertake trials of Bt cotton on 85 hectares and allowed seed production on 150 hectares, implying the intention to expand transgenic cotton cultivation without waiting for social, ecological and economic assessments.

The official note circulated by MoEF states that "M/s. Maharashtra Hybrid Seed Company (MAHYCO) has been permitted to undertake field trials and generate environmental safety data on transgenic cotton in various agro-climatic regions of the country". This proclaimed objective is totally misleading. Firstly because, it hides the role of Monsanto which has the Patent on the transgenic Bollgard Cotton and with whom MAHYCO has a joint venture i.e. Monsanto MAHYCO Biotech (India) Pvt. Ltd. (MMBT).

In any case corporations promoting Genetic Engineering cannot be the source for biosafety data. Biosafety data has to be generated by ecologists and other independent experts. Depending on Monsanto-MAHYCO for environmental safety data is like depending on the chemical industry for data on chemical pollution and the auto industry for CO_2 pollution. Pollution monitoring and assessment agencies must be independent of the commercial interests that gain from an activity that generate pollution. In the case of genetic pollution, which as the note says is a legitimate public concern, similar independence needs to be maintained for environmental safety data.

Given the public concern related to GE the absence of public participation in the Monitoring-cum Evaluation Committee is another major cause of concern. Since over the last two years studies of RFSTE have shown that the claims related to transgenic cotton in terms of yields or reduction in pesticide use have been fabricated to speed up commercialisation and have no scientific basis.

This is a democratic imperative and fundamental to the right to know. The government is silent on the results of the last two years of field trials and is reluctant to open monitoring and evaluation for public participation.

The MOEF falsely associates GE with increase in food productivity. All data around the world is showing that yields of transgenic crops are lower than conventional crops. GE will not promote food security though it can create new environmental risks through genetic pollution.

Farmers' Suicides: Opportunity for Gene Giants to Launch Genetically Engineered Crops

The farmers' suicides in Andhra Pradesh, Karnataka, Maharashtra, Punjab and other states of India (see chapter 3) as well as the ecological disasters like the continuous failure of cotton in last few years in Andhra Pradesh and Punjab are used by industry to sell new "miracles" and new vulnerabilities.

The excessive use of pesticides in Andhra Pradesh and Punjab was related to the vulnerability of the hybrid seeds. However, the genetically engineered seeds which have pesticides built into them are now being offered by the multinational seed industry as the only alternative to the use of pesticides.

Bt-cotton is one of the products of genetic engineering being offered by Monsanto, the leading US based Agricultural Biotechnology Company as a 'miracle' to end the use of hazardous pesticides, to save the cotton crop from American bollworm and to increase the yield.

4. Monsanto's Genetically Engineered Bt Cotton : New Miracle or New Disaster?

What is Bt-Cotton?

Bt. toxins are a family of related molecules produced in nature by a soil bacterium, *Bacillus thuringiensis* (Bt.). Farmers and gardeners have used natural Bt. as an organic pesticide for more than 50 years. Bt. genes are now being genetically engineered into crops so that the plant produces toxins throughout most of its life.

Genetically engineered Bt. crops are being offered as a sustainable pest control strategy. However, the Bt. crops are neither ecological nor sustainable. They are not ecological because internalising toxin production in plants is not a toxic free strategy — it merely makes toxics internal to plants rather than applied externally. The ecological impacts of this strategy of internalising toxics have not been looked at, though indications are emerging that genetically engineered Bt. is harmful to beneficial insects such as bees and ladybirds.

The Bt. crop strategy is not a sustainable method for pest control because Bt. plants release toxins continuously. Constant long-term exposure of pest populations to Bt. encourages survival of individual pests that are genetically resistant to the toxin. As Margaret Mellon and Jane Rissler of the Union of Concerned Scientists state in their report "Now or Never":

> Over many generations, the proportion of resistant individuals in pest populations can increase, reducing the efficacy of the Bt. toxin as pesticide. If resistance evolves, Bt. toxins will cease to be effective both for the users of the new transgenic plants and those who have relied on Bt. sprays for decades. Scientists have estimated that widespread use of Bt. crops could lead to the loss of Bt's efficacy against certain pest populations in as far as two to five years (Fred and Bruce, 1998).

The primary justification for the genetic engineering of Bt. into crops is that this will reduce the use of insecticides. One of the Monsanto brochures had a picture of a few worms and stated, "You will see these in your cotton and that's O.K. Don't spray". However, in Texas, Monsanto faces a law suit filed by 25 farmers over Bt. cotton planted on 18,000 acres which suffered cotton boll worm damage and on which farmers had to use pesticides in spite of corporate propaganda that genetic engineering meant an end to the pesticide era. In 1996, 2 million acres in the US were planted with Monsanto's Bt. transgenic cotton called Bollgard, which had genes from the bacteria *Bacillus thuringensis* (Bt). The genetically engineered cotton generates a natural toxin to kill caterpillars of their pest: cotton bollworm, tobacco budworm and pink bollworm.

However, cotton bollworms were found to have infested thousands of acres planted with the new breed of cotton in Texas. Not only did the genetically engineered cotton not survive cotton bollworm attack, there are also fears that the strategy will create super bugs by inducing Bt - resistance in pests. The question is not whether super-pests will be created, but when they will become dominant. The fact that Environment Protection Agency (EPA) of the U.S. requires refugia of non-engineered crops to be planted near the engineered crops reflects the reality of the creation of resistant strains of insects.

The widespread use of Bt. containing crops could accelerate the development of insect pest resistance to Bt., which is used for organic pest control.

The genetically engineered Bt. crops continuously express the Bt. toxin throughout its growing season. Long term exposure to Bt. toxins promotes development of resistance in insect populations.

Due to this risk of pest resistance, the U.S. Environment Protection Agency offers only conditional and temporary registration of varieties producing Bt. The EPA requires 4% "refugia" with Bt. cotton i.e. 4% of planted cotton is conventional and does not express the Bt. toxin. It therefore acts as a refuge for insects to survive and breed, and hence keeps the overall level of resistance in the population low. Even at a 4% refugia level, insect resistance will evolve in as little as 3 - 4 years.

For Bt. corn, the suggested "sacrificial" refugia is as large as 3%. Thus, farmers have to make a major sacrifice to adopt the new miracle crops of genetic engineering. The building up of pest-resistance undermines the use of natural Bt. in organic agriculture. This is the reason that legal action against the US, EPA was filed in Washington by Greenpeace International, the International Federation of Organic Movements (world organisation of organic farmers, certifiers, producers, retailers, 650 members in over 100 countries), the Sierra Club, the National Family Farm Coalition, California Certified Organic Farmers, the Rural Advancement Foundation International (RAFI), the Institute for Agriculture and Trade Policy and over 20 organic farmers' organisations. The central demands of the petition was that the EPA cancels registration of all genetically engineered plants that contain the Bt. pesticide and that it refrains from taking new registrations. Furthermore, that the EPA completes an impact statement analysing the registering of genetically engineered plants that express Bt.

Engineering a toxin into a plant can have its own hazards. Plants engineered to manufacture their own pesticides can harm organisms other than their intended targets. Soil inhabiting organisms that degrade the organic matter containing the insecticidal toxins produced by the soil bacterium *Bacillus Thuringiensis* can be harmed by the toxin.

One of the most significant reasons contributing to the pesticide treadmill has been the death of beneficial insects, and the emergence of resistance. More than 500 species of insects have become resistant to conventional insecticides and there is empirical evidence that they can also adapt to Bt. toxins (Fred and Bruce, 1998).

In Australia, Bt. cotton acreage has been limited to below 20 per cent of all cotton grown because of the risks of emergence of resistance. The Australian experience with commercial use of Bt. cotton in the summer of 1996-97 showed that Bt. expression can vary based on the genetic material planted and on environmental factors. A significant number of Bt. cotton growers experienced pest damage by H. armigeca (the Australian equivalent of the cotton bollworm) as high as fields with untreated non-Bt. cotton.

The failure of Monsanto's Bollgard cotton in large areas in the U.S. shows the risks of extrapolating from trials on small plots to large scale commercial planting. A second lesson from the 1996 U.S. planting is that it is not easy to force farmers to leave refugia at their own costs in order to manage pest resistance. The extra costs of leaving 20 per cent land to non-Bt. cotton to be sprayed with conventional insecticides should be internalised in assessment of the benefits of Bt. cotton.

Scientists have recommended that 50 per cent area be planted by non-Bt. cotton when farmers plant Bt. cotton (Fred and Bruce, 1998). If farmers should not plant more than half their acreage with Bt. cotton, why should they plant it at all?

As the example of the cotton crisis in Warangal in Andhra Pradesh shows, farmers who have lost control over their seeds, agriculture and knowledge and have switched to the mentality of technological fixes to ecological problems through miracle varieties or chemicals will maximise the use of what has been offered to them as a technological miracle.

The impact of Bt. cotton on Indian farmers and Indian agriculture can be even more serious than the impact of the hybrid cotton in Warangal or any other part of India. Besides this, the Bt cotton will have a direct impact on the practitioners of the Indian system of medicines. The cotton seeds, roots, flowers, leaves, oil and cotton is used internally as well as externally in different ailments in the Indian system of medicines.

The cotton seeds are used for increasing milk secretion; the use of Bt cotton seeds can cause serious health hazards to the mother and the child. Similarly the roots are used during the labour to enhance the uterine contracts. The ash of the cotton is taken to check bleeding from wound. The leaves are given as dyurative. The introduction of Bt cotton will have a dangerous effect on the traditional medical practices and the use of its seeds, leaves, roots, oil will be fatal for the patients.

India is the home of cotton diversity. We should use the biodiversity of cotton to our advantage to create ecological strategies of selecting pest

resistance varieties, using integrated pest management and avoiding the risks of hazardous pesticides as well as the risks of genetically engineered crops. The risks are aggravated by the fact that Bt. cotton is patented. Since Bt. crops destroy alternatives, and are themselves treated as "intellectual property", planted Bt. cotton seeds would totally enslave the farmers to a single company.

The risks of monopoly

Monsanto has the largest stakes in Bt. Cotton, which it sells under the trade name of Bollgard.

In recent years, Monsanto has acquired Calgene, Agracetus, Dekalb, Delta & Pineland, Asgrow & Holdens, Mahyco (Indian) which makes it the largest biotechnology corporation in the seed sector (see Table 2.1).

In India, Monsanto has set up a Joint Venture with MAHYCO, the largest Indian seed company in the private sector. Monsanto plans to market its Bollgard cotton through this Joint Venture. It has decided to unveil a limited launch of Bollgad in India by 1999 and a full scale launch in 2000 (Asian Age, 1998). They have set for themselves a turnover target of about Rs. 500 crore in the next five to seven years in India.

Monsanto's promotional literature does not inform farmers about the risks of Bt. crops. As Hendrik Verfaillie, the President of Monsanto, stated in an address to the Forum on Nature and Human Society at the National Academy of Sciences, Washington D.C. October 30, 1997 in describing Monsanto's Bt. Potato:

> "The bioengineered plant has been given genetic instructions which allow it to use sunshine, air and soil nutrients to make a biodegradable protein that affects specific insects and pest, and only those individual insects that actually take a bite of the plant... It spares the lives of the beneficial insects which previously would have been killed by broadcasting a broad spectrum insecticide."

This description is misleading in many ways. The use of genetic engineering to make transgene bt-plants has described as "giving genetic instructions to use sunshine, air and soil nutrients", a high dose toxin is described as a "biodegradable protein", and the impact is artifically restricted to insects "that take a bite of the plant", thus excluding the impact on bees that take the pollen, and organisms that eat the insects which have eaten the toxin. The impact of Bt. crops can be large because the toxin can travel up the food chain and is hence not limited to the plant and insects, which feed on it.

Chemical insecticides were pushed in the Third World on grounds that without them agricultural production is impossible. However, as the experience of Indonesia shows, a reduction of pesticides by 60 per cent contributed to an *increase* of rice yields by 13 per cent.

Like insecticides, insecticide producing plants which have been genetically engineered to produce Bt.-toxin could be another false miracle which sows the seeds of massive disasters.

Cost of the Bt *Technology*

Bt technology is not free of cost to the farmers. The farmers have to pay for the non-cotton gene inserted into the cotton genome. The fees that are charged to farmers are related directly to the benefits or saving made in planting the transgenic cotton varieties. It is generally presumed that Bt cotton if planted would significantly reduce the need for spraying insecticides and accordingly the technology fee has been related to the insecticide use.

Each farmer interested to plant Bt variety has to sign an agreement with the Company. In the case of purchase of Monsanto's transgenic products, one of the important conditions of the contract has been that the seeds can neither be saved for next year nor passed on to other cotton growers. The company apparently intends to reap technology benefits for years to come by extending the duration of agreement.

It has been observed that the performance of Bt cotton is not always profitable. According to a study by Sutton (1998) it was not profitable to grow Bt cotton in Arkansas (USA) during 1997. The study involved two similar fields on the same farm at seven locations for comparing cost of production and net returns from Bt versus non-Bt cotton varieties. The study noted that the differences between the Bt and non-Bt fields were in the area of technology fees, cost of insecticides and their application, growth regulators and second harvest costs. In most Bt fields, the additional cost of seed, the necessity of using plant growth regulators, the technology fee and the need to make second pick were responsible for higher cost of production.

It is very clear through studies [like Sutton (1998)] that bollworm pressure is an important factor for determining the economical suitability for Bt cotton.

Study by Gibson et al (1997) compared the costs and returns associated with growing Bt cotton and non-Bt in Mississippi for two years. The study reveals that there was not much difference in the total cost of production. However, Bt cotton required more expenses in the form of fertilisers, fungicide treatments and the technology fees. The Table 2.3 provides the performance of Bt to that of non-Bt cotton in Mississippi (USA) in 1995-97. It is observed from the table that the amount spent on insect control together with the technology fee exceeds for Bt cotton in all the years and made it more expensive for the farmers. Thus the total cost for Bt crop exceeds on an average fifty percent more to that of non-Bt crop.

TABLE 2.3

Performance of Bt vs Non-Bt Cotton in Mississippi 1995-1997

	1995		***1996***		***1997***	
	Bt	***Non*-Bt**	**Bt**	***Non*-Bt**	**Bt**	***Non*-Bt**
Lint yield kg/ha	1086	983	1002	950	1103	1009
Insect Control US$/ha	176	232	157	144	209	204
Bollgard Fee US$/ha	204		61		133	
Total Cost US$/ha	**380**	232	**218**	144	**342**	204
Total Return US$/ha	1176	1176	1218	1218	1239	1239

Source: *ICAC, June 1998.*

For the trials, the company has not charged any technology fees as such. However, for commercial sale of the seeds the company is certainly going to impose technology fees. In such situation, there will be tremendous pressure on the farmers and ultimately the very survival of farmers will be threatened. There is absolutely no difference in terms of total returns for Bt and non-Bt crops of cotton.

Genetically Engineered Crops Yields More: Myth or Reality?

It is argued that the yield from genetically engineered crops will be significantly higher than the normal hybrids and high yielding varieties or the open pollinated varieties.

The failure of GE crops to yield has been reported from all over the world. The Mississippi Seed Arbitration Council has ruled that Monsanto's Roundup Ready Cotton failed to perform as advertised in 1997 and recommended payments of nearly $2 million to three cotton farmers who suffered severe crop losses. The University of Arkansas study showed that on average Bt cotton yielded fewer pounds and lower income per acre (Union of Concerned Scientists, 2000).

In his testimony in Bija Panchayat – Seed Tribunal at Bangalore in September 2000, Percy Schmeiser a Canadian farmer, who was sued by Monsanto for cultivating Bt canola, informed that not only the yields of genetically engineered canola was very low but also the quality was poor.

> Before you could buy the canola seed from Monsanto you have to sign a Licence. And in that Licence you gave up many of your rights as a farmer. You gave your rights up that you could not use the seed from that crop in the following year, you have to sell all your seed, you have to buy seed from Monsanto, you have to buy the chemical from Monsanto. Worse than that you have to also sign that if you violated your contract that they could fine you, you could not say one word, that they can say anything about you. In addition to get seed from Monsanto, you also have to pay a technology charge which is $15 an acre. So basically they have complete control over you with regard to the seed that you bought. It is just like renting the seed. And you have to buy back next year.
>
> ***Percy Schmieser,*** *Canadian Farmer*

The rush to expand the area under GE crops in India is largely related to the failing fortunes of the biotech industries in the US and Europe. The yields in all the trial plots were found to be low as compared to what the company promised. A comparison of the local hybrid variety cultivated and *Bt* shows that the yield from both the crops was more or less same. Table 2.4 shows the comparison of Bt and non-Bt yield.

The performance of Bt with respect to other non-Bt cotton in some of the trial sites shows no good results. It has been observed that in almost all the sites, farmers reported that except for some protection from bollworm nothing much has benefited them. The cost of cultivation has also worked out to be same for all the trial farmers.

Studies undertaken in US during 1999, where 50% of the soybean crop came from genetically modified glyphosate-resistant soybeans, farmers reported yield losses and increased costs. One of the review of more than 8,200 soybean trials found the "yield drag" of the top varieties of GM beans compared with conventional varieties to be 6.7% (Charles Benbrook, 1999). The yield drag and Monsanto's technology fee practically impose tax on the income of farmers who cultivate genetically modified soyabean.

TABLE 2.4

Actual yield reported by the farmers in the Trial Plots for Bt Cotton (1998-99)

Name of the Farmer & Location	Bt *Yield/acre*	*Non*-Bt *Yield/acre*
1. Mr Lehri Singh, Hissar, Haryana	745 Kg	880 Kg
2. Mr Harpal Singh, Sirsa, Haryana	5 Kg	200 Kg
3. Mr Surendra Singh Hayer, Punjab	Poor yield	250 Kg
4. Mr Mahalingappa Shankarikopp, Haveri, Karnataka	700 Kg	700 Kg
5. Mr B V Nunjundappa, HBHalli, Karnataka	Poor yield	Not performed well
6. Mr Karelli Bakka Reddi, Ranga Reddy, Andhra Pradesh	50 Kg	150-200 Kg
7. Mr Bansi lal Lakhmi, Khargoan, Mahdya Pradesh	12 Kg	300 to 400 Kg

Source : *Compiled from Primary Survey of Trial Sites by RFSTE team.*

TABLE: 2.5

Round Up Ready & Conventional Variety Yields by State, 1998

States	*Per cent Yield Drag per Acre*		
	Trial Mean	***Top 5 Varieties***	***Top Variety***
Illinois	+3.4%	0.0%	0.0%
Iowa	-6.6%	-6.3%	-9.1%
Michigan	-3.0%	-6.8%	-10.3%
Minnesota	-7.6%	-8.2%	-6.8%
Nebraska	-12.1%	-10.8%	-9.1%
Ohio	+3.3%	-6.0%	-5.8%
S Dakota	-10.2%	-7.4%	-8.9%
Wisconsin	-2.8%	-3.5%	-3.4%
Average	-5.3%	-6.1%	-6.7%

Source: *Charles Benbrook, 1999.*

In a study, which was initiated on the requests of producers regarding yield related questions about Roundup Ready Soybean in 1997, carried out by Nebraska University Institute of Agriculture and Natural Resources headed by NU agronomist Roger Elmore reported in June 2000 that roundup ready soybeans yielded 6% less than their closest relatives and 11% less than high yielding conventional soybeans.

Decline in Planting Area of Bt crops

According to World Watch Institute's Report 2000 there has been a decline of about 25% planting area of GM crops in the US. In January 2000, the planting undertaken by farmers in United States for Bt corn declined to 24% and Bt cotton to 26%.

A study by North Carolina State University in March 2000, reveals that damage to cotton bolls in Bt crops from stink bugs increased by a staggering 430% compared to conventional cotton. Based on these results US southern states had been prohibited from planting more than 50% of their acreage to Bt crops because of the risk of the rapid development of pest resistance which threatens to make the technology impotent.

Refugia Maintenance Strategies: At whose cost ?

Responding to Monsanto's amendment request of June 1999 and November 1999, United States Environmental Protection Agency's Biopesticide and Pollution Prevention Division informed that 20 % and 50 % refugia must be grown in Bt corn and Bt cotton growing areas (Letter from USEPA). It has been also reported in other studies that the expression of Bt in cotton varieties is not high enough to kill most of the cotton bollworms, allowing 10 – 40 % of insects to survive. This requires a huge refuge to create a large enough susceptible population for mating with survivors.

With the advent of mass planting of transgenic crops, many of the natural refuge where susceptible larvae thrive will disappear. Therefore, the strategy of non *Bt* plant refuges in which the *Bt* vulnerable insects can continue to multiply, thus reducing the rate at which the *Bt* resistant insects dominate the population. Many companies selling transgenic seeds, including Monsanto, have accepted this refuge strategy.

The refugia need to constitute 5-40% of a given crop. "With the bollworm, the key strategy is refugia, host plants where the insect can escape exposure to *Bt* protein. Non-selected populations that develop on these refuges help dilute and suppress any resistance genes that may develop in the Bollgard fields. The bollworm has a multitude of hosts – both wild and crop plants. With Bollgard, resistance management is taken even further by requiring growers to plant refuges with cotton that does not contain the Bollgard gene. When both the natural and mandated refuges are combined, resistance development in the

bollworm can be delayed significantly." Therefore, Bt technology is for corporate farmers with industrial agriculture.

80% of Indian farmers who are small and marginal and having medium land holding can not afford to put aside land to have refugia to delay resistance. This also shows that *Bt* cotton will not increase yield, though it is not engineered for that, nor it would help in reducing pesticide use. The *Bt* technology has already proved to be a unreliable, expensive technology and has also failed to control bollworms, rather it has developed resistance to *Bt* toxin. Thus Bt technology in India can never be a reliable technology for the small and marginal farmers of India.

The Australian experience, as discussed earlier, showed a significant number of growers had fields of *Bt* cotton in which the damage due to *H. armigera* was similar to that in untreated non-*Bt* cotton.

The basic questions that are however not being raised in the U.S. debate are:

> Monsanto did an aggressive campaigning claiming that the genetically engineered rape seed provided by them was more nutritious, had high yield and would consume less chemicals. But this was not entirely true. Farmers who used it found that it was not what was claimed but instead had become a super weed, destroying other varieties through its resistance to Monsanto's branded herbicide *Roundup*.
>
> This contamination of seed has now appeared in the wheat, barley. It has also ruined the sales of organic rapeseed products in Europe. The Alberta University has now found that there are 3 genetically manipulated genes in the GE Canola plants. Organic farmers are now convinced that the MNCs are all out to destroy them, as they are not buying the chemical fertilisers and pesticides. It has become a major problem in Canada.
>
> **- Percy Schmieser,** Canadian Farmer

1. Who bears all the costs of resistance management, the farmer or Monsanto?
2. Is not the really sustainable option of using organic methods which would reduce the ecological and economic costs of insecticides without creating new costs of genetically engineered seeds, royalties, technology fees, continued insecticide use and the risks of the emergence of resistance to Bt.

Reduced Use of Insecticides, Pesticides: the Truth

Genetically engineered crops are developed to reduce the chemical application to the plants. It has been observed that the use of pesticides, weedicides and herbicides has been increasing tremendously all over the world. To reduce this dependence on agri-chemicals and to minimise the damage to environment through these poisonous substances, genetically engineered crops were thought of as an alternative to reduce the chemical usage in agriculture.

According to industry, the promise of transgenic crops inserted with Bt genes is the replacement of synthetic insecticides, which is at the moment used to control insect pests. However, it has been found that there is no decline in usage of synthetic pesticides and insecticides in the Bt cultivated areas.

Insecticides sprays were still required in the genetically engineered crops to control pests other than Lepidoptera not susceptible to the endotoxin expressed, as most crops have a diversity of insect pests (Gould, 1994). On the other hand, instead of reducing the agri-chemical dependence, new problem of pests developing resistance to the ever expressing endotoxin from the genetically modified crops.

Monsanto company admits that bollworm larvae greater than ¼ inch long or 2 to 4 days old are difficult to be controlled with Bollgard alone (see promotional material of Monsanto). It recommends applying supplemented insecticide treatment and further recommends the farmers that "if sufficient

larvae of this size are present you may need to apply supplemental treatment at intervals" (Monsanto Company, 1996).

In another instance, the pesticide effect of the engineered Bt was not sufficient to kill off all pests throughout the season as Monsanto promised. Dr Mae-Wan Ho, of the UK's Open University, attributes this failure to unpredicted changes in the behaviours of the Bt gene. In 1997, 20 % of the first commercial crop of Roundup Ready cotton suffered deformed bolls and bolls dropping off early.

In one out of the three regions which the United States Department of Agriculture (USDA) studied total chemical treatments for all the cotton pests were actually 53 % higher for adopters of Bt cotton than non-adopters (WWF Report, March 2000).

An analysis by the Pesticides Trust on behalf of Greenpeace argues that the introduction of herbicide resistant varieties will alter the pattern of herbicide use but will not change the overall amounts used. If it leads to greater use of glyphosate this will damage other crops and have potential adverse effects on wildlife, including beneficial insects such as ladybirds. The analysis further shows that the compounds can remain active in the soil for long periods and can contaminate water (International Agricultural Development, 1998).

The actual pesticide sprays by the farmers at various trial sites in India, during the first round of illegal trials of Bt cotton revealed that the use of pesticides has not at all stopped for Bt crop. Pesticide sprays ranging from as high as 12 to 15 in one of the trial fields in Haryana to a minimum of three in the trial fields have been observed. According to Mr Basavanappa s/o Shri B V Nanjundappa in Hagari Bommanahalli Taluk, Bellary district, the number of sprays in all the three test plots of Bt and non-Bt has been almost same and incurred around Rs 6700 for chemicals sprays and fertilisers. This amount is almost spent by all other conventional/hybrid cotton growers on purchase of chemicals and fertilisers in that part of the State. Table 2.6 gives the number of sprays farmers used on the Bt plots during the trial.

TABLE 2.6

Number of Chemical Sprays on Bt Cotton by the trial farmers (1998-99)

Name & Location of Farmer	*Number of Sprays on Bt Crop*
Mr Surinder Singh Hayer, Punjab	5 to 6 times spray of chemicals.
Mr Lehri Singh, Hissar, Haryana	3 times spray of chemicals.
Mahyco R D Centre, Gurgoan, Haryana	3 to 5 spray of chemicals.
Shri B V Nanjundappa, Bellary, Karnataka	4 times spray of chemicals.
Shri V Thirupalliah, Kurnool, A P	4 times spray of chemicals.

Source: *Compilation from RFSTE Primary Survey, 1998.*

Contrary to the claim of Monsanto about the reduction of chemical sprays, farmers had to revert to chemical spraying inspite of built-in insecticidal properties in the Bt cotton.

Increased Costs to Farmers

With the introduction of genetically modified crops, per acre cost of cultivation will tremendously increase with increase in added costs in terms of seed cost, technology fees, and use of chemicals. In the present situation with internal inputs organic agriculture the added costs are almost negligible except for the cost of seeds, which most of the farmers saving their seeds and using them for cultivating in the following season. Other inputs are also provided on farm.

Once Bt cotton is cultivated, all these costs will appear and the farmer will get into serious financial troubles.

An estimation of additional burden which the farmer has to bear for switching over to Bt cotton from conventional variety is nearly nine times more in terms of seed cost, technology fee of nearly US$ 80 per hectare and more spending on pesticides and chemicals. Most calculations used by Monsanto compare the costs incurred by the farmers of developed countries. The estimates for Indian farmers are totally different and have profound impact when the comparisons are made in Indian context between cultivation with genetically engineered seeds and cultivation under organic conditions.

The genetic engineering option is projected as leading to lower chemical use and hence economic benefits by comparing it to chemical intensive, large scale industrial monocultures instead of ecological organic agriculture which is perhaps the only real alternative. However the comparison of genetically engineered crops that should be made is not with chemical intensive agriculture but with ecological regenerative agriculture. In addition to the increased cost of chemicals, the shift from ecological agriculture to genetic engineering also leads to increased costs of seed, including technology costs, which are never mentioned when the economic benefits of transgenic crops are assessed.

Thus, from Table 2.7, it is evident that the ecological farming has no expenditure in terms of seed cost, technology fee imposed on the seed and the cost of pesticide. Once there is shift in the farming system, from ecological to that of genetically engineered farming, the farmer has to bear Rs 10500 per acre additional cost apart from other input costs such as labour costs.

As per 1997-98 figures the total area under cotton in India is 214 lakh acres. Therefore, if whole of the cropping shifts to genetically engineered cotton then nearly **Rs 16050 crores on pesticides** and **Rs 22470 crores on entire cotton cultivation will be the added costs compared to the ecological option of internal input agriculture**.

The false comparison with chemical/industrial agriculture rather than with ecological organic agriculture is used to create the illusion of sustainability of genetically engineered crops.

TABLE 2.7

Comparison of costs in Ecological farming and Genetically Engineered farming system for Cotton crop in India (per acre)

Inputs	*Ecological Farming*	*Genetically Engineered Farming*
Seed Cost	Nil	Rs 550
Technology Cost	Nil	Rs 2000
Pesticide Cost	Nil	Rs 7500
Total Cost of Cultivation/acre	Nil	Rs 10050

Source: *Compiled from RFSTE Primary Survey, 1998*

TABLE 2.8

Average Projected 2000 Insect Control : Costs and Damages ($/acre) of Bollgard Versus Conventional Cotton for North Carolina Producers

Items	*Bollgard*	*Conventional*
Average Technology Fee [a]	19.14	0.00
Insect Control Cost [b]	5.63 (0.75 apps)	18.98 (2.53 apps)
Insect Damage [c] (% damaged bolls)	0.00 (4.47 %)	6.08 (5.25 %)
Additional Scouting Fees [d]	2.50	0.00
Total	($ 27.27)	($ 25.06)

Source: *Charles Benbrook, 1999.*

a Technology fee varies according to seed rate and row spacing.

b Pyrethroid = $ 5.50 per acre; application = $ 2.00/acre

c Damage:1 % boll damage equals approx 12 lb lint per acre; cotton = $ 0.65/lb

d Scouting requirements for Bollgard typically exceed those needed for conventional cotton.

5. Socio-Ecological Aspects of GE Revolution

Genetic Pollution

Genetic engineering is creating new forms of pollution identified as genetic pollution. Across the world evidences are emerging about the reality of threat from this new form of pollution. The nature of genetic pollution is different from that of chemical pollution in the sense that there is no abatement for this type of pollution.

The risks associated with genetic pollution arise from a number of aspects of genetic engineering. The transgenic organisms are modified organisms with a foreign gene which behave differently in the ecosystem. The ecological impacts of such organisms are a function of the explicit properties of the added genes, the effects of new combinations of genes and specific environmental situations.

Transgenic organisms also carry risks because exotic genes are also introduced through the use of viruses and plasmids as vectors, which themselves can create ecological risks. Transgenic crops contain antibiotic resistance markers that carry the risks of antibiotic resistance spreading.

According to evidence presented by the Union of Concerned Scientists, there are already signals that the commercial-scale use of some transgenic crops pose serious ecological risks and do not deliver the promises of industry (see the Box below).

Field Performance of Some Recently Released Transgenic Crops

Transgenic Crop Released	*Performance*	*Reference*
1. Bt transgenic cotton	Additional insecticide sprays needed due to Bt cotton failing to control bollworms in 20,000 acres in eastern Texas	The Gene Exchange, 1996; Kaiser, 1996
2. Cotton inserted with Roundup Readgô gene	Bolls deformed and falling off in 4-5 thousand acres in Mississippi Delta	Lappe and Bailey, 1997; Myerson, 1997
3. Bt corn	27% yield reduction and lower Cu foliar levels in Beltsville trial	Hornick, 1997
4. Herbicide resistant oilseed rape	Pollen escaped and fertilised botanically related plants 2.5 km away in Scotland	Scottish Crop Research Institute, 1996
5. Virus resistant squash	Vertical resistance to two viruses and not to others transmitted by aphids	Rissler, J. (Personal communication)
6. Early FLAVR-SAVR tomato varieties	Did not exhibit acceptable yields and disease resistance performance	Biotech Reporter, 1996
7. Roundup Ready Canola	Pulled off the market due to contamination with a gene that does not have regulatory approval	Rance, 1997
8. Bt potatoes	Aphids sequestered the Bt toxin apparently affecting coccinellid predators in negative ways	Birch et al., 1997
9. Herbicide tolerant crops	Development of resistance by annual ryegrass to Roundup	Gill, 1995

In the United States Bt crops are registered as insecticides. These registrations are conditional and expire in 2000 - 2001. The insecticidal Bt-toxins, isolated from *Bacillus thuringiensis* are often engineered into plants in a pre-activated form, and are already known to be harmful to bees directly, and to lacewings further up the food chain. A recent study in Switzerland found that lacewings, which prey on corn pests, suffered maldevelopment, increased mortality when fed with corn borers raised on Bt crop (Hilbech, et al, 1998).

Monsanto's genetically engineered "Bollgard" cotton or Bt-cotton has genes from a bacteria engineered into it so that the plant produces its own pesticide contrary to Monsanto's claim. Bt-cotton is not "pest-resistant" but a pesticide producing plant. The severe ecological risks of crops genetically engineered to produce toxics include the threat posed to beneficial species such as birds, bees, butterflies, beetles which are necessary for pollination and for pest control through prey predator balance. Nothing is yet known of the impact on human health when toxic producing Bt. crops such as potato and corn are eaten or on animal health when oilcake from Bt-cotton or fodder from Bt-corn is consumed as cattle feed. Further, while pesticide producing plants are being offered as an alternative to spraying pesticides, they will in fact create the need for more pesticides since pests are rapidly evolving resistance to genetically engineered Bt-crops.

Research at the Scottish Crop Research showed that lady birds fed on aphids which were fed on transgenic potatoes laid fewer eggs and lived half as long as lady birds on a normal diet (Brich et al, 1996/97).

The latest research that has sent shock waves throughout the scientific and environmental community is the finding by the Cornell scientists that the Monarch butterfly *Danaus plexippus* was killed by ingesting milkweed leaves dusted with pollen from Bt cotton (Losey et al., 1999).

These impacts on non-target species falsify the claims that the Bt toxin in Bt cotton only effects the cotton bollworm. If such Bt cotton is allowed to spread across the country its impact on diverse species will be similar to the devastating impacts of pesticide use. In addition, the risks of transgene moving into other plants will have the added risks of genetic pollution and the destruction of our biodiversity.

Transgenic plants have been genetically engineered to contain traits from unrelated organisms. The spread of transgenic crops threatens crop genetic diversity by simplifying cropping systems and promoting genetic erosion. The potential transfer of genes from pesticide resistant crops to wild or semi-domesticated relatives may create new super weeds.

The wide spread use of Bt containing crops could accelerate the development of insect pest resistance to Bt, which is used for organic pest control.

There is serious mismatch between the mindset of genetic engineering biotechnology and the reality of the new genetics. A summary is given below to highlight the mismatch between the two :

Genetic Engineering Mindset	*Reality of Scientific Findings*
1. Genes determine characters in linear causal chain: one gene gives one function.	Genes function in complex network; causation is multidimensional, nonlinear and circular.
2. Genes and genomes are not subject to environmental influence.	Genes and genomes are subject to feedback regulation.
3. Genes and genomes are stable and unchanging.	Genes and genomes are dynamic and fluid can change directly in response to the environment and give adaptive mutations to order.
4. Genes stay where they are put.	Genes can jump horizontally between unrelated species and recombine.

The Taco Shell Case

Taco shells are a very popular food in the US, and many brands are found in all supermarket shelves. Our coalition of groups against GE foods, called *Genetic Engineering Food Alert,* tested various foods for contamination with genetically engineered Bt corn. We found that the Bt corn that had been cleared **only** as animal feed had infiltrated in the human food. This Bt corn had not been approved for human consumption, as it is toxic to humans due to the presence of allergens. The genes that were found in Taco shell were of Cryonine gene, which does not degrade in the gut of humans. This shows that the regulatory bodies don't work.

- Ellen Hickey, USA

Monsanto's technology destroys beneficial biodiversity and create superpests both through wiping out pest predators and by creating pests, which are resistant to pesticides. While Monsanto's pesticide producing Bt. crops are not based on the terminator technology, which terminates germination of seed so that farmers cannot save it. However, they are in an ecological sense terminator, which terminates biodiveristy and the possibilities of ecological and sustainable agriculture based on the conservation of biodiversity.

The ecological impact of Bt-cotton cannot be assessed on the basis of a 3-month trial. The trial needs to be carried out over 2-3 growing seasons and impact needs to be assessed on all organisms, including soil microorganisms which have been known to be killed by the toxics in Bt-crops. To get the full-ecological impact of biodiversity destruction and genetic pollution caused by genetically engineered crops, the following steps are necessary :

- a full biodiversity assessment of the ecosystem in which the GMO is to be introduced.
- impact of genetically engineered crop on diverse species including pollinators and soil microorganism
- risks of transfer of genetically engineered traits to non-engineered crops through horizontal gene transfer and pollination.

Indian Trials Lack Ecological Impact Assessment

None of the above referred steps for ecological risks of GMOs have been carried out in Monsanto's illegal and unscientific trials with Bollgard cotton during 1998, in India.

When Monsanto states that they have had 93% success they are referring to agronomic performance, not to ecological safety. Further, since the Bt-technology is aimed at pesticide production, not yield increases, Monsanto is deliberately distorting facts when it refers to yield increasing characteristics of Bollgard cotton.

The wrong committee asked Mahyco-Monsanto to generate data on pest load, performance in terms of yield and fiber quality, to compare the insect damage on the boll shedding and retention for Bt cotton. There has been no concern to monitor the impact of transgenic crops on the surrounding flora and other relevant ecological aspects.

Containment - the Need

The absence of containment measures during the Bt cotton field trials include:

- No safegaurds for the prevention of leaf fall from Bt cotton entering the soil ecosystem;

- No safegaurds against soil microorganisms being adversely impacted;
- No netting to prevent insect pollinators from approaching the Bt cotton plants to prevent gene transfer through pollination;
- No steps to prevent non-target species from feeding on the Bt cotton and transferring the transgenic material in to the larger environment through the food chain;
- No safegaurds to ensure that the stems, roots, leaves, cotton fibre, cotton seeds were collected at the end of the harvest and destroyed;
- No precaution whatsoever is on record to provide for post harvest segregation. The Bt cotton produce harvested by farmers was mixed with the produce harvested from non-GE cotton and sold in the local market.

Through these multiple flows and interactions with the environment the Bt cotton trials are a deliberate release of a GMO into the environment and not "contained" experiment.

The lack of containment of field trials implies that the GMO and the transgene contained in it can escape in to the larger environment through pollination, food chains and marketing chains. Unlike non-living material, GMOs multiply and reproduce. In the words of Ms Elaine Ingham (Professor at the Department of Botany and Plant Pathology, Oregon State University, USA) any engineered organism to be released into the real world, free from the controlled laboratory situation, must be treated as the potential hazard that it is. The biotechnology industry needs to step back and make certain that the biological potential of organisms being altered, both before and after alterations, is recognised and understood. After all, organisms are capable of reproduction and increasing in number and spreading. Human produced chemicals may have posed problems to the environment but at least chemicals, whether organic or inorganic, did not reproduce. One molecule of a problem chemical remained one molecule and did not replicate to become a million problems.

In case of biological material, tiny amounts of material can be multiplied. Bacterial multiplication takes places at phenomenally high rates.

A comparison of the field trial design with actual field practice and required ecological trial parameters as specified by biosafety regulations is presented in Table 2.9.

Isolation Distances

Isolation distances are scientifically important while undertaking trials with transgenic crops since, the transgenic material cannot be treated as if it were a chemical matter rather than biological matter. Biological matter can not be equated to chemical matter. Because of the reproduction and multiplication inherent to living organisms, GMO releases can have irrepressibly damaging impact on the environment. The inherent tendency of biological organisms to multiply and reproduce and interact with other species implies that what begins with a small number of plants or bacteria can become a major invasion or epidemic. The example of Parthenium substantiates the point. A few seeds of Parthenium which came in as contaminants in a wheat consignment of PL480

a few years ago, today covers millions of acres of productive land in the country and causes allergies to millions of people.

TABLE 2.9
Comparison of the Field trial design with Actual Field Practice and Ecological trial parameters as specified by Biosafety Regulations

Trial Design	*Actual Field Practice*	*Ecological Trial Parameters*
• Experimental design for the quadruplicate trials of Bt cotton would be in field space of about 1394 sq meters.	• 1800 sq meters of plots were used.	• Impact of leaf fall on soil organisms. • Impact on Non target species. • Emergence of resistance.
• Experimental plots containing transgenic Bt cotton plants should be surrounded by an isolation distance of 5 meters with no plantations.	• No isolation distance. Instead crops were planted in between the plots.	• Experimental plots in total isolation. Series of experiments to be conducted in contained environment. • Assessment of the impact on other crop and plant species dominant in the region.
• Comparative assessment of lepidopteran pest load in randomised Bt, non-Bt field along with non-Bt foeld plantations due to host preference. • Performance of the Bt and non-Bt hybrids for yield and fiber quality.	• No data available. • Manipulation in comparing the yield of Bt and non-Bt cotton by opting for its own inferior variety and not taking the most common variety cultivated by the farmers in the region.	• Integrated analysis of flora and fauna in soil and agroecosystem within a distance covered by pollination potential. • Local cultural practices should not be manipulated and comparison should be made with the most commonly grown variety of the crop.
• Keep full account of the transgenic materials and seeds in the transgenic plots and use all transgenic material in a contained environment.	• Free sale of the Bt cotton produced mixed with normal cotton produce in the market by the farmers. No precaution of containment.	• Complete destruction of the material/produce obtained from the trials.
• All materials, like quantities of transgenic Bt cotton seeds produced, transgenic cotton produce etc after experimentation be reported to the government.	• Taluk level concerned government departments unaware of the experimentation and did not receive any material or produce of the trangenic Bt cotton.	• All concerned committees at all levels of institutional hierarchy should be well informed about any trials with the genetically modified organisms in the field.
• Ensure company authorised personnel permitted to visit experimental sites.	• Mahyco organised *kshetra utsav* for publicity of the Bt cotton among other farmers of the region surrounding the trial fields.	• While in research conditions all the results should be open and accessible to the interested citizens of the country.
• Ensure adherence to Recombinant DNA guidelines of the Government of India.	• No adherence to the guidelines laid by the Government of India.	• Strong biosafety regulations needed. • More public participation needed.

Source: *Compiled from Primary Survey, Biosafety Guidelines and Rissler & Mellon (1996).*

Pollen escape cannot be equated with crossing. Hybridisation and pollen flow are two separate things. Hybridisation is species specific. Therein also the need to list all the relatives of cotton with which the *Bt* Cotton could hybridise with. Such is the nature and extent of research and study that needs to be undertaken before any activity even remotely resembling a commercial application can be allowed. Many experiments on pollination in different ecosystems need to be carried out in different universities and research institutes and not by commercial agencies to assess pollination distances for the risks of gene flow of transgenic material.

Ann Clark, an agronomist at the University of Guelph in the province of Ontario, was quoted as saying, "Canola pollen can move up to 8 kilometers; (pollen from) corn and potatoes, about 1 kilometer : Wind is only one of the ways pollen moves. Canola pollen, for example, is carried by pollinators" (Ann Clarke, 1998).

GMOs released into the environment without full safeguards and containment measures therefore automatically translate into a deliberate release and a large-scale process at the biological and ecological level. In the domain of genetic pollution and ecological impacts of GMOs, the matter of scale relates to ecological linkages and ecological impacts and not the initial area planted or the initial number of GMOs introduced since the GMOs and their transgenes can spread and multiply.

Environmental protection cannot be ensured on the basis of "beliefs" of adequate protection based on flimsy premises. Such protection has to be objectively ensured and that is the purpose of environmental laws.

If genes escape from genetically engineered (GE) crops, they can spread and multiply and lead to biopollution of the other crops and biodiversity. It is the clear absence of any containment measure in the release of transgenic plants through an open experiment in the field that poses serious ecological risks that be highlighted and prevented in the public interest.

The five meters distance is definitely not a safe and clear isolation either in the context of preventing genetic pollution through gene flow via pollination or preventing genetic pollution through the food chain.

The so-called buffer zone of 5 meters isolation distance is not a containment measure in any ecological sense for the trials of Bt cotton in India:

Firstly, it does not ensure containment by prevention of non-target species feeding on the plants, plant parts having an impact on soil ecology and soil organism and plant products being sold in the market.

Secondly, there is arbitrariness throughout the process of designing the scientific basis of the trials on the actual isolation distance required.

The determination of what would be a safe isolation distance for different genetically engineered crops should be made by independent ecological studies on different crops and their pollinators. The minimum isolation distance for GMO trials should be based on the isolation distance required to be maintained during seed breeding to maintain genetic purity of seeds.

According to the seed laws of the US pertaining to cotton to maintain genetic purity, a distance of 1920 ft. has to be maintained, this stipulation is further increased to 2640 ft. in hybrids and in the case of GMOs it is even higher i.e. above 3000 ft.

During the trials the isolation distance has been reduced to 5 meters "although seed certification norms have established 30 mts.". This arbitrary change in prescribed isolation distances for seed breeding has endangered the environment and violated the laws for preventing such risks.

The isolation distances would need to be higher than the isolation distances specified in seed certification laws since as mentioned earlier pollen transfer and crossing are not the same things.

The pollen flow from the transgenic Bt has not been contained because the so-called isolation distance used has been arbitrarily fixed and is totally inadequate to prevent pollen escape. It is important to point out that pollen carriage can be everywhere and anywhere. It does not have to always result in crossing between sexually compatible species. This fact is highlighted by the example of the killing of the Monarch butterfly from pollen dust from Bt corn depositing on milkweed on which the butterfly feeds.

Thirdly, since hybridisation and cross pollination increase from natural to hybrid, and hybrid to GMOs, the buffer zones for GMO trials need to be higher than isolation distances used for hybrid seed breeding. As Afzal and Khan observe "...the percentage of natural crossing was slightly higher in the case of American cottons as compared to local..." Further a paper in the scientific journal *Nature* records that transgenic plants are thirty times more promiscuous than conventional seed plants (Bergelson, et al, 1998).

Fourthly, even if the 5 meters was maintained, it is not an adequate safeguard. In such a situation the trial cannot be called "contained" as pollen can travel much further than 5 meters. A study by the National Pollen Research Unit in Scotland shows that the wind can carry viable pollen hundreds of kilometers in 24 hours. The study found that GM oilseed rape pollen had been carried three mile by bees and nearly 500 ms by air in 24 hours. The environment minister of UK, Mr. Micheal Meacher has admitted that the bees which may fly upto 9 kms in search of nectar can't be expected to observe a 'no fly zone', they even do not obey the 200 meters 'no fly zone' as currently required in UK regulations. Current trial plots where GM crops are grown have a buffer zone of 200 meters which is considered inadequate. As reported by Reuters World Report, BBC's News night programme on Wednesday, 29th September 1999 stated, that modified genes were found in pollen samples collected upto 4.5 kms from a field of GM oilseed rape in the Central England County of Oxfordshire. This was atleast 20 times over a limit set by the Labour Government of just 200 meters. Therefore, in the context of this evidence the MAHYCO calculations on gene flow are clearly totally inadequate. The 5 mts required by DBT, as isolation distance does not isolate the *Bt* trial field from its environment and other species.

Emergence of Pest Resistance

The engineering of the genes for the Bt toxin into plants implies that high dose toxin is expressed in every cell of every plant all the time. Long term exposure to Bt toxins promotes development of resistance in insect populations. This kind of exposure could lead to selection for resistance in all stages of the insect pest on all parts of the plant for the entire season.

For cotton, the emergence of Bt resistant strains of budworms and bollworms

poses a real risk once this historically effective pest control agent loses its effectiveness.

Further, since the Bt toxin in Bt Cotton is released in every cell and every part of the plant it has the impact of making pests resistant to the Bt and hence creating 'superpests', which will require more pesticide use instead of reducing pesticide use.

Insects were found to develop resistance rapidly to the transgenic plants with built-in biopesticide, when exposed to the toxin. This has been the problem with the Bt cotton crop at Texas.

The wide spread use of Bt containing crops could accelerate the development of insect pest resistance to Bt, which is used for organic pest control. Already eight species of insects have developed resistance to Bt toxins including diamond black moth, Indian meal moth, tobacco budworm, Colorado potato beetle and two species of mosquitoes (Altieri, 1998).

According to the industry the promise of transgenic crops inserted with Bt genes is the replacement of synthetic insecticides used to control the insect pests. Since most crops have a diversity of insect pests, insecticides will still have to be applied to control pests other than Lepidoptera not susceptible to the endotoxin expressed by the crop. On the other hand several Lepidopteran species have been reported to develop resistance to Bt toxin in both field and lab tests, suggesting that major resistance problems are likely to develop in Bt crops which through the continuous expression of the toxin create a strong selection pressure (Tabashnik, 1994).

Development of Antibiotic Resistance

The first test under the FDA's voluntary review system came in 1994, when the agency approved the Flavr Savr tomato, a fruit genetically altered to stay firm during shipping. It proved to be a flop in the market and did not get acceptance from the consumers.

At the same time, Monsanto developed a genetically modified soybean that could resist the company's best selling weedkiller—Roundup. The herbicide destroyed weeds but spared the genetically altered crop—reducing the need for weeding the crop while boosting Roundup sales.

Simarly, Ciba-Geigy, now part of Novartis, produced a corn with an insecticide from Bt bacteria built into every leaf and kernel to kill the European corn borer.

One concern about such products was that antibiotic resistance genes, now standard in genetically engineered plants, could be taken up by bacteria, creating antibiotic resistant microbes. While others believed that the widespread use of Bt crops might create superbugs—pests no longer susceptible to Bt insecticides.

Disruption of Food Chain

The potential of Bt toxins moving through food chains poses serious implications for natural biocontrol in agroecosystems.

Scientists apprehend that the tests carried out to assess safety of genetically modified crops "may be insufficient" for new crops in development. According to Dr Andrew Chesson of Aberdeen's internationally famous Rowett Research

Institute, "tampering with the genetic make-up of crops could produce new plant chemicals which may not be spotted by traditional checks".

Natural enemies could also be affected directly through inter-trophic level interactions. Evidence from studies conducted in Scotland suggest that aphids were capable of sequestering the toxin from Bt crops and transferring it to its coccinellid predators, in turn affecting reproduction and longevity of the beneficial beetles (Birch et al. 1997).

The entry in the food chains is multidirectional. It could be from the milch cattles who are fed on GM crops, like the crushed GM rape-seeds, and any dangerous chemicals could therefore enter the human food chain. GM foods are being forced into the food chain without adequate safety tests.

Social Resistance to Crop Genetic Engineering

There has been global rejection of genetically engineered foods.

In early September 2000, Greenpeace activists were acquitted from causing criminal damage to the standing G.M. crops in U.K. There are conflicts arising between European Union and the United States over the safety and the need for the genetically engineered agricultural products since 12 years. There is demand all over the Europe for segregating the genetically modifies crop and non-genetically modified crop supplies in the market. Small farmers who are engaged in organic farming are not accepting GE crops so as to avoid pollution from genetically modified seeds. Consumer response has led to decline in share price of companies dealing with GM crops. This has also led companies to further mergers to try strengthen their positions. (David Barling at Seed Tribunal, September 2000).

A farmer from USA who portrays a successful fight against genetically modified means of growing cotton. Will Allen's farm is named as Ganesh Farm. Initially starting with a small group of farmers with small land holdings, Will has managed to reach out to many farmers and persuaded them to take up organic means of cultivating cotton, in spite of the numerous odds faced, such as facing the aggressive marketing tactics of corporations and the difficulties in getting bank loans.

The rejection of GMOs by consumers world-wide is creating tremendous uncertainty and unpredictability for farmers growing GM crops. There is a visible changing trend clearly against genetically modified organisms, and chains of supermarkets worldwide are taking action to eliminate GM products, [Refer article on Brazil's Transgenic -Free Zone published in "Seedling", September, 99].

3,00,000 farmers of the family farm movement in California, United States protested against the National Organic Legislation of USDA for considering genetically modified food, irradiated foods as organic in nature and use of toxic sludge as bio-fertilisers (Dave Henson, October, 2000).

In another instance, consumers in US responded very angrily about mixing of genetically engineered maize in Taco Shell (as told by Debi Barker and Ellen Hickey, October, 2000).

That a growing consumer resistance against genetically engineered foods is gaining intensity is also evident from the instances given below :

- In April 1999, Unilever, Nestle and Cadbury announced that they were phasing out GM products in the face of customer resistance. Tesco and Co-op did the same, joining the other big supermarket chains.

- In August 1999, Edeka, German's largest retailer declared that it is completely abandoning GE. The headquarter in Hamburg announced that it does sell own-brand products containing GE ingredients. Other large German retailers to go GE free are Spar and Metro.
- In September 1999, Brake Bros., Britain's biggest distributor of frozen foods has eradicated GM ingredients from all its products, making it the first wholesale catering supplier to be totally GM-free. The group promises that all 2,000 food items it supplies to restaurants, hotels, schools and hospitals will be free of GM ingredients.
- Over the last year Holland's biggest retailer Albert Heijin has removed 100 food products that contained GMOs from its shelves.

The trend on acreage under GMOs during 1999 has clearly reversed with a premium being paid for non-GM crops. A recent poll of the *Farm Journal* showed, 22% farmers who has been planting GM crops in the US will reduce their planting of GM this year.

As reported in Business Week, October 18th 1999, page 50, a US farmer, namely Dave Boettger, like many others in his country, is having to pay for having cultivated genetically engineered crops. "ADM is offering 8 cents a bushel more for the old-fashioned corn Boettger grows than for the gene-spliced corn that accounts for one-half of his acreage. But if testing reveals a tiny amount of altered gene anywhere in his grain, he would have to pay ADM for the cost of dumping the entire load."

As reported in Independent, UK, by Paul Waugh on 4th August 1999 the Church of England has refused to allow the Government to use its land to conduct genetically modified crop trials. The decision has been prompted by the growing controversy over the morality and safety of the technology. Tim Cooper, Chairman of Christian Ecology Link, said, "The use of farm-scale trials is premature and dangerous. Research should only be done in a closed environment for the foreseeable future".

In Thailand, the Government has declared Agricultural Zones Free of Genetically Modified Organisms in a bid to promote exports. GMOs have turned into a major concern in several key markets of Thai Agricultural Products including the European Union and Japan.

The State of Rio Grande do Sul, one of the 27 states of Brazil, is known as the "granary" of Brazil, since it is the Brazil's largest seed producer. The state has declared itself a "transgenic free zone" from 1st January 1999. The local government of the State explains this: *to preserve the human health, the environment, the autonomy of the farmers to get seeds, and to increase the sale and production for natural and organic ways, to develop the economy in harmony with the environment (sustainable development).* [refer brochure *Rio Grande do Sul: A place without transgenics*]**.** As explained by the agricultural secretary, Jose Hermeto Hoffman, "We have a very clear objective and Monsanto has a very clear objective, so its like a war."

India too is benefiting from Japanese and South Korean markets for GM-free agricultural products. Speaking to *Business Line,* Mr.B.V.Mehta of Solvent Extractors Association for India, said that the development may provide the

much needed shot in the arm for Indian exports. "Almost two-third of our aggregate meal exports are to Asian destinations and the fact that they have grown wary of transgenic foods opens up an opportunity for our country." (refer News report in *Business Line,* September 13th 1999, *Market emerging for non-GMO foods*)

In Japan, the import of Soybeans has declined rapidly as food processing companies shift their purchases to Soybeans that have not been genetically modified. The Japanese Government has announced plans to require labeling of products made from GM crops beginning in April 2001. In August 99, Kirin, Japan's largest brewer and a leading biotech company, announced that it will stop using genetically modified (GM) corn to make beer by 2001, due to consumer concerns over the safety of bioengineered crops. Although beer is exempt from Japanese requirements for labeling of genetically altered food which take effect in April 2001, Kirin plans to switch to non-GM corn, saying it cannot ignore consumer doubts about the safety of such food.

Japan's third largest beer maker, Sapporo Breweries Ltd., announced that it too will stop using genetically modified (GM) corn to make beer.

Honda Trading Corp, a wholly owned unit of Japanese automaker Honda Motor Co. Ltd., said it will build a plant in Ohio for sorting and bagging soybeans free of genetically modified organisms with an annual handling capacity of 20,000 tonnes of soybeans. Honda Trading will contract with US farmers for production of non-GM soybeans.

Fuji Oil Co. Ltd., Japan's largest maker of soybean protein food products, has decided to stop using genetically modified soybeans by next April.

In March 99, two major grain processors ADM and A.E. Staley Mfg. Co. announced that they would not accept any varieties not approved for import into Europe. Later in the spring, ADM said it would pay a premium for DuPont's STS soybeans, which are not genetically modified.

In the US the American Corn Growers Association (ACGA) in an official press release dated 25th August 1999, has proposed the farmers explore the option of planting non-GMO crops in the light of uncertainty caused by GMOs. The Consolidated Grain and Barge Company in a letter to producers dated 26th August 99, has indicated that consignments containing GMO contamination 'no matter how trivial will not be eligible for premium prices, as GMO crops become increasingly unsaleable on International markets.

Europe's leading dry dog food producer, Royal Cannin, vowed on September 15, 1999 not to include genetically modified (GM) ingredients in any of its pet food lines. The decision by the Paris-based firm comes after British pet food producer Pascoe's Group Plc launched the country's first wholly organic, non-GM dog food line last month. It also comes amid a looming trade war as European consumers, concerned about the safety of foods derived from GM crops, reject genetically modified products many of that are imported from the United States.

> Polls have shown that more than 80% of the American consumers want genetic engineering foods labeled. The US government and industry argue that labeling is not necessary because genetic engineered foods are "substantially equivalent" to the foods they replace. This argument was fairly discredited by FDA scientists before the regulations governing genetic engineered foods for humans and animals foods were developed in 1989 to 1992.
>
> **Ms. Dena Hoff,** Chair of Northern Plains Resource Council, USA

India too has voiced its opposition to genetically engineered crops; the Union Agriculture Ministry has opposed a US proposal to bring trade in genetically engineered crops on the WTO agenda [News report dt 26.10.97 in the Observer].

In the first week of September 1999 US Agribusiness giant Archer Daniels Midland Co., alerted trading partners against biotechnology asking suppliers to keep Genetically Modified crops separate from conventional ones. In an official statement issued by ADM for distribution to grain elevators and large-scale producers, the company said "we encourage you as our supplier to segregate nongenetically enhanced crops to preserve their identity…. Some of our customers are requesting and making purchases based on the genetically origin of the crops used to manufacture their products. If we are unable to satisfy their requests, they do have alternative sources for their ingredients".

Genetic Manipulation Firms (e.g. Monsanto) are on top of the Ethical Investors' Blacklist. As reported in the *Scotsman* dated August 31, 1999, a survey of socially responsible investors by the Ethical investment Trust shows that concern about investing in business carrying out GM research among firms has gone from being a minor issue two years ago to investors' second biggest concern. The report follows the revelation that (Deutsche Bank) Europe's biggest bank, has advised leading investors to sell their shares in companies involved in the GM foods industry. Guy Hooker, the director of the Ethical Investment Co-operative's Edinburgh branch, said the explosion in awareness about genetically modified organisms (GMOs) and the call to avoid them has been staggering.

The most pertinent example of the growing rejection and eroding market of its products is that of the Terminator Technology. Monsanto had to withdraw its decision to commercialise its Terminator Technology because of worldwide resistance against it. This is the technology that triggers seed-sterility in crops thereby creating a biological lock against seed-saving and replanting. With its reputation to conceal, Monsanto has on various occasions claimed either that the technology does not exist, or that it is not yet in use in its commercialised lines. Today it has had to publicly announce suspension of its Terminator Technology in the light of widespread protests.

There is a complete absence of biosafety regulation on the large-scale spread of GMOs in the US. The United States has failed to sign and ratify the Convention on Biological Diversity and has undermined legally binding international Biosafety Protocol that was being evolved under the Convention. The United States has no regulation domestically to make safety tests mandatory. Monsanto is using the US administration to dismantle regulatory systems in all countries to be able to release its GMOs under totally unregulated conditions. Its functioning in India also indicates that it would like to bypass and dilute existing regulations to ensure reckless and careless commercialisation of GM crops that bring no benefit to Indian farmers but introduce new costs and environmental risks.

6. The Inadequacies of Present Biosafety Regulations

The clearance of Monsanto's trials with toxic plants without the democratic consent of concerned governments, from state to local level and democratic

participation of the public in biosafety decisions reveals the loopholes and inadequacies in the present Biosafety regulations both from the democratic perspective and the ecological perspective. The trial produce has been freely marketed without adhering to any containment process.

Thus in the wake of above events biosafety regulations need to undergo dramatic changes through increasing public participation in decisions related to genetic engineering.

The clearance for trials of genetically engineered crops and their release needs to be given not just by the central government but by all levels of government, from the state to the local level. Further before any clearance is granted for trials of a particular genetically engineered crop the application for trials should be notified to the public as part of the citizen's right to know. Public hearings need to be organised in the specific villages and districts and states where the trials and introductions are planned.

The scientific framework of the ecological impact of genetically engineered crops on biosafety, ecosystem health and public health also needs to be upgraded for dealing with the impact of field trials and deliberate releases under diverse ecological contexts existing in India.

If Monsanto and the Indian government fail to fulfil these ecological and democratic criteria for field trials of genetically engineered crops, we will have further evidence that the promotion of genetic engineering by corporations like Monsanto can only be based on dictatorial, distorted and coercive methods. In such context, genetic engineering in agriculture must necessarily be anti-nature and anti-people.

The Need for Strong Biosafety Regulations

The Monsanto trials with genetically engineered crops have clearly shown that there are many gaps and many weaknesses in the regulation of genetically engineered (G E) crops and there is an urgent need for strengthening the biosafety regulations in India.

The Regulatory Anarchy in Genetic Engineering

The trials have shown that under the present regulations it is possible for a company to perform G E trials secretly without prior informed consent of either the state government or the local community or Gram Sabha. The Agriculture Minister of Karnataka, Shri Byre Gowda, was informed about the trials in his state through the newspapers. The Agriculture Minister of Andhra Pradesh said that the Department of Biotechnology had given the clearance for trials to MAHYCO without informing the state government. The fact that it was MAHYCO which got the clearance but Monsanto which carried the trials out shows how much anarchy exists in approval for G E experiments and commercialisation.

The approval of trials should include prior informed and also prior informed consent of state governments or local communities or Gram Sabhas. The states should be included because agriculture is a state subject. People should be included because decentralised democracy and Panchayati Raj are commitments, which have been made through the Constitution. The present regulations have no respect for the decentralised democracy required by Panchayati Raj. Nor do they have any room for public participation in decisions about genetic

engineering either at the experimental stage or at the commercialisation stage. These lacunae must be filled to ensure democratic participation and decision making.

The anarchy, chaos and confusion in the regulatory system needs to be stopped. This requires that all trials are stopped till Biosafety Regulation is made strong, coherent, scientifically sound and transparent through public participation.

Corporations as "physician, diagnostician and patient - all in one": The Need for Public Monitoring of Private Corporations

The Monsanto trials have also revealed that the corporations pushing genetically engineered crops are simultaneously the judge and the accused.

When Trade Related Intellectual Property Rights (TRIPs) Agreement of WTO was signed, a Monsanto representative had claimed that Monsanto with other corporations had shaped and designed the agreement. As they stated, "We were the physician, the diagnostician, the patient - all in one". In the area of Biosafety too, Monsanto seems to be functioning as the diagnostician, physician and patient - all in one.

They are the source of information on biosafety, they carry out the trials without government and public monitoring and they themselves declare their activities as safe and causing no risks.

The information on risks and status of the GMO are provided to GEAC by the company, not the Government, ensuring that biosafety information is biased, not neutral.

The Andhra Pradesh Government's order to Mahyco-Monsanto to stop trials and to only carry them out in the Research stations of Shri N.G. Ranga Agricultural University under the direct supervision of government scientists is a precedence that should be applied nation wide. Genuine biosafety requires that experiments with GMOs prior to commercialisation be carried out in the public system and not by the private firm that stands to gain through commercialisation and has nothing to lose if there is "genetic pollution" and risks posed to the environment and public health.

The public system science and technology capacity in India is high, and our scientists have better knowledge of plants and ecosystems than Monsanto's scientists or narrowly trained biotechnologists whose expertise is restricted to petridishes and does not cover ecological and ecosystem expertise. Public scientists with ecological expertise will therefore do a much more comprehensive job of assessing the ecological risks of transgenic crops than corporate scientists with biotechnology expertise. This will also ensure better monitoring and control over the trials.

In addition to experiments being carried out in public system institutes, public participation in the monitoring of trials is also essential.

Scientifically Fraudulent Assumptions of "Substantial Equivalence" and the Undermining of Biosafety

The entire genetic engineering guidelines is based on the false assumption that GMOs behave like their naturally occurring counterparts. The guidelines are also based on the totally incorrect assumption that "G E organisms have greater

predictability compared to species evolved by traditional techniques". Neither of these assumptions is true. GMOs do not behave like their naturally occurring counterparts and the behaviour of GMOs is highly unpredictable and unstable.

Naturally occurring *Klepsiella planticola* does not kill plants, but as research at the University of Oregon has shown, the genetically engineered Klepsiella was lethal to crops (Report of the Independent Group, 1996).

The naturally occurring *Bacillus thuringiensis* (Bt) has not contributed to the evolution of resistance in pests, but the genetically engineered Bt. crops create rapid resistance evolution because the Bt. toxin is expressed in *every* cell of the plant, *all* the time (Shiva, 1998). The assumption of "substantial equivalence" does not hold, and the absence of strong biosafety regulation is undermined because of this false assumption of substantial equivalence.

The assumption of "predictability" is also totally false. While genetic engineering makes the *identification* of the gene to be transferred into another organism more predictable, the ecological *behavior* of the transferred gene in the host genome is totally unpredictable. A transgenic yeast engineered for increased rate of fermentation with multiple copies of one of its own genes, which resulted in the accumulation of the metabolite, mythylglyoxal, at toxic mutagenic levels. Intransgenic tobacco, 64 to 92 per cent of the first generation of transgenic plants become unstable. Petunias do not have unstable colouring, but genetically engineered petunias changed their colour unpredictability due to "gene silencing" (Report of Independent Group of Scientific & Legal Experts on Biosafety, 1996).

Monsanto's Round up Ready Cotton engineered to resist Monsanto's herbicide Round up, had its bolls falling off, an instability which does not occur in the naturally occurring cotton and was induced unpredictability due to genetic engineering of herbicide resistance. Monsanto has been sued for millions of dollars because of the losses incurred by farmers.

GMOs do *not* have greater predictability compared to species evolved through traditional techniques. Since the very assumptions underlying our genetic engineering guidelines are false, we need to evolve new Biosafety Regulations on the basis of honest and good science, after assessing all the independent scientific evidence available across the world. Guidelines based on anti-democratic structures and unscientific assumptions provide no safeguards for the public or the environment. Strong biosafety regulation with strong public participation is both a democratic and an ecological imperative. The public and the government needs to act immediately to prevent private corporations from unleashing, irreversible genetic pollution through the release of GE organisms in the agriculture and the environment.

- A ten year moratorium should be introduced on all commercialisation of genetically engineered crops both through imports and through seed production and distribution in India while full and adequate ecological and regulatory frameworks for assessing the ecological impact of genetically engineered crops and public participation is evolved.
- The regulatory framework for genetic engineering is not just inadequate in India. It is inadequate worldwide. In the U.S., trials for such crops do not have any ecological dimensions. They only assess agronomic

performance. The data from the hundreds of U.S. trials is basically "non-data from non-trials" in the ecological context.

- The large scale seed failure pushing farmers to suicides create the need for strict certification and liability for the commercial seed sector. This issue of liability becomes urgent in the context of genetically engineered seeds which in addition to normal risks of seed failure have the potential of leading to genetic pollution and high ecological risks.
- The farmers' seed supply and direct exchange network must be strengthened through community control and local participation. Farmer's seed supply system must be treated totally distinct from the commercial seed supply system. While the commercial private seed supply system needs strong state regulation, farmer seed supply should function free of state interference with strong community control and public participation.

Biotechnology and genetic engineering in agriculture is evolving in a total regulatory vacuum as it is clear from the U.S. situation. Monsanto itself states, "Monsanto should not have to vouchsafe the safety of biotech food,". "Our interest is in selling as much of it as possible. Assuring its safety is the F.D.A's job". FDA does not look at the safety of Bt. crops since such crops are treated as a pesticide. EPA which is supposed to look at safety of pesticides treats genetically engineered crops which produce pesticide as conventional crops and hence does not look at the safety either. There is, therefore, no agency guaranteeing the safety of genetically engineered crops. It is to fill this policy vacuum for environmental safeguards that citizens worldwide are calling for a five year moratorium on genetic engineering in agriculture.

7. Illegal Spread of Bt cotton from Illegal Trials in India

Bt. cotton illegal planting in Gujarat without any clearance from Genetic Engineering Approval Committee (GEAC) once again highlighted the lack of biosafety infrastructure in India. More than 10,000 hectares planted with "Navbharat 151" cotton in Gujarat has been tested by GEAC and found to contain the Bt. gene.

Gujarat is an important cotton-growing region in India. In 2001, in spite of good rainfall and good cotton crop growth, an epidemic of bollworm devastated the cotton crop throughout the state. The pest menace was so acute that even the seed producers were compelled to discontinue their hybrid cottonseed production programmes. The continuous and heavy spraying of pesticides did not save the crop. However, one cotton variety, Navbharat-151 was observed to be completely free from bollworm damage. This variety had been planted over a sizable area across the Gujarat State during current monsoon season, with the company (Navbharat Seeds Pvt. Ltd.) having sold 10,000 packets (each packet contain 450 grams for an acre) during the season.

The Navbharat 151 was suspected by the other private seed companies dealing in cottonseed to be a transgenic product containing the Bt. gene, which provides protection against bollworm. It was also found that the company has been selling Navbharat-151 since last 2-3 years and that many farmers have raised cotton crop using open pollinated (OP) seeds collected from the variety

grown in the previous season. Several seed companies of Gujarat in a joint memorandum to the Department of Biotechnology, Government of India, appealed to take immediate action to stop the cultivation of Navbharat 151 because its OP seeds would spread at a faster rate in a larger area not only in Gujarat State but also other cotton growing regions of the country. According to them, the spread of unauthenticated and illegal seeds carried serious risks and would have grave consequences for Indian farmers and Indian agriculture as a whole, if found to have Bt. gene. The appeal was meant to enforce strict biosafety rules to check the bio-pollution.

Biosafety means minimizing the risks to environment and human health from the handling and transfer of Genetically Modified Organisms (GMOs). The biosafety regulatory framework in India consists of the 1989 Rules issued by the Minister of Environment and Forests under the Environment (Protection) Act, 1986. As per these Rules, Review Committee on Genetic Manipulation (RCGM) established under the Department of Biotechnology oversees only research activities. However, approvals for large-scale releases and commercialization of GMOs are to be given by the Genetic Engineering Approval Committee (GEAC), established under the Ministry of Environment and Forests, Government of India.

Acting on the request of private seed companies and newspaper reports about marketing of transgenic Bt. cotton seeds (Navbharat-151) as conventional hybrid seeds by the Navbharat Seeds Pvt. Ltd. of Ahmedabad, without the mandatory approval of the GEAC, the Ministry immediately sent a notice to the company seeking explanation. The Ministry also procured a packet of the seeds marketed by the company (Label No. 002948 dated 30.3.2001, Lot no. JAN-01-06-OOF-028) and had it tested at the South Campus of the University of Delhi, for the presence of Cry 1A© gene (a patented product of Monsanto Inc. and therefore their intellectual property). The seeds tested positive, indicating that they are genetically engineered. Dr. E. A. Siddiq, Chairman of an Indian Department of Biotechnology Committee, that monitors transgenic crops, said that, "this is a foretaste of a frightening situation where transgenic will be out of control and all over the place", thus highlighting huge loopholes in the regulation regarding seed distribution and safety issues related to transgenic crops.

The Environment Ministry also sent a two-member team comprising of Dr. C.D. Mayee, Director, Central Institute of Cotton Research, Nagpur and Dr. T.V. Ramanaiah of the Department of Biotechnology, New Delhi, for on-the spot inspection of the fields near Ahmedabad. They conducted Gene Check and ELISA tests on the samples collected from these fields. Their observations and the test reports conclusively indicated that the 'Navbharat-151' is transgenic cotton containing Cry 1A© gene. The Navbharat Seeds Company had not obtained any approval for developing this Bt. hybrid. The environmental impact of this transgenic crop has also not been studied and tested. Thus the M/s Navbharat Seeds Pvt. Ltd., violated the provisions of the 1989 Rules notified under the Environment (Protection) Act (EPA), 1986. In accordance with the Rules for Manufacture, Use, Import, Export and storage of hazardous microorganisms/ Genetically Engineered Organisms or Cells, 1989, under the EPA, no person can import, export, transport, manufacture, process, use or sell

any genetically engineered organisms without the approval of Genetic Engineering Approval Committee (GEAC). The Principal Secretary, Forests and Environment, Government of Gujarat informed the GEAC that nearly 11,000 acres in Gujarat is under cultivation of Navbharat-151. Meantime it was brought to the notice of the GEAC that Navbharat Company is engaged in the seed production of Navbharat 151 under the name of *Jay, Vijay* and *Digvijay* in Andhra Pradesh.

The Ministry of Environment & Forests convened a meeting of GEAC on 18th October 2001 and decided to immediate intervention to "prevent damage to the environment, nature or health as a result of the standing crop of Navbharat 151". On the same day GEAC issued an order to uproot the standing crop of "Navbharat 151" and destroy it by burning and also to destroy the seed production plots and seeds harvested. The order also included to 'remove and destroy the breeding lines, hybrids, segregating material including any plucked cotton bolls or any breeding material and seed material available with the company'.

However, this order was later changed (on 31st October 2001) to procure the cotton which has already reached the market, destroy the seeds and store the lint; the Gujarat Government would also procure the cotton from the remaining standing crop of "Navbharat 151" in the farmers' fields and also from farmers' storage places, and that this procured cotton would be ginned for separation of lint and seed, the seeds will be destroyed and separated seeds would be kept under safe custody till further orders from GEAC; that the state government would ensure uprooting and complete destruction of the cop residue by uprooting, burning and sanitation of the fields. The state government of Gujarat was also directed to take necessary steps to prevent the use of Navbharat 151 seeds by the farmers either in the F^1 or F^2 generations.

In addition, the GEAC directed the government of Andhra Pradesh to "take necessary action for stopping immediately the seed production and multiplication programme of the Navbharat 151, or by whatever name it is called, in the Kurnool and Mehboob Nagar districts of Andhra Pradesh as has been confirmed by the reports".

Navbharat Seeds Pvt. Ltd. challenged the GEAC Order of 18th October 2001 in the Delhi High Court on 24th October 2001 in the case *Navbharat Seeds Pvt. Ltd. Vs Union of India & others.*

The company has basically argued that it has engaged in conventional crop breeding research since 1983. That the Navbharat-151 cotton variety is an *intra hirsutum* hybrid and it was developed by using conventional plant breeding method and has not carried out genetic engineering methods to produce seeds; that it is a very small company and has no such facility of genetic engineering research; and that it has basically produced a hybrid from cotton plants collected from Maharashtra, selected superior hybrids and then registered the hybrid "Navbharat 151" with the Department of Agriculture, Government of Gujarat, and marketed it for the last two years. In the year 1999-2000, 1371 kilograms of "Navbharat 151" seeds were produced while in 2000-2001 it was 5817.50 kgs. In the year 2000, the 2437 packets of "Navbharat 151" were sold while in the year 2001, 11820 packets of "Navbharat 151" were sold.

It is thus evident that the source of the Bt. in the "Navbharat 151" hybrid has come from either the open field trials undertaken by Monsanto-MAHYCO or by cross-pollination from their trials with other cotton varieties. In either case Monsanto and MAHYCO are the source of the genetic pollution that has now entered the commercial seed supply through hybridization, either intentionally or through natural processes. Incidentally, Dr. D. B. Desai, the Managing Director of the Navbharat Company is a former employee of MAHYCO.

Bt trials: illegal seed production under the guise of research

The large-scale illegal commercialization of Bt. cotton in Gujarat is therefore clearly linked to Monsanto-MAHYCO trials.

On 10th March 1995, MAHYCO, a collaborator with Monsanto, imported 100 grams of the Bt. cottonseed after obtaining permission from Review Committee of Genetic Manipulation (RCGM) under the Department of Biotechnology, and not from the GEAC, which, under the Environment (Protection) Act 1986, is the only body that can grant permission for importing genetically engineered substances (seeds in the present case). Therefore the import of Bt. gene into India was illegal.

In 1998 the large scale, multicentric, open field trials by Monsanto-MAHYCO began in 40 acres at 40 locations spread over nine states. These field trials were also started without the permission from GEAC even though it is the sole agency to grant permission for large-scale open field trials of GMO's under the 1989 Rules.

While genetically engineering trials are supposed to involve the destruction by burning of all vegetative parts and leftover seeds, the Bt. cotton trials of Monsanto-MAHYCO have systematically multiplied seeds.

The companies did not ensure post harvest management and safety. Many of the farmers who had participated in the trials sold their genetically engineered cotton in the open markets. In addition, some of the farmers replanted their trial fields with crops like wheat, turmeric, groundnut etc., in total violation of Para-9 on "Post harvest handling of the transgenic plants" of the Biosafety Guidelines, 1994.

The isolation distance maintained were insufficient. Trials there were several fields of conventional cotton at a distance of 10-15 meters from Bt crops at trials sites and this short distance can lead to genetic contamination of the neighbouring cotton crops. However there is no coherence among the monitoring agencies on the maximum distance to which Bt. pollen can fly. According to DBT, the gene flow in Bt cotton is two metres while MAHYCO-Monsanto says that it is 15 metres. However US Department of Agriculture says that it is three miles.

Moreover, no measures for containment to prevent grazing of animals or picking by others were followed.

Again, the planting with Bt seed in the trials was delayed; delayed planting of any cotton reduces the risk of bollworm attacks, and thus the efficacy of Bt is yet to be proven.

The illegal trials carried out for the past five years by Monsanto-MAHYCO thus became an underhand means for seed multiplication and it is this illegally

multiplied seed that has now spread to large areas in Gujarat. It was this kind of violation of laws and Rules, as well as the risks of genetic pollution that forced Research Foundation for Science, Technology and Ecology (RFSTE) in 1999 to take Monsanto and MAHYCO to court. Monsanto Bt. cotton has not yet been cleared for biosafety and commercial release in India.

Ironically, in spite of the fact that a Supreme Court case challenging the 1998 field trials is ongoing and that there were numerous irregularities and violations of biosafety laws and guidelines in previous year field trials, the hitherto-ignored GEAC has not merely given Monsanto-MAHYCO permission in July 2000 to undertake large scale field trials of Bt. cotton in 85 hectares, but also permission to produce seed production in 150 hectares, making it very clear that the motive is commercialization rather than actual research or biosafety concerns.

Interestingly, the GEAC was not satisfied with the results of the trials and it withheld environmental clearance for large-scale cultivation of transgenic Bt. cotton. Instead, it called for fresh large-scale field trials under the direct supervision of the Indian Council of Agricultural Research under their Advanced Varietal Trials of the All India Co-ordinated Cotton Improvement Project. GEAC also sought comprehensive data from the field trials that would be conducted in multi-locations under different agro-climatic conditions.

Even in its submission in the Gujarat case, the GEAC has admitted that Bt. cotton poses major risks. It says:

(i) The crop, which is standing, may pass to the soil that modified genes which it contains. The effect on soil microorganisms can not be estimated and may cause an irreversible change in the environment structure of the soil. It is a standard practice to uproot crops which pose such a threat. The destruction by burning is to ensure safety to environment and human health and to obviate any possibility of cross-pollination.

(ii) The destruction of the cotton produce as well as seeds harvested from this plant is also equally necessary. The cotton which has been produced is genetically modified cotton, the effect of which i.e. allergenicity and other factors on mammals are not tested. The precautionary principles would require that no product, the effect of which is unknown be put into the market stream. This cotton which in appearance is no different from any other cotton will intermingle with ordinary cotton and it will become impossible to contain its adverse affect. The only remedy is to destroy the cotton as well as the seeds produced and harvested in this manner.

(iii) Since the farmers are being put to a loss, the further process to determine the compensation payable to farmers, who have unwittingly used this product has to be determined and undertaken.

13. I would respectfully submit that every day of delay in this matter poses a threat to the environment."

This submission clearly points out the enormity of the environmental damage that had been done by the illegal planting of transgenic cotton. It also indicates the practical difficulty of containing this damage, which is impossible to reverse. Even if the sale of the Bt cotton is banned in future years, it will

continue to be cultivated in fields as many farmers have saved the GE cotton F^1 seeds for planting in coming years. Even this year many farmers used F^1 and F^2 seeds of the Navbharat 151 in Gujarat. It is believed that the Open Pollinated (OP) seeds would spread at a faster rate in a larger area not only in Gujarat but also other cotton growing regions of the country, especially because of the high cost of branded seeds which poor Indian farmers cannot afford. This, in fact, was the primary motivation behind farmers paying three times the current rate for cotton to buy Navbharat 151 Produce so that they would use its F^1 seeds for next season. Many farmers and local dealers have also reserved the cotton fields planted with Navbharat 151 and even its second-generation OP crops to collect seed for sale in the ensuing season.

The impact of GE cotton goes much beyond the immediate environment to potentially affect human and animal health because in several Indian states, where trials were undertaken, cottonseed oil is the primary edible oil and the seed cake is used for animal feed.

Transgenic Bt. crops: the biological trap for farmers

In Gujarat this year, some farmers got good yield from Bt. cotton, and also did not spend too much on chemical pesticides. However, this is primarily because Bt. is not Commercialized in the country; and hence resistance to it has yet to build up. Experience with Bt. crops from around the world shows a quick buildup of resistance, which has become a main concern in the US and Canada, and has now been detected even in China. Farmers have to spray pesticide to control third and fourth generation of American bollworm insects. In Australia too, farmers have now been advised to go in for more sprays because of a drop in expression levels. With the insect increasingly developing immunity against the Bt toxin in the plant, GE seed companies are now suggesting farmers to adopt refuge method that is now reported to be fifty percent of the transgenic field.

Moreover, Bt cotton is designed to be resistant only to cotton bollworm (*Helicoverpa armigera*) while the cotton crop in India is faced with a complexity of pest attacks. Pests such as whitefly and Pink bollworm have emerged as major pests in the last few years with crop losses being as high as those caused by the bollworm. According to N.P Agnihotri, cotton bollworm led to a 50-60 percent loss in cotton crop, while the whitefly showed an equally significant share of crop losses, in the range of 53-80 percent. (*Pesticide Safety Evaluation and Monitoring*, Indian Agricultural Institute, New Delhi, 1999, p. 10.)

Consequences such as these can severely threaten to jeopardise other ecologically sound methods of pest control and eventually prove devastating to the farmers. Farmers have been forced to apply all kinds of pesticide cocktails to control pest infestation. As seen in Andhra Pradesh, when these costly chemicals fail, thousands of farmers are forced to commit suicides.

Genetically Engineered Bt. is more like a biological trap, more potent than the toxin it produces that kills the American bollworm. The 'chemical treadmill' is now being replaced with a more dangerous 'biological treadmill'.

In India, Monsanto's Bt. cotton is the only cotton variety which has Bt. gene in it. Monsanto, in fact, has the patent on the Bt. gene. Strangely this biotech giant, which has been suing farmers, whose fields were contaminated by the

gene through processes of nature, for theft, has not yet raised any voice against the infringement of their patent by Navbharat Company. This clearly indicates the possibility that the whole episode of Bt. cotton in Gujarat is a calculated move to hasten the commercialization of transgenic crops in the country, especially those with Bt. genes in them.

The Bt cotton has not yet been procured by the Gujarat government from the farmers citing funds constraint. It is in these circumstances that no further trials of GE crops should be allowed in India till the time comprehensive and foolproof biosafety regulations is put in place which ensures that there is now genetic pollution of any kind and further that if any such genetic pollution occurs the biosafety infrastructure is in place to effectively contain it.

The Bt. cotton case in India reaffirms RFSTE's stand of safety first - commercial release of Bt. cotton or any other genetically engineered organisms should be frozen till biosafety structure are put in place and capacity is built at the multiple level of governments as well as farmers to deal with biosafety issues.

Almost all the national farmer unions in India supported this stand and also issued a resolution in this effect. In a resolution adopted on 1st November 2001, the major farmer organisations in India i.e. Akhil Bharatiya Kisan Sabha (Ashoka Road), All India Kisan Sabha (Ajay Bhawan), Bhartiya Krishak Samaj, Bharatiya Kisan Sangh, All India Agriculture Workers Union, Agragami Kisan Sabha, Bhartiya Khet Mazdoor Union, Bhartiya Kisan Union (Ambavat), Samyukta Kisan Sabha and Navdanya declared:

> The Government of India and respective State Governments should buy and destroy the cotton and cotton seeds suspected to be genetically engineered Bt. seed especially in Gujarat and other states.
>
> The Government should compel Monsanto to pay full compensation to the affected farmers since the Monsanto owns the Bt. gene which has spread because of Monsanto's illegal trials and illegal seed multiplication. They are therefore fully liable for the damage caused to Gujarat farmers.
>
> The illegal spread of Bt. cotton reflects the Government failure to regulate and ensure biosafety. The agencies and officials of various Ministries involved should be held accountable for the lapses that have occurred.
>
> In any litigation involving MNC's and farmers and agriculture labourers, the Government must bear the expenses incurred by them in fighting cases to their conclusion in the defense of rights of agriculture workers and farmers rights.
>
> We have resolved that both the Government of India and the Multinational Company, Monsanto, be held responsible for illegally testing Bt. cotton seed and not preventing its illegal dissemination.
>
> We are unanimous in declaring that we are not opposed to scientific advance in agriculture but are totally opposed to the manner in which profit-oriented organisations are allowed to deal with safety provisions in an irresponsible and unchecked manner, greatly increasing the danger to the lives and livelihood of the vast majority of the Indian people.

The illegal spread of genetically engineered seeds in Gujarat also highlights the failure on the government to check the operation of seed companies in India. Since the seed sector was liberalized and MNC's were allowed entry into Indian agriculture as a result of World Bank and WTO driven globalization policies, seed corporations are playing havoc with seed supply and threatening farmers' ecological and economic security.

Already, freedom of seed corporations to make false promises and sell high cost, untested and uncertified seeds under the label of "truthful seeds" has led to large-scale seed and crop failure, pushing thousands of farmers into debt and suicides. Gujarat is the latest example of corporate irresponsibility and the violation of farmers' rights to safe seeds and freedom from risks. The government therefore needs to regulate the seed industry, put all new seeds through two years of coordinated trials, and certify and label seeds according to the method of production and recommendation for appropriate agro-climatic regions.

This corporate crime is a crime against Indian farmers and a threat to India's biodiversity, which provides the ecological and economic security to Indian agriculture.

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CHAPTER III

Seeds of Suicide

The Ecological & Human Costs of Globalisation of Agriculture

Introduction

Seeds of Suicide study take stock of the impact of a decade of trade liberalisation that has impacted the lives and livelihood of farmers and transformed them into negative economies through propagating non-sustainable agriculture practices. Across the country farmers are taking the desperate step of ending their life because of the new pressures building upon them as a result of globalisation and corporate take over of seed supply leading to spread of capital intensive agriculture. The lure of huge profits linked with clever advertising strategies evolved by the seeds and chemical industries and easy credit for purchase of costly inputs is forcing farmers into a chemical treadmill and a debt trap. The reality of globalisation is different from the corporate propaganda and from the promises of trade liberalisation and agriculture offered by the World Bank, the WTO and experts and economists sitting in our various ministries.

The impacts of trade liberalisation and globalisation have been felt in each and every state with the states of Andhra Pradesh, Karnataka, Maharashtra and Punjab bearing the maximum burden in terms of the high social and ecological costs in terms of farmers paying for globalisation by being forced to sacrifice their lives and livelihoods. In what follows we present the scenarios from these states on the status of farmers suicides, since December 1997 when farmers suicides first acquired epidemic proportions, the Research Foundation for Science, Technology and Ecology has been continuously monitoring and analysing the causes of farmers suicides.

The epidemic of farmers' suicide is the real barometer of the stress under which Indian agriculture and Indian farmers have been put by globalisation of agriculture. Growing indebtedness and increasing crop failure are the main reasons that the farmers have committed suicide across the length and breath of rural India. Indebtedness and crop failure are also inevitable outcomes of the corporate model of industrial agriculture being introduced in India through globalisation. Agriculture driven by MNC's is capital intensive and creates heavy debt for purchase of costly inputs such as seeds and agri-chemicals. It is also ecologically vulnerable since it is based on monoculture of introduced varieties and on non-sustainable practices of chemically intensive farming.

The suicides by farmers highlights these high social and ecological costs of the globalisation of non-sustainable agriculture which are not restricted to the cotton growing areas of these states but have been experienced in all

commercially grown and chemically farmed crop in all regions. While the benefits of globalisation go to the seeds and chemical corporation through expanding markets, the cost and risks are exclusively born by the small farmers and landless peasants.

The two most significant ways through which the risks of crop failures have been increased by globalisation are the introduction of ecologically vulnerable hybrid seeds and the increased dependence on agri-chemical input such as pesticide, which are necessary to be used with pest prone hybrids.

The privatisation of the seed sector under trade liberalisation has led to a shift in cropping patterns from polyculture to monoculture and a shift from open pollinated varieties to hybrids. In the district of Warangal in Andhra Pradesh, this shift has been very rapid, converting Warangal from a mixed farming system based on millets, pulses and oilseeds to a monoculture of hybrid cotton.

The problem of pests is a problem created by erosion of diversity in crops and cropping patterns and the introduction of commercial hybrid seeds. The most sustainable solution for pest control is rejuvenating biodiversity in agriculture. Non-sustainable pest control strategies offer chemical or genetic fixes while reducing diversity, which is the biggest insurance against pest damage.

As the cotton disaster shows, the globalisation of agriculture is threatening both the environment and the survival of farmers. Biodiversity is being destroyed, the use of agri-chemicals is increasing, ecological vulnerability is increasing and farmer debts are sky rocketing leading to suicides in extreme cases.

1. The Andhra Pradesh Scenario of Farmers' Suicides

From Mixed Farming to Monocultures: The Lure of "White Gold"

More than 16,000 farmers have committed suicide in Andhra Pradesh alone from 1995 to 1997 (Observer, 8th June 1999). Taking into consideration the large number of suicides during 1998 and 1999 it is possible that by early 2001 the farmers' suicides will across nearly 20,000 in Andhra Pradesh itself.

Cotton cultivation has been taken up in areas, which were not traditionally cotton growing areas. One such region is Warangal district in A P, which has switched over from predominantly food crops to cotton, which is relatively a new crop, brought under trade liberalisation. The area under cotton in this region grew over three times in a decade's time.

In Warangal, over three decades (between 60s to 80s) the total acreage under cotton crop was negligible. According to the available data, in 1986-87 the total area under cotton cultivation was 32792 hectares (or 81980 acres) which increased to 100,646 hectares (or 2,51,615 acres) in 1996-97, which is nearly three times. The cotton cultivation has basically replaced the jawar crop. The area under jawar in 1986-87 was 77884 hectares, which went down to 27306 hectares in 1996-97. The acreage under the traditional paddy has also shrunk. The land under bajra (millet) has also decreased in the last ten years. In 1986-87, total land under bajra was 11289 hectares which has drastically reduced to just 400 hectares in 1996-97.

The acreage under cotton increased because the farmers in Warangal were getting a good return on cotton. But 1997-98 turned out to be different. There

was a heavy damage to the cotton crop in this season due to several reasons. The most important reasons for the crop failure were bad weather and a severe pest attack. There was drought in June-July, which is the main sowing season for cotton. Due to the drought condition only 15% paddy could be planted. In Oct - Nov the rain came during the cotton boll-bursting season. The untimely rain also affected the paddy because it was in the maturity period. The cloudy weather, untimely rain and lack of winter in Nov-Dec led to the emergence of pests.

In 1997 the pests first emerged in the chilli fields and the weather helped them to multiply. The pests attacked all the crops, which were in the field e.g. chilli, cotton, red gram etc; the yield thus fell down heavily. Since several sprays of chemicals had already been made by that time, they had no effect on the pests. The more the chemicals failed, the more they were used. The panic created by the pests led to heavy dosage of pesticides sprayed at frequent intervals in the cotton fields.

The focus of cotton failure has been on the excessive use of pesticides or of spurious pesticides. However, pesticide use is intimately linked to hybrid seeds. Pesticides become necessary when crop varieties and cropping patterns are vulnerable to pest attacks. Hybrid seeds offer a promise of higher yields, but they also have higher risks of crop failure since they are more prone to pest and disease attack as illustrated by the Andhra Pradesh experience. Monocultures further increase the vulnerability to pest attacks since the same crop of the same variety planted over large areas year after year encourages pest build-ups.

G. Mahendar of Mulkaligud village in Warangal District bought Excel cotton seed last year, after being lured by company's advertising propaganda. The company dealers took two jeep-loads of farmers to the trial fields of Excel cotton everyday and informed them that the variety yield 18 quintals per acre. Farmers in Mulkaligud and neighboring village planted 35,000 acres of land with the variety. The crop did not perform well; the plant shed the bolls it developed.
The farmers complained to the dealer in their area and demanded compensation, following which many company officials visited the farmer households and conducted elaborate surveys. However, so far no compensation has been paid to the farmers. Instead the dealer threatened that he will close the shop in their area and open a new shop in some other area.

TABLE 3.1

Statement Showing the crop wise normal areas and area sown in Warangal districts

(Area in Hectares)

	1985-86			*1986-87*			*1987-88*			
Crops	*Kharif*	*Rabi*	*Total*	*Kharif*	*Rabi*	*Total*	*Kharif*	*Rabi*	*Total*	*hect.*
1. Rice	104514	11731	116245	104182	17083	121265	129127	37244	166371	″
2. Jowar	32982	53640	86622	34071	43813	77884	38383	57602	95985	″
3. Bajra	14310	11	14321	11280	9	11289	9330	—	9330	″
4. Maize	19326	9179	28505	26803	8736	35539	23455	9743	33198	″
5. Green gram	75455	—	75455	76783	—	76783	85898	—	85898	″
6. Red gram	7073	102	7175	2485	—	2485	2634	—	2634	″
7. Ground nut	25911	30710	56631	33481	31252	64733	30818	47396	78214	″
8. Sesamum	20717	303	21020	19744	367	20111	23599	410	24009	″
9. Castor	8183	326	8509	9971	140	10111	12385	180	12565	″
10. Sunflower	—	—	—	—	—	—	—	—	—	″
11. Chillies	8502	7476	15738	15119	7228	22347	6371	7360	13731	″
12. Cotton	—	—	—	31540	1252	32792	32823	—	32823	″
13. Tobacco	229	870	1079	—	—	—	562	—	562	″
14. Turmeric	—	—	—	—	—	—	—	—	—	″

Crops	1988-89 Kharif	1988-89 Rabi	1988-89 Total	1989-90 Kharif	1989-90 Rabi	1989-90 Total	1990-91 Kharif	1990-91 Rabi	1990-91 Total	hect.
1. Rice	135255	43713	180968	140660	43941	184601	137323	48366	185689	〃
2. Jowar	20653	30857	51510	18973	24771	43744	13238	21966	35202	〃
3. Bajra	5702	94	5796	3020	42	3062	2505	76	2581	〃
4. Maize	15608	8789	24397	13572	8344	21916	18326	8778	27104	〃
5. Green gram	76008	14	76022	66299	26	66325	66737	88	66825	〃
6. Red gram	9506	61	9567	8644	112	8756	9940	599	10539	〃
7. Ground nut	45867	46197	92064	45098	43821	88919	49369	52465	101834	〃
8. Sesamum	27632	356	28188	23244	514	23758	19934	803	20737	〃
9. Castor	9101	227	9328	8276	1119	9395	9616	330	9946	〃
10. Sunflower	—	—	—	—	—	—	—	—	—	〃
11. Chillies	14290	9965	24255	23131	10556	33687	21408	8602	30010	〃
12. Cotton	28173	51	28224	32202	25	32227	27842	319	28161	〃
13. Tobacco	334	696	1030	649	801	1450	—	—	—	〃
14. Turmeric	—	—	—	—	—	—	—	—	—	〃

Crops	1991-92 Kharif	1991-92 Rabi	1991-92 Total	1992-93 Kharif	1992-93 Rabi	1992-93 Total	hectares
1. Rice	131652	24247	155899	94899	13666	108565	〃
2. Jowar	7554	16714	24268	5588	25208	30796	〃
3. Bajra	1128	85	1213	702	121	823	〃
4. Maize	19755	9550	29305	22620	8778	31398	〃
5. Green gram	67068	32	67100	60782	39	60821	〃
6. Red gram	8378	311	8689	7485	408	7893	〃
7. Ground nut	47493	50583	98076	40843	37423	78266	〃
8. Sesamum	19578	484	20062	20974	291	21265	〃
9. Castor	8142	50	8192	4905	91	4996	〃
10. Sunflower	—	—	—	—	—	—	〃
11. Chillies	20291	9662	29953	25677	7988	33665	〃
12. Cotton	33626	50	33676	29494	144	29638	〃
13. Tobacco	1173	917	2090	1817	725	2542	〃
14. Turmeric	—	—	—	—	—	—	〃

Crops	1993-94 Kharif	1993-94 Rabi	1993-94 Total	1994-95 Kharif	1994-95 Rabi	1994-95 Total	hectares
1. Rice	76294	16555	92849	99657	31600	131257	〃
2. Jowar	5439	33367	38806	4927	26823	31750	〃
3. Bajra	1189	—	1189	819	—	819	〃
4. Maize	20843	6031	26874	20239	9200	29439	〃
5. Green gram	52144	—	52144	53330	—	53330	〃
6. Red gram	6888	—	6888	6567	700	7267	〃
7. Ground nut	36353	45558	81911	36270	44000	80270	〃
8. Sesamum	23688	—	23688	26993	27	27020	〃
9. Castor	1580	—	1580	3884	120	4004	〃
10. Sunflower	121	12433	12554	1104	14000	15104	〃
11. Chillies	19565	9920	29485	15811	10454	26265	〃
12. Cotton	53357	938	54295	69286	—	69286	〃
13. Tobacco	1580	293	1873	160	20	180	〃
14. Turmeric	—	—	—	7772	—	7772	〃

		1994-95				1995-96				
		Kharif		RAbi		Kharif		RAbi		
	Crops	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Hectares
1.	Rice	119285	99657	30774	31600	111618	90630	29393	29790	〃
2.	Jowar	10247	4927	25132	26823	7338	2563	25905	24000	〃
3.	Bajra	1714	819	—	—	1310	467 77 28			〃
4.	Maize	19691	20239	8664	9200	21163	20837	8584	10200	〃
5.	Green gram	64491	53330	—	—	62263	47126	50	487	〃
6.	Red gram	8506	6567	—	700	8356	6606	—	—	〃
7.	Horse gram	—	—	1696	909	—	—	1794	2156	〃
8.	Black gram	—	—	176	—	—	—	154	862	〃
9.	Bengal gram	—	—	788	638	—	—	759	573	〃
10.	Ground nut	44998	36270	46284	44000	43349	31329	46024	46000	〃
11.	Sesamum	22230	26993	514	27	23189	21786	475	340	〃
12.	Castor	7360	3884	375	120	6331	3552	—	—	〃
13.	Sunflower	911	1104	7411	14000	1038	435	11004	15500	〃
14.	Chillies	22780	15811	9088	10454	22425	18717	8903	9735	〃
15.	Cotton	57544	69286	—	—	60719	77528	107	2730	〃
16.	Tobacco	1208	160	717	20	—	96	554	36	〃
17.	Turmeric	4819	7722	—	—	6084	5497	—	—	〃
Grand Total		**385783**	**346280**	**131619**	**138491**	**375183**	**327169**	**133783**	**142437**	**hectares**

		1996-97				1997-98				
		Kharif		RAbi		Kharif		RAbi		
	Crops	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Hectares
1.	Rice	102645	120712	27957	41387	102054	16574	32866	1118	〃
2.	Jowar	5148	2356	25986	24950	4065	2796	26183	12263	〃
3.	Bajra	906	338	64	62	720	338	48	—	〃
4.	Maize	22115	22317	8694	9050	23052	19961	8957	13917	〃
5.	Green gram	57846	43051	37	154	53236	19689	54	192	〃
6.	Red gram	7616	8810	—	215	7997	12266	351	7640	〃
7.	Horse gram	—		2059	2156	36	26	2086	1115	〃
8.	Black gram	—	150	143	2092	—	—	191	2029	〃
9.	Bengal gram	—	—	791	764	—	—	791	497	〃
10.	Ground nut	40021	34308	43948	43575	37344	17838	40799	23819	〃
11.	Sesamum	24099	22945	362	—	25298	11901	337	55	〃
12.	Castor	5329	4435	—	—	4715	3839	—	—	〃
13.	Sunflower	1088	150	13827	10950	1025	150	14553	14765	〃
14.	Chillies	22635	17792	9232	6550	23505	9482	9474	12283	〃
15.	Cotton	66710	100646	—	—	77073	99150	40	—	〃
16.	Tobacco	—	—	—	—	—	—	271	—	〃
17.	Turmeric	6646	5395	—	—	7285	4846	—	—	〃
Grand Total		**362499**	**383405**	**133102**	**122562**	**367369**	**207856**	**136730**	**89693**	**hectares**

Source: *Office of the Joint Director of Agriculture, Warangal, Andhra Pradesh.*

Privatisation and the Spread of Monocultures

Since Warangal is a non-traditional cotton region, therefore no native variety of cotton is found. All varieties of cottonseeds used in Warangal are hybrid seeds sold by private companies. Various seed companies are providing high yielding varieties of cotton and truthful seeds due to the huge demand of cottonseeds.

For any company to launch certified seeds takes atleast six to seven years' process of undergoing trials and verifications in the supervision of government authorities. However to avoid such delays in the launch of seeds in the market, seed companies sell the seeds as "truthful" seeds, which means that the company sells seed on the basis of farmers having confidence in the company's claims. There is no regulation to prevent marketing of "truthful" seeds.

In 1970's cotton cultivation in Warangal was dependent upon the varieties developed by the public sector seed supply. During that time the most popular variety was hybrid - 4, a short staple cotton variety. Besides Hybrid - 4 (H-4), the other varieties used during the 70's and 80's were MCU - 5 (developed by Coimbatore Research Station); L. K. varieties (which was resistant to white fly and jassids); Varalakshmi (developed by Cotton Research Station, Nandyal); JKHY-1 (an HYV developed by Jawaharlal Nehru Krishi Vidhyalaya, M.P) amongst others. All these varieties were government varieties, which were cultivated in the Telangana region.

TABLE 3.2

Acreage under different varieties of cotton in Warangal: 1996 - 97

	Variety	*Hectares*	*Cost of 450 grams*	*packet*
1.	RCH-2	60,080 hec.	Rs. 250/=	- Rs. 300/=
2.	H - 4	2,500 "	Rs. 260/=	- Rs. 300/=
3.	NH - 44	4,100 "	Rs. 250/=	
4.	JKHY - 1	3,800 "	Rs. 250/=	
5.	MAHYCO	8,100 "	Rs. 250/=	- Rs. 350/=
6.	Nath	8,200 "	Rs. 250/=	- Rs. 350/=
7.	Vanapamula	4,800 "	Rs. 250/=	- Rs. 300/=
8.	Others	9,066 "	Rs. 250/=	- Rs. 350/=
	Total	**100,646 hec.**		

Source: *Office of the Joint Director of Agriculture, Warangal, 1997.*

However, during eighties a handful of private companies participated in cotton research and evolved a number of hybrid cotton varieties. These included Maharashtra Hybrid Seeds Company, Jalna (Mahyco); Mahindra Seeds Company, Jalna; Nath Seeds Company, Aurangabad amongst others. These companies captured the entire market for cottonseed production and distribution.

The most popular variety of cotton in Warangal based on yields during 1995 – 1997 was RCH - 2, a long duration 'truthful' hybrid variety, produced by Rasi Seeds Company, and marketed by J. K. Company, Secundrabad. Other varieties of cottonseeds grown by the farmers and the acreage under each variety in Warangal during 1996 - 97 is given in Table 3.2.

Similarly in Adilabad the most popular variety during this period was the L. K. variety which is a short duration variety. While the MCU varieties were popular in Khammam district. The choice of variety for a particular region depends upon its soil condition, water availability and the inclination of farmers. As a result of the aggressive marketing by private companies the farmers committed their first mistake, according to Dr. L. Jalpathi Rao, a senior agronomist in the Warangal Agriculture Research Centre, by abandoning the short-duration variety of cotton suitable for the low rainfall and shallow soil

of Telengana. They planted RCH-2, a long duration variety, suitable to areas with assured irrigation. The drought condition in the beginning and the erratic power supply compounded the problem of poor irrigation.

In 1994-95 the total area under cotton cultivation in Warangal was 69286 hectares which increased to 100646 hectares in 1996-97. Commensurate to the increase in acreage was the increase in cotton arrival in the Warangal cotton market. In 1994-95 the total arrival of cotton was 6,76,993 quintals which increased to 13,38,330 quintals in 1996-97. The increase in cotton production led to the decline in its prices. In 1994-95, the average price per quintal of cotton was Rs. 1809/-, which went down to Rs. 1618/- in 1996-97 (see Table 3.3). However, there was no decline in the input cost per acre, instead the input cost in cotton has been increasing every year, says Dr. Jalpathi Rao.

TABLE 3.3
Cotton Arrival and Prices in the Warangal Agriculture Market

Year	*Arrival*	*Price per qtl.**
1985-86	1,77,929 qtls.	Rs. 437/-
1986-87	1,62,332 "	Rs. 585/-
1987-88	6,08,592 "	Rs. 793/-
1988-89	5,10,296 "	Rs. 786/-
1989-90	5,64,290 "	Rs. 761/-
1990-91	4,32,364 "	Rs. 785/-
1991-92	3,73,430 "	Rs. 1233/-
1992-93	5,72,643 "	Rs. 1040/-
1993-94	7,72,999 "	Rs. 1257/-
1994-95	6,76,993 "	Rs. 1809/-
1995-96	11,35,972 "	Rs. 1742/-
1996-97	13,38,330 "	Rs. 1618/-
1997-98	8,33,000 "	Rs. 1800/-

* Annual Average Rate per quintal.

Source: *Cotton Cooperative Office, Warangal*

In Warangal district the cotton crop basically replaced the crop rotation based on jawar (Rabi) and green gram (Kharif). Now these two crops have been almost finished. The acreage under the green gram - jawar sequence has shown a drastic decline in last one decade. In 1987-88 the area under the green gram and jawar sequence was 143500 hectares which declined to 31952 hectares in 1997-98. Besides jawar and green gram, cotton has also replaced other oil seeds especially sesame, groundnut and castor. Today cotton is grown in 20-23% of the total cultivable area in Warangal. The total agricultural land of Warangal is around 4.5 lakh hectares, according to Dr. Jalpathi Rao.

In 1997-98 the total area under kharif cotton was 99,150 hectares. 80% of cotton farmers used RCH - 2 (Research Cotton Hybrid- 2) apart from the other varieties used by the farmers were Somnath and Shaktinath of Nath seeds, MECH - 1, 12 and 13 of Mahyco Seeds, Sunjiv of Indo-American Seeds. RCH -2 has been the most vulnerable variety to pest attack. One of the reasons for the more severe pest attack on RCH-2 was due to the compact planting or bushy planting of this variety. This variety grows horizontally and it has a closed canopy, which protects pests due to non availability of sunrays beneath the canopy.

In one acre, 450 grams of seeds (of any cotton variety) are sown. The cost is between Rs. 250-Rs. 350/= per 450 grams' packet. However, when the farmer finds that all seeds have not germinated he again sow seeds at that point. So, about 500-600 grams of seeds are used in one acre. Since RCH-2 was very popular, the farmers had to book this variety in advance and those who did not book the seeds, had to buy it by paying higher prices in the black market.

However, the cotton failed due to severe pest attack. The frequent sprays and spurious quality of pesticides used, made them even more ineffective. Most farmers had to spend between Rs 12,000 to Rs 15,000 an acre on pesticides.

B Ramanamma belongs to Gangapur village in Jadcherla in Mehboobnagar District of Andhra Pradesh. She and her husband cultivated 20 acres of leased land. Taken in by the marketing hype of seed companies, they replaced paddy with cotton. This proved beneficial at the beginning, but demanded intensive irrigation, for which they took a loan of Rs. 50,000. The subsequent crops failed. Burdened with loans and accumulating interests Ramanamma's husband consumed pesticide and committed suicide. Ramanamma and her son are today working as construction workers in order to survive.

The heavy investment made in purchase of agri-chemicals could not be recovered because the yield was much below the expected level and it even did not cover the input cost. The small farmers who had taken money and material on credit were driven into debt and then to suicide.

The agricultural season of 1998-99 in the state of Andhra Pradesh echoed the experience of the preceding years. Facing incessant rains followed by drought, working hard for the whole year and not getting the reasonable price for the produce, unable to pay back the loan obtained from private money-lenders, farmers have been succumbing to suicides. Within Andhra Pradesh, more than 80 percent of total farmers suicides occurred in the Telangana region of the state alone, and Warangal district shares 40 percent of total deaths in Andhra Pradesh.

Farmers, lured by the good features of advertisements screened on varieties of cotton seeds of few companies in their villages, cultivated their lands with new varieties of cotton namely Navratan, Ajith, Parry White Gold, Bioseed etc. Keeping in mind the losses incurred during the past cotton crop, cotton has been cultivated with utmost care. In spite of that, the adulterated seeds have destroyed thousands of acres of cotton crop in Parakala, Regonda, Atmakuru, Geisukonda, Sangyam, Dharmasagar mandals of the district.

In Warangal district, during 1998-99, the extent of area cultivated by Navratan, Ajith, Parry White Gold, Bioseed etc varieties of cotton was around thirty thousand acres, which was spread across two hundred villages in twenty-seven mandals. It is believed that about six seed companies were successful in introducing these varieties in the villages through their field distributors.

Interestingly, the seed companies select their seed distributors from the village itself. These distributors are found to be the large farmers who were well off and influence decision making for number of villagers. The films shown by the seed companies to the farmers have been found to have great impact in their decision making about what type of seed to go for. Many of the farmers were reporting that the boll size and the opened boll were very good in the films. However they could not get a single boll so far in their fields, and whatever bolls formed were shed by the plant without opening.

In village Ulligedda Damera, Atmakuru mandal of Warangal District, the whole village had planted a total extent of 150 acres with Navratan Ajith variety of cotton in 1998-99. Madarappu Ramesh, who had cultivated Navratan Ajith, informs that he had invested a total of Rs 10,000 to Rs 11,000 per acre on his cotton crop. Of this investment nearly 70 percent was spent on the chemicals and fertilisers. In the same village another farmer, Gudur Rajaiah had cultivated 3 acres of land with Navratan Ajith variety and admits that he also incurred the same cost of cultivation for the cotton crop. His situation was worse as compared to Ramesh as he had a debt of Rs 90,000 from the *arthies* or private moneylenders at an interest rate of 36 to 48 per cent. All of them came to know about this variety of seed from video film showed to them in their village. And

almost all the farmers were under debt either to the Arthies shops or to the landowners.

In another village Pallarigudda in Sangyam mandal of Warangal district, almost all the farmers had cultivated their fields with Parry White Gold ('PWG'). The standing crop was very robust but without any bolls on the plants. About 150 villagers had moved their papers in the district consumer redressal forum at Warangal against the failure of PWG and demanded appropriate compensation for them by the company. The Government officials also visited the fields of farmers whose cotton crops were failed. The villagers also requested the government officials to do the needful so as to clear their spiralling debts.

Lack of Agricultural Extension Workers Support

In addition to the seed failure, in many mandals yellow-insect pest of cotton had destroyed the entire standing crops in 1998-99. The farmers reported that the agriculture department of the state shown total negligence in disseminating the advice of scientists and hence it resulted in the havoc caused by the pest. Added to this, the farmers persuaded by the suggestions given by the pesticide shopkeepers had used inferior chemicals with high cost, which could not reduce the pests attack on the cotton crop. Also the rate for cotton per quintal was not more than Rs 1500/- which was not commensurate with the investment made on the crop.

Getting disappointed over the losses incurred over the investment and the inability to feed their families, the farmers are consuming pesticide mixed in their curd rice and committing suicide. The number of suicides reported during November and December in 1998 was about 15 farmers. These suicides were mainly due to the debts that got accumulated over the few cropping seasons. Of these suicides majority of the farmers were in the age group of forty years and above. The deceased farmers left behind them families who have no one to look after them. The story of two farmers who committed suicides is given in the Box.

Through discussions with various seed and pesticide merchants at Warangal, it was revealed that the seed companies provide a very high margin on their products and also they do not demand immediate payment through cash from the pesticide merchants. About 80 percent of the transactions are on credit basis. They get nearly 45 to 60 days of credit. The merchants pay the seed companies through post dated cheques. In turn the merchant sells the product on credit to the farmers who get lured by the helping hand extended by these merchants. Since the farmers need not pay the amount in cash they get trapped by

Case Studies of two farmers

Kottula Yakayya, Village Samudrala

Kottula Yakayya of village Samudrala in Staton Ghanpur Mandal committed suicide in 1999. His family owns 4 acres of land. On 2 acres of land chilies were sown and remaining two acres cotton was grown. Last year for cultivating cotton he burrowed a sum of Rs 25,000/- on loan basis. With interest it totaled to Rs 60,000/-. Money-lenders started pestering him for payment of their interest. Not getting proper price for the cotton in market and unable to know how to clear the heavy debt, the farmer got agitated and consumed insecticide and committed suicide.

Pacchikayala Kameswara Rao, Village Akinepalli

Pacchikeyala Kameshwara Rao of Akinepalli village of Mangapeta Mandal, unable to bear the financial problems committed suicide same year. Insects intensely attacked the cotton crop cultivated by him. Use of many insecticides could not stop the spread of insects. Due to this the crop got completely destroyed. Due to lack of advice from the scientists and agricultural officers he got completely disillusioned and consumed poison in the form of insecticides and committed suicide.

There are many more cases of suicide where the lack of scientific advice by the concerned agricultural departments led to suicides of Indala Ayilayya, Malotu Danja, Tallapalli Lakshamayya, Pentala Odelu.

the seed merchants and debt on the farmer increases. Also the same merchant sell the chemicals and fertilisers required for the crops. Getting everything under one roof and that too without paying cash and in credit makes the farmer listen to every suggestion given by the merchant. In this way the farmer sinks in the marsh of indebtedness and gets spiraled in the loans.

Various seed and chemical companies that are operational in Warangal are Shaw Wallace, ICI, Rallis India, Monsanto, Saral India, Novratis, Nocil, Bayer. The liberalisation of seed sector is an epidemic leading to suicides and high debt for purchase of seeds, agri-chemicals and pesticides.

Growing Seed Scarcity

Globalisation and privatisation of the seed sector have eroded farmers seed supply and seed supplied by the public sector. While the entry of private seed companies is justified on grounds of increasing farmers options and choices, by making farmers look down on their own varieties as inferior and by eroding the capacity of the public sector, globalisation has in effect created a seed famine.

There is a great mismatch in the seed demanded by the farmers and the seeds supplied. With widening gap between the demand and supply, the plight of the farmers is getting worse. The demand for the seeds of all crops has nearly doubled within a time span of six years. Of the total requirement of seeds in Andhra Pradesh the Public Sector Agricultural Departments, State Seed Development Departments and Oil-fed supply around 20 percent of the demand. Taking advantage of the deficit supply of seeds, private sector seed companies are entering into supply of spurious seeds.

TABLE 3.4
Andhra Pradesh State Requirement of Seeds

Year	*Seeds Requirement (Quintals)*
1994 - 95	9,55,892
1995 - 96	9,85,822
1996 - 97	10,16,720
1997 - 98	11,33,205
1998 - 99	13,78,489
1999 - 2000	17,56,300

Non-availability of seeds is also creating conditions of distress and instances are surfacing where farmers are resorting, again in this situation of seed scarcity, to committing suicides. For instance, in the Rayalseema region of Andhra Pradesh, 50 lakh acres of groundnuts is cultivated. It is known to the farmers that the groundnut crop in the kharif season can withstand for 10 to 15 days without any rains. This peculiarity of groundnut has been utilised by Anantpur and Kurnool regions and cultivate this crop. Anantpur district itself requires 14 lakh quintals of groundnut seeds. The government supplied only 1.12 lakh quintals of the seeds. On further agitation by the farmers, the government could further provide 68,000 quintals, totaling all together a meager 12 percent of the requirement.

Thus, public sector seed companies are unable to meet the demand and are backing every year. Taking advantage of the situation and also governments privatisation spree, the private seed companies are trying to reap benefits through unreliable seeds.

In the absence of non-availability of seeds, the farmers either leave their lands fallow or are forced to change to other crops. Gogoti Bali Reddy, from Kuntalapalli village in Nallamada mandal, in Ananthpur district succumbed to suicide due to the situation arising out of non-availability of seeds to sow.

In the agricultural season of 1999 – 2000, five lakh acres of rich fertile land

has been left fallow without any crop. The scenario is same everywhere. In the ghat region (basically tribals), the farmers were not able to raise their paddy nurseries due to lack of paddy seeds. Similarly, the subsidy available on seeds has been removed. During the cropping season of 2000 – 01, the Department of Agriculture, unearthed a racket operating in distribution and sale of spurious *banni* cotton seeds. The farmers have so far planted 50,000 acres of land with *banni* seed in the districts of Guntur and Prakasham.

Another aspect, which has been the result of seed scarcity, is the shooting up of the seed prices. The cottonseeds are now sold at double the price of the period of easy availability. This appears to be deliberate, so as to create market for the genetically engineered *Bt* cotton which will be relatively higher priced.

Seeds, Pesticides and Debt: The intimate nexus of Corporate Feudalism

In Warangal, land is easily available on lease because of the heavy migration of people from the villages to the city. The farmers with small land holdings often take land on lease to grow cotton. Those who take land on lease have to pay Rs. 1800 - 3000 as annual rents. Rajmalla Reddy of Atmakur Mandal has 40 acres of land of his own. Out of 40 acres, 35 acres he gives on lease every year and get Rs. 1800 per annum as rent for one acre. Those lands that have irrigation facility fetch up to Rs. 3000 per annum said Mr. Reddy. Attracted by the prospect of getting rich overnight, peasants who lease land spend thousands of rupees on buying pesticides and fertilisers that were necessary for the conventional cotton cultivation. Besides putting their own resources, the middle and small farmers borrow money, paying high interest rates, from "*arthies*" or private moneylenders who also provide them seeds, fertilisers and pesticides on credit. The private moneylenders took on the role of "pest management advisers", extended credits to farmers, sold spurious pesticides made by fly by night companies, charged higher prices than prevailing prices for them, and recommended the application of excessive doses of these pesticides.

The rise of moneylenders is a part of an emerging phenomenon of corporate feudalism. Withdrawal of low interest credit has been a key element of the World Bank led economic reforms. As cooperatives and rural banks close down, and public sector banks are privatised, rural credit dries up and farmers are pushed into borrowing from moneylenders. The failure of the private sector in Indian banking was what had ushered in the nationalisation of banks in the 1966. The per-nationalisation period had witnessed the growth of a banking system, which driven by profits could not cater the development needs of the nation with the virtual inaccessibility to credit for the large masses of the rural and poor population. Lending policies were turned to the advantage of industrialists with banks being under the control of industrial chairmen. Banking came to be controlled by a few communities making it a family profession. The nationalisation of banks was followed by a sharp increase in the number of bank branches. Consequently employment shot up. Further, banking policies were tuned more to cater to the development needs of the nation as priority sector lending took headway over profit driven lending. Protecting the poor from the clutches of unscrupulous money lenders, the

nationalisation of banks had succeeded in building up the productive base of regions and areas which would have otherwise remained neglected, through a number of projects and programmes targeted particularly at women and other weaker sections of society.

The opening up of the banking sector to competition from domestic private and foreign banks has been accompanied by a reversal in the above trends. For instance, there has been a fall in the proportion of credit received by the household sector, which had earlier received relatively larger share of bank credit. Further, the incremental expansion during the post-reform period for the household sector has not only been the smallest during the post reform period but also smaller than the expansion in favour of corporate enterprises. Similarly, the financial assistance sanctioned by the all-India financial institutions suggests that while disbursements of Development Financial Institutions (DFIs) generally assisting large scale industries expanded by 197 per cent between 1990-91 and 1994-95, those of DFIs assisting small scale and medium industries have risen by 62 per cent only (Shetty, Alternative Economic Survey, 1996).

The area and group wise classification of banks shows the concentration of foreign banks in metropolitan areas and a complete absence of foreign banks in the rural areas, while private banks are mostly concentrated in the semi-urban areas. In the event of the nationalised banks giving way to private participants, it wouldn't be long before the rural areas are isolated from the financial scene. These trends are but suggestive of a return to the pre-nationalisation era that had doomed to be a failure.

The private moneylenders are mostly pesticide dealers or shop owners. In Warangal there are 13000 pesticide shops which distribute pesticides produced by 93 companies which are registered in Andhra Pradesh and also by about 200 contraband units based in Maharashtra (Asish Chakrabarti, Feb 1998). In each village there are 5-8 shops. The shop owners and dealers get their supply of the stock from the pesticide companies on credit. So there exists a chain of credit system, and the shop owners are only the mediators. In reality the farmers indirectly get the credit from the company itself. The interest rate varies from 36 to 60 percent per annum. Since the chemicals are easily available on credit, the farmers have no hesitation in using it at short intervals, usually once a week and at a higher intensity. There is no government agency to finance the farmers and bank loans are negligible. This has forced farmers to approach the private moneylenders.

The cotton farmers in Warangal spend about Rs. 1500/= on preparing the field (esp. on labour). The sowing period is June - July. In fields that are rainfed, sowing is delayed till it rains. One week to 10 days after sowing the cotton seeds farmers do the first spray of pesticides. This is done without ascertaining the existence of pest in their field. The first spray is considered to be very crucial and it is believed that if the first spray is missed, the crop will fail. However, the State Government's Agriculture Department and the Agricultural Research Station, Warangal, have suggested the Integrated Pest Management (IPM) strategy to the farmers to control the pests through growing "trap crop" e.g. castor, marigold and pheromone trap in the field to see whether pests exist or not.

But farmers brainwashed into the miracle seeds - miracle spray culture do not pay heed to these suggestions, and within 10 days of sowing, they start

spraying their cotton fields with pesticides. Initially they use lower concentration of chemicals. The chemicals that are used in the initial stage of spraying are Monocrotophos 36% EC, Dymethet 30%, Oxydemeton Methyl etc. Mixing of two chemicals is very common. In the first spray only 250 ml technical is used in one acre of land. But from the 2nd spray onwards 50 ml is added and at one stage they end up using one liter of chemicals per acre. In one season, besides expenditure on fertilisers, labour and seeds, the cotton farmers spend Rs. 8,000 to 10,000 on pesticides alone. Pesticide is a major input in cotton. Once a week 300 ml. to 500 ml. of pesticide are sprayed per acre and in one season (June-March) 25-35 sprays of pesticide is a normal practice in Warangal.

Among all the Indian states, the maximum use of pesticides is in Andhra Pradesh. A major portion of this is used in cotton and chilli cultivation. Cotton is quite susceptible to a range of pests and diseases. In 1980s pesticides consumption in Warangal was less than Rs. 10 crores. But as the hybrid cotton cultivation picked up its momentum in 1985-86 pesticides use also increased. In 1997 - 1998 the approximate sale of pesticides in Warangal district alone is Rs. 200 crores (Asish Chakrabarti, Feb. 1998), which is the highest in Andhra Pradesh, and near about 80% of this is used in cotton.

The pest problem is not new in the Telangana region; the farmers of this area have been facing this problem for the last three years. But in 1997-98 the problem was very severe and the pests attacked almost all standing crops in the fields. However, the most affected crop was cotton. Unlike the last three years, there was a heavy loss of crops in 1997-98. The cotton farmers were more affected because input cost in cotton was higher and the yield was not as expected.

Earlier the cotton farmers used to get 10-12 quintals of yield in one acre spread over four to five picking. But 1997-98 they could hardly get 4-5 quintals. Some of the farmers could not get even that. The temptation of heavy returns on cotton had attracted the small farmers who had even leased land for growing cotton. Bandi Kalavathi, w/o. Somaiah of the Venkatapur village, had no land of her own but she had taken 5 acres of land on lease and in 4 acres she had planted only cotton. She had taken Rs. 35,000 as debt from private parties. Bandi Kalavathi is one of the farmers who committed suicide due to the crop failure.

In the cotton cropping season in 1997-98 not a day passed since mid-December 1997 without at least one farmer ending his life as a consequence of the failure of the cotton, chilli, red gram and other crops in Warangal, Karimnager, Medak, Rangareddi and Mahabubnagar districts in the Telangana region and Kurnoor in the Rayalaseema region.

Incidentally, this was not the first time that such suicides have taken place in Andhra Pradesh. In 1987, in the Guntur and Prakasham areas, the cotton farmers faced a similar predicament followed by tobacco farmers in other areas in subsequent years. Farmers were encouraged to shift from their traditional self-sufficient cropping (of paddy and vegetables) to more remunerative cash

Andhra Groundnut crop failure drives farmers to suicide

Hyderabad, September 24.

Close on the heels of suicdes by Mehboobnagar cotton farmers during April-May this year, death has once again begun to take a heavy toll in the fields of Anantaput distrcit, bordering Karnataka. AS many as seven farmers and two girls have committed suicide in the districts during the last four days due to pest attack that almost wiped out the entire groundnut crop in 3 lakh acres.

The Hindustan Times, New Delhi, 25.09.2000

crops. But unlike their traditional food crops, total reliance on cash crops entailed a gamble, since fluctuations in the market price affected their earnings. Besides, their cultivation involved huge expenditure on inputs like fertilisers and pesticides.

For the pesticides industry, the pests are a blessing in disguise. It has over the years sustained the profit margins of the pesticide manufacturers and traders irrespective of the extent of crop damage. The more the pest incidence the more lethal is the pesticide cocktail. Consequently, the insects became resistant to all kinds of pesticides. Today the controversial synthetic pyrethroids are also available in the market. The pyrethroids are more expensive and are known to have a knockdown effect on insects, birds, and animals and are also believed to be carcinogenic. No sooner did the pesticides trade push in the pyrethroids, the insects also developed immunity against these fourth generation pesticides.

There are 28 known natural enemies of pests in the cotton fields. Nature has provided enough protection for cotton through the abundance of benign insects, parasites and predators available in the field, for example spider, lady-bird beetle, crysopa, wasp, rats, frogs, snakes and birds etc. But the tragedy is that it is these parasites and predators that first get killed when pesticides are sprayed. Bereft of its natural enemies the pest appears stronger in the crop field. In Warangal the indiscriminate use of pesticides have reduced the population of birds in this area. When the pesticides disturb Nature's equilibrium, many of the little known and insignificant pests of cotton, like the white fly and spodoptera, emerge as major pests.

There are more than 50 chemicals (technical) used in agriculture and more than 90 companies are selling their products in Warangal district. There are several companies that are selling spurious and low quality chemicals that has developed pest resistance. As a result, farmers used higher concentrations and more expensive pesticides. Mixing of two-three chemicals in order to combat the pest has become a normal practice.

Besides pesticides, the cotton farmers also use fertilisers. In one season, about 150 kg of fertilisers, which cost about Rs. 1500 – Rs. 2000, are used in one acre. Every cotton farmer uses DAP and Urea. Besides Urea, they either use 17-17-17, 28-28-0, 14-35-14, 16-20-0-15, Ammonia, DAP etc.

The two pests that attacked the cotton crop in 1997-98 in Warangal were "*Heliothis*" and "*Spodoptera*". Before these pests attacked cotton, the sucking and chewing pest, i.e. white fly had attacked groundnut and chilies. In October - November, *Spodoptera* attacked the cotton crop. Though this is not a major pest for cotton, but it heavily attacked cotton besides groundnut, chilies, pulses etc. The *Spodoptera* eats everything that is green - leaf, buds, flowers, and capsules. It is a voracious eater and moves in-groups attacking one field after another. *Heliothis,* on the one hand, only eats cotton capsules and buds. From morning to evening it remains under the soil and comes up in the evening for eating. That is the reason pesticides spray doesn't affect them. In 1997-98 the farmers had to use poison baits to kill this pest.

Consequences of Overburdening Debts: Distress Sale of Kidneys

The ever growing interest rates and the accumulating debts in Rentichintala Mandal of Andhra Pradesh has led to distress sale of kidneys by many farmers.

The farmer are caught in loose - loose situation and there is no way out either for getting rid of the debts or getting humiliated at the hands of *'arthies'* and money lenders/ *pawn* brokers.

The farmers here switched to cultivating chilli, as usual, driven by the lucrative returns. The investment during initial years were very less as they were using native seeds which are known for less chemical intakes. However with the monoculture of chilli cultivation spreading the damage through disease attacks increased and every year the standing crops were affected.

The loan which was subsequently taken after a failed crop each year was utilised by the farmers to sustain themselves and with whatever left amount to carry for the next cropping season. Farmers got the support of *pawn* brokers to get money in order to buy the necessary chemicals and sprays. The *pawn* broker is the major actor who is always in win – win situation in dealing with the farmers. He supports the farmer by providing loans at very exorbitant interest rates and also imposes chemicals on them from his shop. The small loans got accumulated over years and the farmers found themselves in heavy debts.

Once farmers are deep in debt there is no alternative available, but sell off their land, agriculture implements or the house in which they live. Of late some farmers in Rentichintala and surrounding areas like Gurazala, have sold their kidneys in order to clear their outstanding debts with the *pawn* brokers.

The farmers who sold their kidneys from Rentichintala Mandal are:

1. Durgyampudi Chinna Venkat Reddy
2. Dirsinals Narsi Reddy
3. Bobba Venkat Reddy
4. Siddhavarpu Poli Reddy
5. Peram lacchi Reddy
6. Kancharla Krishna
7. Narmala Krishna
8. Golle Ramaswami
9. Thai Narsaiah

After the incident of kidney sale by farmers came to the knowledge of everyone, the life of these farmers has become even worse. There is no support either from the government or from the village itself. These farmers are looked after as untouchables and no one is coming forward to extend support to the deprived families.

A. P. Farmers Sell Kidneys to avoid Penury

Guntur, May 15.

Rentachintala, once again the hottest place in Andhra Pradesh, is back in the news, for an altogether different reason. At least 26 persons, all in their prime age, have sold their kidneys for pecuniary gains.

Pushed into the clutches of penury, the handful of small time farmers found an easy way out from their debt trap at the cost of their kidneys. The gravity of the situation can be gauged from the fact that at least 100 persons underwent fitness tests.

A "seller" Mr. Polli Reddy said he had no other option. "We owe thousands of rupees to the money lenders. They gave us loans to raise crops, mostly cotton and chillies. We could not reap a good crop in thelst two years. The growing interest was draining our pockets."

The Hindu, New Delhi – 16. 5. 2000

Bobba Venkat Reddy got deeper and deeper into debt as spurious seeds and chemicals ruined his crops year after year. Continuously harrassed by money lenders, he heard of a broker who was helping farmers get money by selling their kidneys. For Venkata Reddy, this was a better option than suicide, and he availed of it. However, the surgery has left him weak and unable to work his farm. Because of the media coverage, money lenders have refused to loan any more money to him and other farmers like him.

2. The Karnataka Scenario on Farmers' Suicides

Crop Failures

Paddy In the preceding cropping season (i.e. 1999) farmers at Harobanavalli village in Shimoga taluka, have reported that 1001 paddy variety which is very popular in the region has failed to perform in the second cropping season. Around ten farmers have reported that the paddy variety 1001 supplied by Rallis company in this village failed.

> On 1999, Gaddilingappa cultivated four acrea of land with C-71 variety of Jowar supplied by Cargill. The company assured 20 –25 quintals of yield. However, he got only 1 to 1.5 quintals. All the farmers who had taken up the seed variety went to the agricultural commissioner and senior officials in the agricultural department. An enquiry by the commissioner revealed that the seeds were meant for kharif season and not for rabi. Farmers picketed the Cargill company at Bellary, following which Rs. 380 per acre was given as compensation. Farmers also demanded that the 28 tonnes of seed that was still with company be destroyed.

The cost of the seeds is steadily increasing over the years. The problem with the 1001 variety was that despite the applications of regular fertilisers and other chemicals there was drastic reduction of yield. The farmers have been using the company seeds for long and therefore, depended on market for the seeds. Some of the farmers informed that the company cautioned the farmers for not using 1001 variety second time on their field. They are apprehending this as a possible reason for the failure of crop.

Chilli The case with horticultural crop of chilies is also not good. The crop though does not have much to do with companies for the supply of seed, the farmer saved seeds are mostly used. The farmers largely depend upon two major regions for supply of seeds – one in Karnataka itself called Baidagi and the other is Guntur (Andhra Pradesh).

What is disturbing is the heavy investment for chilli crops in terms of chemical protection. There were number of suicide cases reported due to losses.

For instance, in the Bellary region itself, out of the 35,000 acres of planting with chilies during 1999-2000, around 26,000 acres of the crop suffered total destruction. This amounts to nearly 70 % of the area planted. Per acre investment for the chili crops is between Rs 16,000 to Rs 20,000 of which majority is on the chemical sprays. In turn the returns from the output was around Rs 2000 to Rs 4000 per acre. The reason attributed is that of excess rainfall and the subsequent attack of viral disease. This amounted in huge losses by the farmers who have taken loan from commercial banks at the rate of 30 percent per annum.

The number of suicides related to chili crop failure during 1999-2000 as reported by government agencies was around 8 individuals and the figure reported by one of the concerned non-government group is of 19 individuals.

Another problem with the chili farmers is the storage place for their harvest. The government cold storage facilities are becoming more costlier and the farmers are not getting good prices despite holding the stock for longer periods. This is only adding to their costs and the interests keep accumulating.

Seed Supply: Public Versus Private Companies Participation

All the agencies, which are involved in seed production, cater to the needs of farmers. These agencies need to provide quality seeds to these farmers by either providing certified seeds or labelled seeds. For selling certified seeds, the

agencies need to get the certificate from the state certification agency. Otherwise it can also sell labelled seeds on its own. An analysis of all the agencies which are providing various types of seeds shows that only public sector agencies go for certification of seeds. Private sector operate without any proper certification.

In the Kharif of 2000, an analysis of the seed production (that has gone through seed certification) in the state shows that more than eighty percent of the seed production is with the public sector agencies of which major players are Karnataka State Seeds Corporation and National Seeds Corporation of the State. The States' private sector participation in the seed distribution in the state is around 12.28 percent of the total seed distributed.

Interestingly, a detailed analysis of the sixty-five operational private seed companies which are registered with the state seed certification agency, 88 percent of the companies are involved in supply of cotton seeds followed by the maize, paddy and bajra. The list of private companies, which are engaged in production of varieties of seeds is given in the Box.

Public Sector Seed Producers in the State of Karnataka

Name of the Seed Producing Company	*Seeds for crops of*
Karnataka State Seed Corp Ltd.	Paddy, Ragi, Maize, Bajra, Black gram, Cowpea, Redgram, Sunflower, Soyabean, Groundnut, French bean, Cotton.
National Seeds Corporation Ltd.	Maize, Bajra, Paddy, Ragi, Cowpea, Tur, Groundnut, Soyabean, Sunflower, jute
University of Agricultural Sciences	Maize, Cotton
Karnataka State Dept. of Agriculture	Bajra, Green grams, soyabean, Tur
State Farms Corporation India Ltd.	Paddy, Maize, Jute
Karnataka Oilseed Growers Federation Ltd.	Paddy, Maize, Groundnut, Soyabean, Cotton

Crops	*Private Companies engaged in dealing with seeds*
Maize	Mahesh Hybrid Seeds; Varada Seeds; Bhadra Hy seeds Co; Somnath seeds co; Karnataka Hitech Ent; Basaveswara Agro Seeds; Karshek Seeds; Patil Agro; Mahyco; Sumanth Seeds;
Cotton	Mahesh Hybrid Seeds; MSSC; Raja Rajeswari Seeds; Ganga Kaveri Seeds; Siddheswara Seeds; Vani Seeds Co; Sree Hybrid Seeds; Mahantesh Seeds; Rallis Hybrid Seeds; Bhadra Hy. Seeds Co; Somnath Seeds Co; Karnataka Hitech Ent; Nandi Seeds; T S R Amareswara; Amarewara Agri Tech; Sagar Seeds; Laxmi mills; Vinayaka Agro Seeds; Zauri Seeds; SPIC Bio Tech; Karnataka Seeds; HLL; Mahyco; Vasu & Co; Karnataka Agro Genetics; Mohan Traders; Niranjan Seeds; Mahagujarath Seeds; Adavi Amareswara Seeds; Sumanth Seeds; MHSC; Novarties Ltd; Laxmi Hy. Seeds; Rait Hy Seeds; Viba Agro Tech; Sri Amarewara Seeds; Manjushree Plantations; Nuziveedu Seeds; Shiva Seeds; T N Amareswara Seeds; Deepthi Seeds; HYCO; Venkateswara Seeds; Advanta; NFCL; Banashankari Seeds; Ashwini Seeds; Kwality Seeds; Shathavahana; Sumantha Hy. Seeds; Bhubaneswari Seeds; Prabhat Agri Bio-Tech; Amarewari Hybrid Seeds; Kaveri Seeds; Pro Agro Seeds; Pruthivi Agro Tech.
Paddy	Mahesh Hybrid Seeds; Raja Rajeswari Seeds; Ganga Kaveri Seeds; Varada Seeds; Bhadra Hy seeds Co; Mahyco; Agro Seeds
Bajra	Karnataka Hitech Ent; Sagar Seeds; Karnataka Agro Seeds; CJ Parekh; Mahyco
Sunflower	Sagar Seeds
Tur	Surya Seeds; Agro Seeds

3. The Maharastra Scenario on Farmers Suicides

In Maharashtra, the people were growing millets, but agriculture departments working as extension workers for seed corporations advised them to stop growing millets and to start growing soya. Because they would get more money. They went in for soya. The farmers when growing millets were getting foliage that helped them to keep cattle, which produced dung to make the compost, which in turn, went back to the farmers' fields. Now when soya came to the market, the soya oil went to some factory, the soya cake was exported to USA for feeding pigs; the cattle had nothing to eat, the soil had no dung. It started to lose its fertility. The cycle started to work in the wrong way. The need of the hour is to look into the soil aspect of the farms. The concept of soil aeration is of utmost importance. Soil areation is not taken into account by the western education. We forget about the air. The earthworm is one such type of organism that helps in soil aeration. GM crops endanger the soil component and the concept of living soil will vanish in the course of time if such crops are allowed. The need of the integrated approach to organic farming where the whole cycle of life is again rejuvenated.

- Dr. Sultan Ismail, *leading earthworm ecologist*

82 Maharashtra farmers committed suicide this year

As many as 82 farmers from Vidarbha and Marathwada regions of Maharashtra had committed suicide during the year after being overburdened by debts, The Revenue Minister, Mr. Narayan Rane told the Maharashtra Legislative Council today. The State Government had given financial assistance to 25 farmers.

The Hindu, New Delhi, 21.07.1998

Farmers in Yavatmal District in Vidhrabha, for the last few years, are facing problem of cotton failure despite favourable climatic conditions and uninterrupted supply of inputs. The yields have drastically decreased from a quintal to few kilograms per acre over these years.

The crisis is very severe and farmers are struggling for survival in the wake of failure of not only cotton but also other important crop seeds such as *toor* (pulses) etc. Till 1992, majority of farmers were cultivating basic normal hybrid (AHH 468) of cotton which was fairly consistent and provided normal yield. The problem in this region started since 1992, when a new variety of cotton (CAHH 468), was introduced to the farmers in the region. The farmers spotted that the new hybrid, which has not been certified by the government, failed to perform well inspite of all the care taken by them. As reported by the farmers, the yield registered was almost negligible in subsequent years. These seeds were supplied by some of the trusted seed companies to the farmers for years together. Some of these include Nath Seeds Co., Aurangabad, Ajith Seeds Co., Jalna, and Sanjay Seeds Co., Jalna in this region. The government outlets for selling seeds are supplying sub-standard seeds to the farmers. Some farmers have brought this to the notice of the authorities of these seed companies. For instance, *karadi* (Bhima) seed (marketed by Mahabeej, Akola) which have been duly certified by certifying agency were found to be sub-standard.

Cotton and *toor* are commonly inter-cropped. The farmers found that not only cotton but also seeds of other crops such as *toor* failed to perform.

4. The Punjab Scenario of Farmers Suicides

Punjab - the highest contributor of grain to the national pool has now got a notorious distinction of having the highest rate of farmers' suicides among all the states. Though the farmers' suicides started in 1990 but in 1997-98 it became very severe and today it has acquired an alarming proportion. It seems it has crossed the suicide rate of Andhra Pradesh and Karnataka. Despite some government agency reports to the contrary, an alarming rise in rural suicides has become an acknowledged fact.

Initially the Punjab government was not ready to acknowledge that the

State of Punjab in Brief

- The state of Punjab covers an area of 50,33,000 hectares constituting about 1.57% of the total geographical area of the country.
- There are 17 districts viz. Amritsar, Bhatinda, Faridkot, Ferozepur, Gurdaspur, Hoshiarpur, Jalandhar, Kapurthala, Ludhiana, Sangrur, Ropar, Mansa, Fatehgarh Sahib, Nawa Shahr, Moga and Muktsar which have further been divided into 138 blocks comprising 12795 villages.
- The population of the state as per 1991 census is 20.28 million. Out of this 1,42,88,744 is the rural population while the urban population is 59,93,225.
- The state has been divided into three agro-climatic zones, viz Sub Mountainous Zone, Central Alluvial Zone and Southern Dry Zone. The climate of the state is semi humid to semi arid.
- Of the total geographical area of 50.33 lakh hectares, net sown area in 1997 - 1998 was 42.04 lakh hectares constituting approx. 84% of the total area as against the national average of 42%.
- The gross cropped area is 78.33 lakh hectares and the cropping intensity is 186%. The net irrigated area in Punjab was 40.21 lakh hectares in 1997 - 98 and 96% of the gross cropped area is under irrigation. In 1997 - 98 the average fertiliser consumption works out to be 167 kg / hectare in Punjab against all Indian average of 73 kg/ hectare.
- The numbers of small and marginal farmers having upto 5 acres of land are about 499,510 and having 45% of the total land holding in Punjab. The average land holding of small and marginal farmers are only .99 hectares.

TABLE 3.5

Distribution of number of Operational Holdings and Area of various categories by size groups during 1990-91 agricultural census

Sl. No.	*Category of Holding*	*No. of Operational Holdings*	*%age of Holdings*	*Area Operated Total Area (in Ha.)*	*% age of Total Area*	*Av. Size of Operational Holdings (in Ha.)*
1.	Marginal (Less than 1.0 Ha.)	295668	26.47	164224	4.07	0.56
2.	Small (1.0 to 2.0 Ha.)	203842	18.25	328215	8.14	1.61
a)	**Sub Total (1+2) (Less than 2.0 Ha.)**	**499510**	**44.72**	**492439**	**12.21**	**0.99**
3.	Semi Medium (2.0 to 4.0 Ha)	288788	25.86	841541	20.87	2.91
b)	**Sub total (a+3)** (Less than 4.0 Ha)	**788298**	**70.58**	**1333980**	**33.00**	**1.69**
4.	Medium (4.0 to 10.0 Ha.)	261481	23.41	1621811	40.22	6.20
5.	Large (10.0 Ha and above)	67171	6.01	1076892	26.70	16.03
	Grand Total	**1116951**	**100.00**	**4032683**	**100.00**	**3.61**

Source: *Agricultural Statistics of Punjab on the Eve of New Millennium: 2000; Statistician - Department of Agriculture, Punjab*

Crop Failures lead Punjab Farmers to Suicide

Chandigarh, April 20.

About 80 cases of suicides by farmers and agricultural labourers reported from five villages of Sangrur district in the last four or five years could only be the "tip of the iceberg" as death stalks the rural areas of the Lehra and Andana blocks in the otherwise prosperous distirct of Punjab.

According to a former sarpanch, Mr. Jarnail Singh, and a jathedar, Mr. Mastan Singh, about 33 persons had been driven to suicide in Balaran village. While it is zero in the official record, since 1994

The Hindu, New Delhi, 21.04.1998

suicides were occurring. But when the media reported the suicides in large numbers then the government formed committees to look into the matter. But unfortunately, these committees failed to pinpoint unremunerative agriculture, increased cost of production and large-scale indebtedness as major reasons for the misery of the farmers and instead concluded that the suicides are taking place due to family problems, intoxication and other social reasons.

The study on 'Suicide in Rural Punjab' conducted by the Institute of Communication and Development, Chandigarh, in 1998, confirmed that there has been a distinct increase in the number of suicides in Punjab since 1998. In 1992-93, the suicides in Punjab increased by 51.97 percent; in 1993-94 there was an increase of 14 percent; in 1994-95 the increase was 57 percent. It notes with concern that suicides rates i.e. the number of suicides per lakh population has been steadily increasing from 0.57 in 1988 to 2.06 in 1997 in Punjab (Suicides in Rural Punjab, 1998).

It has been also observed that the percentage share of cultivator farmers' suicide to the total suicides in Punjab between 1991-97 was to the extent of 23 percent. In Sangrur district the percentage share of cultivator farmers to the total suicides in the district was to the extent of 50 per cent. The suicide rate of cultivator farmers in 1993 was 1.98, which increased to 4.49 by 1997. The study clearly admits that the rate of suicides of cultivator farmers has been on the rise in Punjab since 1993. However, the Chief Minister of Punjab undermine the alarming situation. According to a reply on suicides in Punjab, the State's Chief Minister during June-July Assembly Session in 1998 (Q. No. 1087) had said, "During 1996, 1997 and 1998 there were only 8 suicides of farmers and agricultural labourers in Punjab. One in Tarn-Taran in Amritsar district in 1996 was a result of family dispute. The three in Sangrur were due to crop damage and indebtedness. Three in Bhatinda were because of crop damage and indebtedness and one in Jalandhar due to crop damage by hailstorm".

Fifteen years back Paramjit Singh of Punjab cultivated chillies. Over the years, the cost of chemicals increased. Lately, the yield had also declined considerably. Local money lenders forced Paramjit Singh to sign on blank papers in return for giving him loans and took over his land. When he could not repay his loans, they dragged him off the land. This was more than he could bear, and he committed suicide.

Sangrur and Bhatinda districts reported the maximum suicides, with suicide rates of 12.08 percent and 6.24 percent respectively. It is also noticed that the share of non-cultivators' suicides in these two districts is also very high as compared with other districts i.e. 13.24 percent and 11.35 per cent respectively. While the district of Mansa, Amritsar, Ferozpur, Gurdaspur, Faridkot and Muktsar has moderate level of suicide proneness during 1991-97. All these districts comprises the cotton-belt of Punjab.

Some analysts acknowledge the suicide phenomena in Punjab but characterise it as a fallout of militancy. Countering this Mr. Inderjeet Singh Jaijee, Convenor of the Movement Against State Repression, said "If this were the case one would expect to find suicides limited to Punjab and that too to certain areas of Punjab such as the border districts. This is not the

case. Lehra and Andana Blocks in Sangrur district have been identified as suicide prone area and yet this part of Punjab was less affected by militancy. Likewise Haryana did not suffer the turmoil and disruption of militancy, yet debt related suicides are being reported from that state too".

The increased number of farmer suicides in Punjab can be understood in the context of growing distress in agriculture of the state. The factors contributing to this state of affairs in agriculture are the decline in the farmers income from the farm, increased cost of production, crop failures and crop loss, monoculture of wheat - paddy cultivation, rising unemployment in the rural areas etc. According to an estimate of the Department of Economic and Sociology, Punjab Agriculture University, Ludiana, "the annual surplus of small size farm is about Rs. 9500/= during 1993-84". It further estimates that "the best managed five hectares farm with standard field crop rotation, can earn barely an income equivalent to the average per capita income in Punjab." However, in 1999-2000 this could have declined further due to the increased cost of production of principal crops in the state.

Green Revolution is No More Green

The large-scale suicide of farmers in Punjab exposes the flaws in the much-vaunted green revolution. Today the village agricultural economy of Punjab is in crisis and the living conditions of the farming community and farm labourers are in bad shape.

Mr. Prakash Singh Badal, the present Chief Minister of Punjab, has said once "agriculture for most has become a pain in the neck. It is not profitable at all except for those who own ten acres or more... What is in the hands of the state? Everything has been centralised. Prices of all inputs are controlled and fixed either by the industry or Union Government. The price of farmers produce – wheat and paddy and most of the other produce – are fixed by the Centre (Tribune, May 15, 1998).

The farmers of Punjab are voracious users of inputs in their bid to enhance productivity of agricultural crops. For example, Punjab consumes 10 percent of the fertilisers, 11 per cent of the pesticides and 55 percent of the herbicides used in the entire country. The same is true for other agricultural inputs like irrigation and use of farm machinery.

In Punjab the growth of agriculture is mainly confined to two crops, rice and wheat, and has reached its saturation point. The data of Punjab indicates that the productivity of rice was 4.89% during 1965-66 to 1985-86 and it declined to 0.58 % between 1885-86 to 1996-97. The productivity of wheat has also declined from 2.79 to 2.14, sugarcane declined from 3.40 to 0.28 in the corresponding period. The productivity of cotton increased to 1.63 between 1965-66 to 1885-86 but the total production of cotton in the state declined from 19.25 lakhs bales in 1996-97 to 9.41 lakh bales in 1997-98 due to the pest attack and crop failures. However, in the 80's itself, the Punjab Agriculture University, Ludhiana, made it abundantly clear that farmers with holdings less than 14 acres were fighting a losing battle for survival.

Essential factors such as soil health and water resources are getting overstrained and there is a serious build up of pests, diseases and weeds. Pest has emerged as a very serious menace in Punjab due to monocultures. There

is also no scope for further expansion of the area under cultivation or increase in the cropping intensity (which is at present at a very high level of 186 percent).

The water resources of the state are being over exploited through the adoption of high water requiring cropping sequences and the use of high yielding varieties.

Increased Cost of Production

The increase in the prices of inputs and labour has pushed the cost of production up during the last three decades, (6 times for wheat, 7 times for cotton and 10 times for paddy). The increased cost of production has led to increased indebtedness among farmers in Punjab. Today 90 percent farmers of Punjab are in the trap of debt.

To get an idea of the soaring cost of cultivation in Punjab it is desirable to study the trends of the three major crops of the state i.e. Paddy, Wheat and Cotton.

The per hectares cost of cultivation of paddy in Punjab has increased to five times in a span of 18 years from Rs. 3419.33 in 1978–79 to Rs. 17,966.85 in 1996-97. The cost of production of per quintal of paddy has increased from Rs. 68.71 in 1978-79 to Rs. 334.81 in 1996-97 (see Table 3.6).

However in comparison to the five-fold increase in the cost of cultivation of paddy there is no corresponding increase in its yield. The yield increased by just 2.17 quintals per hectare from 1978–79 to 1996-97. However, during this period there is very significant increase in the use of fertiliser, insecticide and machine labour in the paddy crop in Punjab and a very drastic decline in the use of animal labour. This also indicates that the Punjab farmers have almost left doing any manual work at their farm. They have left it to either migrant labourers to do all manual jobs or use machinery.

The fertiliser use in Paddy increased from 163.85 kg in 1978–79 to 195.49 kg per hectare in 1996-97. During the same period the total amount of insecticide, in terms of value, also increased from Rs. 56.77 to Rs. 825.04 while the machine labour cost increased from Rs. 90.93 to Rs. 956.80. Unfortunately the heavy use of machine labour has its impact on the animal labour in the farm which declined from 21.89 pair hours in 1978-79 to 1.99 pair hours in 1996-97 (Cost of Cultivation of Principal Crops, '91, '96 & Feb. 2000).

The wheat crop has also shown the similar increasing trend in cost of production. There is a six fold increase in the per hectare cost of cultivation of wheat in Punjab from Rs. 2722.36 in 1977-78 to Rs. 17,333.89 in 1997-98. During the same period the cost of production per quintal of wheat has also increased from Rs. 108.57 to Rs. 411.97 (see Table 3.7).

In wheat, the yield has increased from 22.61 quintal in 1977-78 to 35.78 quintals per hectare in 1997-98. In comparison to this, during the same period, the fertiliser use also increased from 125.69 kg per hectare to 224.87 kg per hectare, the cost of insecticide per hectare increased from Rs. 0.95 to Rs. 428.83 and cost of machine labour per hectare also increased from Rs. 283.03 to Rs. 1692.07. Due to the heavy use of machine labour, the animal labour declined from 45.44 pair hours in 1977-78 to 2.47 pair hours in 1997-98 (Cost of Cultivation of Principal Crops, '91, '96 & Feb. 2000).

TABLE 3.6

Economics of Paddy Cultivation in Punjab

ITEMs	*1974-75*	*1978-79*	*1981-82*	*1982-83*	*1983-84*	*1984-85*	*1985-86*	*1986-87*	*1987-88*
1. Cost of Cultivation per Heact. (Rs.)	2894.33	3419.33	5473.89	5805.82	6482.42	7016.31	6639.97	7390.21	7847.81
2. Cost of Production per Qtl. (Rs.)	91.63	68.71	102.31	103.87	122.32	137	125.74	129.23	149.19
3. Yield Per Hect. (Qtls.)	31.15	49.47	53.3	55.66	52.82	51.14	52.33	56.71	52.1
4. Fertilisers Use per Hect. (kg. Nutrients)	84.1	163.85	171.72	157.57	213.14	192.57	161.3	165.87	194.51
5. Fertilisers rate per Unit (kg. Nutrients)	-	-	5.01	5.22	4.95	5.02	4.99	5.34	4.99
6. Fertilisers Cost per Hect. (Rs.)	387.67	569.18	860.39	822.02	1055.4	965.86	805.66	885.19	970.95
7. Animal Labour input per Hect.(pair hours)	97.58	21.89	36.54	29.69	26.69	38.26	30.57	25.45	18.96
8. Seed cost per Hect. (Rs.)	110.34	113.39	134.78	124.27	129.73	140.72	130.12	126.54	152.38
9. Insecticide cost per Hect. (Rs.)	0.31	56.77	119.36	109.39	142.54	168.64	146.15	170.42	169.64
10. Mechine Labour (Rs.)	44.44	278.75	310.21	426.66	447.99	463.81	460.89	445.44	685.14

	1988-89	*1989-90*	*1990-91*	*1991-92*	*1992-93*	*1993-94*	*1994-95*	*1995-96*	*1996-97*
1.	7684.71	8785.65	10082.42	10390.8	12651.21	14593.63	15248.49	15526.2	17966.85
2.	159.55	147.18	194.69	206.77	224.38	266.87	290.36	338.81	334.81
3.	47.3	58.97	51.37	49.79	56.18	53.93	51.84	46.03	51.64
4.	179.44	188.03	213.39	185.34	193.04	183.25	195.21	156.99	195.49
5.	4.82	4.76	5.36	5.64	7.21	7.31	8.1	8.47	8.82
6.	865.79	894.24	1144.07	1045.92	1392.58	1340.07	1581.19	1329.86	1724.63
7.	17.16	25.96	6.94	7.35	4.1	5.88	3.79	4.77	1.99
8.	153.89	155.64	174.45	189.9	183.94	218.57	293.87	281.21	354.81
9.	172.82	220.13	262.05	323.27	380.83	490.84	650.44	609.27	825.04
10.	583.25	772.12	990.8	925.49	1087.17	966.85	1053.54	1259.76	1789.07

Source: *Cost of Cultivation of Principal Crops in India, 1991, 1996 and February 2000; Directorate of Economics and Statistics, Ministry of Agriculture, New Delhi*

TABLE 3.7

Economics of Wheat Cultivation in Punjab

	ITEMs	*1970-71*	*1971-72*	*1972-73*	*1973-74*	*1974-75*	*1975-76*	*1976-77*	*1977-78*	*1978-79*	*1979-80*	*1980-81*	*1981-82*
1.	Cost of Cultivation per Hect. (Rs.)	1654.59	1769.25	1650.54	2037.14	2668.65	2632.32	2611.89	2722.36	3040.93	3161.83	3439.47	3776.19
2.	Cost of Production per Qtl. (Rs.)	61.04	59.71	67.1	74.34	87.76	99.45	101.39	108.57	101.45	102.88	124.7	118.77
3.	Yield Per Hect. (Qtls.)	24.4	26.43	22.6	24.87	27	23.11	22.74	22.61	27.49	27.91	25.2	30.75
4.	Fertilisers Use per Hect. (kg. Nutrients)	-	110.39	109.53	112.54	80.26	98.71	119.08	125.69	155.9	172.88	168.35	153.05
5.	Fertilisers rate per Unit (kg. Nutrients)	-	2.09	2.19	2.66	5.25	4.37	3.7	3.25	3.43	3.32	4.63	5.36
6.	Fertilisers Cost per Hect. (Rs.)	208.6	230.61	224.76	299.06	421.33	430.96	440.96	407.94	534.67	574.44	781.11	820.03
7.	Animal Labour per Hect.(pair hours)	-	103.92	103.08	96.63	101.66	93.87	92.6	72.25	45.44	45.19	37.94	31.49
8.	Seed cost per Hect. (Rs.)	65.35	68.68	74.96	84.04	107.2	108.53	120.97	144.21	145.16	133.66	163.56	168.16
9.	Insecticide cost per Hect. (Rs.)	0.41	0.47	3.37	7.12	1.16	2.22	0.01	0.95	5.73	9.97	14.16	22.51
10.	Machine Labour (Rs.)	80.43	107.59	101.36	141.44	113.84	174.55	152.1	283.03	337.02	367.58	458.46	474.24

	1982-83	*1983-84*	*1984-85*	*1985-86*	*1986-87*	*1987-88*	*1988-89*	*1989-90*	*1990-91*	*1991-92*	*1992-93*	*1994-95*	*1995-96*	*1996-97*	*1997-98*
1.	4227.28	4452.57	5154.72	5387.84	5306.96	5943.42	6686.22	6991.52	8002.43	9274.96	10945.52	13598.04	14311.17	17992.01	17333.89
2.	125.19	137.47	136.33	129.29	151.49	139.95	150.01	164.24	190.79	210.41	250.72	298.68	342.83	362.5	411.97
3.	30.75	29.49	33.45	35.6	30.32	34.14	36.51	36.93	36.22	38.34	37.08	39.41	36.06	43.48	35.78
4.	155.59	161.24	162.36	167.82	182.4	183.2	184.63	189.5	208.04	197.98	194.63	203.18	203.66	220.17	224.87
5.	5.25	4.82	5.01	4.81	4.93	5.16	5.01	5.21	5.16	6.79	7.99	9.41	10.43	10.48	10.3
6.	816.22	776.4	813.05	808	898.45	944.44	925.63	987.45	1072.91	1344.64	1554.9	1912.61	2124.67	2307.45	2315.34
7.	30.04	27.89	30.83	24.78	19.31	15.58	14.62	13.88	9.37	8.35	5.77	3.72	2.53	2.66	2.47
8.	207.04	195.88	203.72	207.43	227.12	259.79	306.76	276.48	325.38	374.4	403.17	463.95	500.57	647.31	691.19
9.	59.8	111.01	69.17	62.7	104.7	116.45	160.7	190.37	183.2	191.83	208.16	294.26	314.32	388.4	428.83
10.	532.1	535.72	600.89	667.22	657.58	765.49	825.12	826.49	974.35	1093.65	1157.69	1182.02	1384.67	1586.4	1692.07

Source: *Cost of Cultivation of Principal Crops in India, 1991, 1996 and February 2000; Directorate of Economics and Statistics, Ministry of Agriculture, New Delhi*

TABLE 3.8

Economics of Cotton Cultivation in Punjab

	ITEMs	*1972-73*	*1973-74*	*1974-75*	*1975-76*	*1979-80*	*1980-81*	*1981-82*	*1982-83*	*1983-84*	*1984-85*	*1985-86*
1	Cost of Cultivation per Heact. (Rs.)	1535.95	1864.73	2277.47	2154.31	2551.71	3095.85	3417.03	3281.21	3443.7	4527.43	4693.62
2	Cost of Production per Qtl. (Rs.)	149.19	187.37	236.97	225.95	306.1	338.65	331.38	398.08	593.47	357.28	341.66
3	Yield Per Hect. (Qtls.)	9.77	9.52	9.21	9.11	7.97	8.72	10.39	7.77	5.44	12.11	12.95
4	Fertilisers Use per Hect. (kg. Nutrients)	38.77	60.44	41.63	47.36	37.18	43.91	47.58	45.27	54.89	51.89	62.73
5	Fertilisers Cost per Hect. (Rs.)	84.71	134.25	188.03	189.83	126.3	195.26	238.58	230.12	260.24	237.92	302.98
6	Insecticide cost per Hect. (Rs.)	40.2	42.14	30.42	51.99	70.17	117.65	144.44	189.27	255.33	314.67	319.04
		1986-87	*1987-88*	*1988-89*	*1989-90*	*1990-91*	*1991-92*	*1992-93*	*1993-94*	*1994-95*	*1995-96*	*1996-97*
1.		5318.82	6594.17	6514.42	8201.68	8758.21	12447.5	11826.35	13862.64	17311.03	17073.11	19496.52
2.		360.38	385.41	548.35	513.34	849.52	803.62	831.56	1107.38	1421.08	1643.83	1703.04
3.		13.94	16.34	11.25	15.4	9.83	15.1	13.72	12.21	11.92	10	10.93
4.		57.67	68.84	92.47	100.72	123.87	99.73	98.26	101.19	106.15	82.68	86.66
5.		290.18	320.66	430.88	477.02	686.54	527.67	670.38	696.25	882.2	710.94	776.11
6.		351.88	466.05	582.56	651.51	1131.22	1095.72	1446.85	1597.24	2243.19	1999.69	2401.49

Source: *Cost of Cultivation of Principal Crops in India, 1991, 1996 and February 2000; Directorate of Economics and Statistics, Ministry of Agriculture, New Delhi*

Cotton is not untouched either. There is sharp increase in the cost of cultivation of cotton. In 1975-76 the cost of cultivation was Rs. 2154 per hectare which increased to Rs. 19,497 per hectare in 1996-97 which is more than eight-fold increase. Obviously the cost of production per quintal has also increased in this period from Rs. 225.95 to Rs. 1703.04 (see Table 3.8).

In cotton also there is no significant increase in yield in Punjab despite heavy use of fertilsers and pesticides. In 1975-76 the yield of cotton was 9.11 quintals per hectare which increased to only 10.93 quintals in 1996-97. In comparison to the yield the cost of insecticide use increased from Rs. 51.99 to Rs. 2401.49 and the fertilisers cost increased from 189.83 to Rs. 776.11 per hectare during the same period (Cost of Cultivation of Principal Crops, '91, '96 & Feb. 2000). In 1999-2000 the total consumption of pesticides in Bhatinda alone was about 941,671 liters. Out of this 90% are used only in cotton.

Cotton is a major crop of the southwestern districts of Punjab such as Bhatinda, Faridkot, Mansa, Moga, Muktsar and Sangrur which accounted to 13 to 20 percent of the national cotton production. But in the last few years there is a sharp decline in cotton production. The major constraints in cotton crop are the inadequate availability of certified cotton seed, water logging in some pockets of the cotton area, bad weather condition during cotton season etc.

In Punjab about 80-85% of the area under this crop is covered by American cotton (*Hirsutum*) and the remaining area is under desi (*Arboraum*) (see Table 3.10). Among the prominent varieties of American cotton are LHH-144, Fateh, F-1378, LH-1556, F-1054, F-846, and LH-900 and the desi cotton varieties are LDH-II, LD-491, LD-327 and LD – 230.

In the last few years there is a drastic increase in population of sucking pests and aphids, jasids and bollworm particularly American Bollworm. The farmers are following the dangerous trend of spraying cocktail of pesticides so that atleast one or the other chemical of the mixture could control the pest.

One significant change occurring in the last couple of years in the cotton cultivation in Punjab is the increase in the area of hybrid cotton. It has increased from 10,200 hectares in 1998-99 to 76,800 hectares in the present cropping year i.e. 2000-2001. This is disturbing trend and it will further escalate the cost of cultivation of farmers and would promote a very intensive use of pesticides as we have witnessed in Andhra Pradesh.

However, hybrid seeds by their very nature are high-risk seeds under high input conditions affordable only by rich farmers. They may give good yield but for resource poor farmers, they translate into high risks and high debts.

Also, hybrid seeds are highly pest prone and therefore need frequent pesticide applications. Pesticides create new pest problem as well as environmental and health hazards. Pesticides failed to control pest whether or not they are spurious.

With the increase in the area of hybrid cotton the pest attack will further increase and it will create more problem for the Punjab farmers.

Due to the pesticide treadmill the farmers borrows money on credit to buy pesticides. In 1999 – 2000 also as the bollworm attacked cotton plants, the farmers started taking more loans to buy pesticides and insecticides to save their crops. While the Agriculture Department authorities maintain that there was a mild attack of bollworm in the cotton belt, cotton growers of about 20 villages

TABLE 3.9
Consumption of Chemical Fertilisers (000 Nutrient Tonnes) in Punjab

	Fertilisers	*1970-71*	*1980-81*	*1990-91*	*1995-96*	*1996-97*	*1997-98*	*1998-99*
1.	Nitrogenous	175	526	877	1020	962	1005	1081
2.	Phosphatic	31	207	328	227	229	287	275
3	Potassic	7	29	15	16	17	22	19
4.	Total (NPK)	213	762	1220	1263	1208	1314	1375
5.	Consumption per hect. (in kgs.)	38	143	163	163	155	167	-

Source: *Agricultural Statistics of Punjab on the Eve of New Millennium: 2000; Statistician - Department of Agriculture, Punjab*

in Talwandi Sabo Block of Bhatinda pointed out that the attack was alarming. Sikander Singh of Bhai Bakhtaur village says, "*Sundi* (bollworm) has badly hit the crop. If the bollworm were not killed at this stage, it would kill the cotton growers." He was not able to return the loan last year for buying pesticides and insecticides for spraying on the cotton crop but this year he had to take a loan again for the same task (Tribune, 17.8.2000).

Another farmer, Mr. Resham Singh said that for the past six years he had been growing cotton and suffering losses. Every year he had been taking loans to meet his agricultural and social needs and now he was neck deep in debt.

The cotton farmers points out that bollworm has become resistance to insecticide and pesticides. If the government fail to take any action and the farmers fail to adopt the alternative methods of pest control and integrated management of pests, Punjab might again witness a spurt in the numbers of farmers suicides.

TABLE 3.10
Variety wise area under Cotton in Punjab

American Cotton Varieties				*(Area in '000 Hectares)*
	Variety	***1998 - 99***	***1999 - 00***	***2000 – 01***
1.	F 846	237.30	151.84	57.90
2.	F 1378	53.10	75.50	131.92
3.	LH 1556	37.50	26.50	79.80
4.	Hybrids	10.20	31.13	76.82
5.	Skinderpuri	32.30	20.40	29.80
6.	F 414	34.00	20.00	14.85 (Pk 54)
7.	Others	47.90	43.93	48.82
	Total	**452.30**	**369.30**	**439.91**
Desi Cotton Varieties				
1.	LD 327	54.20	60.40	82.19
2.	RG 8	46.50	33.10	24.68
3.	Others	9.00	12.20	3.22
	State Total	**562.00**	**475.00**	**550.00**

Source: *Department of Agriculture, Punjab*

For economic survival of small and marginal peasants it is imperative to shift away from pesticides treadmill which is pushing farmers into debt and suicides. The farmers are being forced into intensive industrial agriculture which is leading to the loss of their money, their land and their lives.

Extensive Crop failure

Besides the pest attack another menace being faced by the farmers in Punjab is the extensive crop failure and seed failure. Many analysts have attributed crop failure and seed failure as the reason of suicides in Punjab. Prof. Gopal Iyer has acknowledged this fact in his report on Suicides in Punjab. He says that "Punjab has also experienced substantial crop loss in cotton consistently during 90's and there was a major crop loss during 1998 Kharif. This fact has been adequately acknowledged by the Punjab Government in its report submitted

TABLE 3.11

Details of the use of Chemical Pesticide in Cotton cultivation in Bhatinda, Punjab

1st Spray of Systemic Products *(one among the six given below)*			*After 60 days of planting*
	Systemic Products	*Dosage/ Acre*	*Price/ Acre*
I.	Confidor	40 ml.	Rs. 125/-
II.	Monocrotophos	400 ml.	Rs. 100/-
III.	Metasistocs	400 ml.	Rs. 125/-
IV.	Roger	400 ml.	Rs. 80/-
V.	Dymecon	150 ml.	Rs. 60/-
VI.	Endosalpha	1 liter	Rs. 200/-
Dosage of the first spray recommended by Department of Agriculture, Bhatinda			
2nd Spray also of the Systemic products *(in the same dosages)*			*After 70-75 days*
3rd Spray of Synthetic Parathoid *(one among the five given below)*			*After 80-90 days*
	Synthetic Parathoid	*Dosage/ Acre*	*Price/ Acre*
I.	Fhenwalrate	150 ml.	Rs. 40/-
II.	Cypermathlin	200 ml.	Rs. 50/-
III.	Alphamathrin	150 ml.	Rs. 70/-
IV.	Karate	150 ml.	Rs. 70/-
V.	Decameterin	200 ml.	Rs. 100/-
4th Spray is often a cocktail of one of the Synthetic Parathoid mixed with one of three given below			
	Chemical Name	*Dosage/ Acre*	*Price/ Acre*
I.	Cloropariphos	1 liter	Rs. 150/-
II.	Etheon	800 ml.	Rs. 150/-
III.	Quienalphos	800 ml.	Rs. 160/-

On an average 9-10 sprays are made in Cotton in Bhatinda and for that matter in the entire cotton belt in Punjab. Sometimes it goes up to 15. After 4th spray the farmers simply make a cocktail of chemicals from 1st, 3rd and 4th spray chemical lists, choosing the chemicals randomly. Sometimes a cocktail of two chemicals are used but very often, as witnessed during heavy pest infestation in last few years, 3 - 4 chemicals are mixed for spray in cotton fields.

to the Central Government for compensation to Punjab farmers due to crop loss for Kharif in 1998. The untimely rain in the third week of September and again from October 15 to 18, 1998 caused extensive damage to standing and harvested crops in Punjab" (Iyer and Manick, 2000).

However, there are also examples of seed failures and farmers have suffered huge loss. In this cotton season (1999-2000) too several instances of crop failure were noticed. In the Jagaram Tirath village of Talwandi Sabo Block, District Bhatinda, the Kohinoor Variety of hybrid cotton is performing very poorly. Most of the farmers who have sown this variety are not happy with this and they are now mentally prepared to face a total failure of this crop. Some realised this in the beginning and replanted the same field. Mr. Gurcharan Singh (S/o Mehr Singh) and Mr. Gurdeep Singh Sarpanch had to plant again when their Kohinoor Seeds did not germinate well.

Similarly Mr. Mahinder Singh, S/o Mangal Singh of Jagram Tirth village also sown Kohinoor hybrid cotton in seven acres. Though it is an early variety as claimed by the company but till mid of August, after 120 days of planting, very few plants had given flower. The farmers said that by this time the bolls would have been ready. When the villagers went to the dealer to complain he said that the bolls would come and that the same variety is doing well in Rajasthan, knowing fully well that no farmers would go there to investigate.

According to farmers, in more than 20 villages of Moud Mandi, Talwandi Sabo, Rama Mandi, Mansa Mandi about 50% farmers had planted Kohinoor cotton but in all these villages it showed signs of failure, as reported by farmers of Jagram Tirth village.

The loss of crop is a curse for the indebted farmers and in extreme cases they commit suicides.

Cropping Pattern: Trends towards Monoculturism

In Punjab, the cropping pattern shows a trend towards monoculture. The farmers are abandoning the cultivation of diverse crops e.g. pulses, bajra, jowar,

oilseeds etc and got trapped into the paddy-wheat combination. This is one of the major reasons of farmers declining productivity and income. They are now dependent upon the market for their day to day requirement of pulses, oilseeds and vegetables. Though Punjab is know for being the "Food Basket of country and Granary of India" it is not in a way bringing prosperity to its own farmers. The Paddy-wheat combination in Punjab is wiping out agricultural diversity.

The area under rice has increased from 227 thousand hectares in 1960-61 to 2,519 thousand hectares in 1998-1999, an eleven-fold increase. The area under wheat increased from 1400 thousand hectares in 1960-61 to 3338 thousand hectares in 1998-1999, while the area under cotton increased from 446 thousand hectares in 1960-61 to 724 thousand hectares in 1997-98 but declined to 475 thousand hectares in 1999-2000 due to crops failures in the last few years. But again in 1999 – 2000 the area under cotton again increased to 550 thousand hectares in Punjab (Agricultural Statistics of Punjab on the Eve of New Millennium: 2000).

However, the area under pulses in Punjab has decreased drastically from 903 thousand hectares in 1960-61 to 78 thousand hectares in 1998-99, more than ten-fold decrease. In the same period gram went down from 838 thousand hectares in 1960-61 to 132 thousand hectares in 1998-99, which is more than a sixty-fold decline. The area under maize went down from 327 thousand hectares to 154 thousand hectares in the same period. Area under oilseeds has also decreased from 185 thousand hectares to 158 thousand hectares. Area under millets and coarse grains has also declined. In the case of Bajra and Jowar, the decline is very sharp, from 123 thousand hectares to only 4000 hectares and 17 thousand hectares to Nil, during the period from 1960-61 to 1998-99 respectively.

TABLE 3.12

Cropping Pattern of Punjab

in Percentage)

S.N.	*Crops*	*1950-51*	*1960-61*	*1970-71*	*1980-81*	*1990-91*	*1995-96*	*1996-97*	*1997-98*
1.	Paddy	2.9	4.8	6.9	17.5	26.9	28.2	27.7	29.1
2.	Maize	6.3	6.9	9.8	5.6	2.5	2.2	2.1	2.1
3.	Bajra	5.2	2.6	3.7	1.0	0.2	0.1	0.1	0.1
4.	Wheat	27.3	29.6	40.5	41.6	43.6	41.6	41.43	42.1
5.	Barley	2.4	1.4	1.0	0.9	0.5	0.5	0.4	0.5
6.	Total Pulses	23.8	19.1	7.3	5.0	1.9	1.3	1.3	1.1
7.	Total Oilseeds	3.3	3.9	5.2	3.7	1.5	3.0	3.2	2.5
8.	Sugarcane	2.2	2.8	2.3	1.0	1.3	1.8	2.2	1.6
9.	Cotton	5.4	9.4	7.0	9.6	9.3	9.6	9.5	9.2
10.	Total Vegetables	1.2	1.2	0.9	1.1	0.7	1.0	1.0	1.1
11.	Total fruits	0.8	0.6	0.6	0.4	0.8	1.1	1.1	1.1
12.	Other Crops	19.2	17.7	14.8	12.6	10.8	9.6	10.0	9.5
13.	Total Cropped Area	100.00	100.00	100.00	100.00	100.00	100.0	100.0	100.0

Source: *Agricultural Statistics of Punjab on the Eve of New Millennium: 2000; Statistician - Department of Agriculture, Punjab*

It is true that with only 1.57% of the geographical area of the country Punjab produced 19.3% of wheat, 9.6% of Rice and 8.4% of cotton of the total produce during the year 1997-98, and contributes 40-50% of rice and 50-70% of wheat to the Central Pool. However, the increase in area of wheat and rice has shifted the whole cropping pattern of Punjab from diversity to monoculture and quite obviously the shift to monoculture would register an increase of monoculture output but a drastic decline in the output of the diverse crops.

The production of pulses has decreased from 709,000 tonnes in 1960-61 to 50,000 tonnes in 1998-99. Similarly the production of oilseeds, millets and maize has also decreased in Punjab due to the spread of monoculture of wheat and rice. This shift has left no option with farmers except a hope that they would get better yield next year. With that hope they are getting trapped into the treadmill of fertilisers and pesticides and keep on going down into the swamp of debt and humiliation.

Their profit from agriculture has declined while their household expenditure has been increasing. They are still basking in the glory of their good days during the 80' and early 90's when their income had increased many fold due to introduction of HYV, good return from cotton and government supported subsidised inputs to encourage Green Revolution. Today Green Revolution is no longer green. Neither are the HYV performing a miracle of instant increase in yield, cotton has been failing in the last few years and government has been withdrawing the crutches of subsidy. Now to feed their farms with chemical fertilisers and pesticides and to feed themselves and their families they are getting trapped into control of the private money lenders, tractor agencies, seed, fertilisers and pesticides dealers and their burden of debt is increasing every year.

Reckless Mechanisation of Agriculture

Though the agriculture in Punjab is undergoing a severe crisis yet there is no sign of decline in the sale of farm machinery. The farmers of the state have been suffering due to the high cost input intensive agriculture. Table 3.13 on the increase in agricultural implements in Punjab from 1995 to 1999 validates this. In Mansa district alone, which is a very backward district of Punjab and a suicide prone area too, the total number of tractors of all brands sold every year is around 1200 according to Mr. Kishor Chand, Manager Amar Tractor Agency.

However the agricultural experts of Punjab blame tractors for the indebtedness of farmers. The tractor has become status symbol for many a farmers. At present there are

TABLE 3.13

Agricultural Implements and Machinery in Punjab (in '000 Number)

S. N.	Agricultural Implements & Machinery	Position On 31.3.95	31.3.96	31.3.97	31.3.98	31.3.99
1.	Tractors/ Trailers	320	330	350	365	375
2.	Tiller/ Cultivators	220	228	235	245	250
3.	Disc Harrows (T. Drawn)	240	248	255	265	265
4.	Seed-cum-fertiliser Drill	130	135	140	145	155
5.	Spray Pumps	485	510	525	540	545
6.	Tractor Drawn Combines	4.4	4.6	4.7	4.8	4.9
7.	Self Propelled Combines	2.2	2.3	2.4	2.5	2.7
8.	Threshers	305	305	315	325	340
9.	Cane Crushers	35	35	35	35	30
10.	Tube Wells	860	875	900	925	935

Source: *Agricultural Statistics of Punjab on the Eve of New Millennium: 2000; Statistician -Department of Agriculture, Punjab*

about 4 lakh tractors in Punjab. Even farmers with 5-6 acres of land buy tractors in this state. This has given rise to a second hand market of tractors and once a week, tractor mela (market) is held in more than 15 different places in Punjab. But more than that it shows the bad state of affairs of Punjab farmers who are selling their tractors to pay their debt or due to some social obligations.

Farmers buy new tractors on loan and within a month sell it in the market at Rs. 50,000-60,000 less than the actual price. This phenomenon is very much prevalent among distressed farmers in Punjab. The reason for such resale, as acknowledged by some of the farmers, is to repay the loans burrowed from local *arthies.*

Increased Farmers' Suicides

Suicides in Punjab have acquired an alarming proportion in the recent years. The suicides by Punjab farmers are occurring on a large scale especially in the southern districts of Punjab, which is also the main cotton zone of this state.

As reported by Dr. Gopal Iyer and Dr. Meher Singh Manick of the Department of Sociology, Punjab University, the reason for suicides by farmers in Punjab were mainly due to high indebtedness. According to this report, "indebtedness among the farmers and farm labourers in Punjab has reached epidemic proportions. Landless agricultural labourers, small and marginal farmers are more vulnerable than large farmers. Large farmers are able to sell portions of their holdings to pay off debts, which acts as a buffer. The major thrust of the small and semi-medium farmers is to borrow primarily for agriculture and marriage purposes. The lending agencies not only pressurise the farmers to clear the outstanding loans but also humiliate them. They experience loss of prestige and are forced to commit suicide (Iyer and Manick, 2000).

High indebtedness by these farmers is followed by constant pressure from lending agencies to repay the loan which is one of the important factor for farmers to commit suicide. Another important factor is the resistance by the family members towards selling of land to clear off the debts which culminates into suicides by one or more family members.

In the Chek Ali Sher village in Mansa three members of one family committed suicide due to the debt problem. The moneylender claimed his title over the farmers' land, which forced the father and two sons to commit suicides.

Social Reasons

In fact, this culture of committing suicides to escape from the indebtedness and social stigma of being financially broke started in Punjab a few years ago. Small and marginal farmers are opting for commercial crops e.g. hybrid cotton, on a large scale and making huge investment anticipating good return. To meet the heavy investment demands the farmers go for private loans at a very high interest, e.g. 2% to 3½ % per

Crop Failure and Mounting debts drive Punjab farmer to Suicide

Bhatinda, Oct. 2.

Reeling under heavy debts and disappointed over the decay of his crop, Mohinder Singh (30), a farmer of Nat Bagher village,about 35 km from here, allegedly ended his life consuming pesticide. He has left behind a 27-year old wife and three children.

Mohinder's uncle told the Indian Express that he (Mohinder) owed Rs. 2 lakh to a commission agent and money lenders. He has taken nine acres of land on contract at the rate of Rs. 7,000 per acre.

His coton crop on seven acres was destroyed by American bollworm and other pests. Another farmer , Jarnail Singh said that about 90% farmers of the village were under debt owing to thebad crops for the past five years.

The Indian Express, New Delhi, 03.10.1998

month. This has given rise to several other social problems among cultivators' families in Punjab.

According to the psychiatrists in Punjab, debt trap has led to an increase in consumption of intoxicants, matrimonial disputes and family disputes. Expenses of the community have been ascending. Most of the farmers are very 'status conscious'.

Most of the Punjab farmers have insufficient income to maintain themselves. Many farmers have lost the land and they migrate to the cities in search of jobs as labourers. They feel ashamed to work as labourers in their own village. In the cities they compete with the migrant labourers. Even the landlords prefer to employ migrant labourers because they are cheaper and well behaved as compared to the local labourers.

Two More Farmers Commit Suicide in Punjab

In yet another case of debt and crop failure deaths, two farmers of Bir Khurd village in this district allegedly committed suicide by consuming pesticides. Bikkar Singh (39) and Baldev Singh (42) ended their lives on October 19 and October 16, respectively. Both of them were deep in debt.

He had borrowed lakhs from the commission agents and money lenders and mortgaged half of his 8 acre land to money lenders.

The Indian Express, New Delhi, 25.10.1998

Moreover the subsidiary occupations of the farming community like animal husbandry, poultry, bees keeping and fisheries are also running in loss. In most cases these units were started on loans which the entrepreneurs now find difficult to repay.

Besides that the land holdings are squeezing because of rising population and disintegration of the joint family and it has led to fragmentation of holdings into smaller and smaller parcels.

The village education has been totally neglected in Punjab. There are schools with as may as 300 children with a single teacher. The Mansa–Sangrur districts, where large scale suicides are taking place in last few years, the literacy rate is the lowest. The situation further got worse due to the floods every year in this region.

The *arthies* take advantage of the illiterate farmers and even after total payment of loan money by farmers they normally do not delete the farmers names from their registers. There is a saying in Punjab that "if a farmer takes loan from a commission agent, it will never be over till his death", said Subah Singh of Jagaram Tirth village, Talwandi Sabo, Bhatinda.

Due to increased rural indebtedness in certain village all lands are encumbered. The farmers want to sell the land but there are no buyers. The land price has come down drastically.

Credit Facilities to Farmers

Farmers in Punjab are borrowing from various credit sources/ agencies. The main agency that are financing the credit needs of the farmers in the state are cooperative credit institutions like Primary Agricultural Credit Societies and Primary Land Development Banks, Commercial banks, and Regional Rural Banks and also the informal sector credit agencies like commission agents (arthies) and money lenders.

The borrowing for financing the current farm expenses is on a short-term basis normally for a crop season, and these loans are repaid (fully or partly) through the sale proceeds at the end of the season. Fresh loans are again taken to finance the working capital requirement of the next cropping season. In a way a never ending viscous cycle of lagging loan continues between farmers and lending agencies.

The credit advanced to the farmers of Punjab increased six times between 1990-91 to 1998-99 (see Table 3.14).

A formal credit agency lends money to farmers by registering their land as security in its name. Similarly banks also provide loan against security of land. Once the loan is forwarded to the farmer, these agencies ensure that the farmer does not apply from any other bank for loan by putting their stamp on the papers.

TABLE 3.14

Advancement of Credit to Farmers {Rs. in Crores (10 million)

S.N.	*ITEM*	*1990-91*	*1995-96*	*1996-97*	*1997-98*	*1998-99*
1.	**Kharif Season**	159.01	440.86	562.57	693.63	804.31
i)	Cash	79.25	262.75	371.92	468.92	548.28
ii)	Kind	79.76	178.11	190.65	224.71	256.03
2.	**Rabi Season**	204.12	505.65	535.60	679.28	898.69
i)	Cash	102.83	232.98	274.46	364.46	564.72
ii)	Kind	101.29	272.67	261.14	314.82	333.97
3.	**Total**	363.13	946.51	1098.17	1372.91	1703.00
i)	Cash	182.08	495.73	646.38	833.38	1113.00
ii)	Kind	181.05	450.78	451.79	539.53	590.00

Source: *Agricultural Statistics of Punjab on the Eve of New Millennium: 2000; Statistician - Department of Agriculture, Punjab*

Over the years banks and the financial lending agencies have changed their methods of extraction of loans from the farmers. Once the stipulated date of recovery of loan is crossed the banks auction the land by going through the village and announcing on a loudspeaker. This method of auction, according to farmers, is being done to humiliate them as well as to terrify other farmers so that they make their payment on time. The three acres land of Mr. Roshan Singh of Bhai Bhakhtuar village of Maud Block of Bhatinda was auctioned in the similar way by the bank.

All the farmers irrespective of their own investment through loans go for the meager loan of Rs 2000 provided by the bank. According to a study conducted by Dr. Shergill of the Punjab University, the total debt on the farmers of the Punjab state is about Rs. 5700 crore (Shergill, 1998). This debt is about 70% of the net domestic product originating in the state in a year. In other words, three fourth of one year's total agricultural income of the state has to be paid if the total amount of debt is to be liquidated. However, to freeze the annual recurring interest charged on the total debt, about 13.2% of the total farmland area of the state will have to be mortgaged by the farmers. Seventy percent of the farmers are unable to repay their loans. The Punjab scenario is distressing - farmers are unable to sell their land, tractors and cattle - these go at throwaway prices to meet their debt commitment. The cash expenditure of the farmers has been steadily growing which has resulted in continuous decline in the net surplus generated from production of these crops.

Loans through government agencies in the 80's and early 90's used to be waived off by the government. But now it is different scenario because the loans are being taken mostly from the private moneylenders. As per Mr Rudlu Singh, a farmer member of the BKU Ekta, Mansa, there are about 24,000 commission agents in Punjab who charge compound interest for loan money which gets doubled in a short period of 3 years, 3 months and 19 days.

The arthies copy the formal credit institutions and register the land of the borrowers on their name as a security. When a farmer borrows a big amount from the arthies, he registers his land for the same value. If the borrower fail to

repay the loan he looses his land. But sometime the arthi gives the land to the owner to cultivate as tenants and not as owner. Due to social stigma and shame the victim farmers never tell others in the village that he has become landless.

About Rs. 8000 crores of arthi's money is floating in market in Punjab. These arthies pay no income tax on this amount. There are total 12560 villages in the state of Punjab and on an average two arthies operate in each village and control the village finance and economy, according to the BKU Ekta.

The arthies in case of failing to get their money back from farmers, take away tractors, trolleys, grains and sometimes occupy house and lands of the defaulters. Mr. Mange Ram arthi of Mansa Mandi took away the tractor and Rs. 82,000/- from a farmer Mr. Mahinder Singh, s/o Mr. Arjun Singh, of Burj Tilam village in Mansa district for not repaying a debt of Rs. 3 lakhs to him. To pay the money Mange Ram had to sell his land.

A farmer in village Jattan Khurd in Mansa district had taken a loan of Rs. 65000 and could not repay due to successive crop failure. The commission agent took away 35-40 quintals wheat, the annual ration, lying in his house and his tractor with trolley. With the intervention of BKU Ekta, the farmers only got back his wheat.

There are several farmers in Bhai Bhakhtawar village in Maud Tehsil in Bhatinda District, whose land has been seized by arthies. Some of them are Jagseer Singh (s/o Jaggar Singh), Bant Ram Vpeywala, Nichatar Singh and others.

According to Dr. H. S. Shergill, "In 1997 farmers borrowed a whopping Rs. 3119 crore. Sixty one percent came from traditional commission agents. Here interest rates are between 24 to 30 percent. Cooperative could mange just 34 per cent; the rest – a meager 4 percent – came from commercial banks" (Shergill, 1998). This situation is particularly detrimental to the small farmers as interest rates are dictated by size of holding - smaller the holding, the higher the interest.

Such exploitation by the commission agents and burden of debt are forcing several farmers in Punjab to commit suicide. Even in the year 2000 the suicides are taking place on large scale in Punjab and no body in the government seems to have paying any attention. Unfortunately these suicides are rarely reported to the police. The discrepancy in the actual figure (collected by activists and farmer unions) and the official figure is explained by the fact that many suicides go unreported and official figures are invariably less than the real ones.

There seem to be a unanimous agreement among villagers in the rural Punjab about not reporting these deaths to the police as suicides. The villagers justify by stating it would avoid "desecration of the dead body during post-mortem examination and associated harassment by the police".

The most common method adopted by farmers for suicides is drinking pesticides and agricultural fumigants, which are available in abundance. Hanging, drowning, self–immolation and throwing oneself before the running train are also resorted to by some farmers.

About 150 cases of suicides by farmers and agricultural laborers have been reported in last 4-5 years from the Lehra and Andana blocks of Sangrur district. In a single village 'Dhindsa' of the Lehra Block, in last 5 years more than 15 farmers have committed suicide due to crop failure and increased debt.

In 1999-2000 suicides by farmers continued in Punjab due to the acute indebtedness, exploitation of commission agents and crop failures. Mr. Tirth

Anok Singh of Jagaranm village was in debt of Rs. 1 lakh which he borrowed from an arthi. He also bought a tractor (Mahindra 256 DI) against his lands and was in debt of Rs.2.5 lakhs to the State Bank of Patiala. But one month after the purchase of tractor the Arthi took away his tractor. Mr. Singh left his house the day his tractor was seized and never returned back. His son Mr. Pretem Singh said that his father might have committed suicide. The Arthi sold the tractor in more than Rs. 2 lakhs but kept all the money and nothing was given back to Mr. Singh family after deducting the loan money. Neither any paper was given to the victim family after the sale of tractor. The family is continued to be paying the interest to the Bank otherwise they would loose the land, because the farmers lands are registered in the name of loaner Bank.

Some of the suicide victims in Dhindsa village, Sangrur District

Name	*Age*	*Year*
Mr. Angrej Singh, S/o Sher Singh	-	1995
Mr. Satgum Singh, S/o Mukhtar Singh	8 yrs	1995
Mr. Bhola Singh, S/o Lilu Singh	-	1995
Mr. Dashan Singh, S/o Choto Singh	20 yrs	1996
Mr. Naib Singh, S/o Sukhdev Singh	25 yrs	1997
Mr. Mahadev Singh, S/o Labh Singh	26 yrs	1999
Mr. Govind Singh, S/o Dev Singh	19 yrs	2000
Mr. Sadhu Singh, S/o Gurnam Singh	40 yrs	April '00
Mr. Surjeet Singh, S/o Sher Singh	40 yrs	August '00

Source: *Sarpanch of the Dhindsa village.*

In April 2000, Mr. Sadhu Singh, aged 40 years of Dhindsa village, Mwonak Tehsil of Sangrur committed suicide. In 1998 he took around Rs. 35,000 loan from commission agent. In last two successive years his crop had failed. He had also taken land on lease against his wife's jewelry. After his death the owner of land kept the jewelry and gave the land to the commission agent.

In August 2000 two landless laborers, Mr. Surju, s/o, Chand and Mr. Sukhdev, s/o Preetam of Dudian village under Mwonak Tehsil of Sangrur district committed suicide for not being able to repay the debt.

Conclusion

India has once before been colonised through cotton. From being the biggest producer of the cotton and the cotton textiles, India was converted into the biggest market for textile produced by the British industry.

Today cotton colonisation is not restricted to the cotton textiles but goes deeper into the colonisation of the cotton seeds. From being the country of origin and the centre of diversity India is being rapidly reduced to dependence on imported cotton seeds.

Freedom from the first cotton colonisation was based on liberation through the spinning wheel. Gandhi's use of the charkha and the promotion of khadi was both a form of resistance to the British monopoly on cloth and a reminder that it was in our hand to make our own cloth again.

Freedom from the second cotton colonisation needs to be based on liberation through the seed. Indigenous seeds are still available in large parts of India. Organic cotton is promising to become a major route to prosperity for farmers in marginal and rainfed areas. The freedom of the seeds and freedom of organic farming are simultaneously a resistance against monopolies of corporation like Monsanto and a regeneration of agriculture that brings fertility to the soils and prosperity to the farmers.

The seeds of suicide need to be replaced by seeds of prosperity. And those seeds should be in the hands of our farmers and not in the hands of corporations.

Statement showing the details of suicide cases of farmers in Warangal Districts (Between Dec. '97 and Jan. '98)

S. N.	*Name of the deceased*	*Date of death*	*Particulars of Survival & Age*	*Area of land (Acre)* **Own**	**Lease**	*Crops Grown*	*Outstanding Debts*	*Type of Soil*	*Irrigation details*	*Designation of Enquiry Officer*	*Reasons for death*
1	*2*	*3*	*4*	*5*		*6*	*7*	*8*	*9*	*10*	*11*
1.	Manupally Saraiah S/o. Mallaiah, R/o, Managapet, Mangapet Mandal.	12-12-97	Father - 63 Mother - 45 Wife - 25 Daughter - (2) Son - 1 1/2	2.00	—	Chillies-Nursery-0.10 Tobacco-Nursery-0.10	20,000/- Private	Sandy Loam	Nil	Dy. Director of Agriculture (FTC), Warangal	Overburdening of Loans on Crop failure.
2.	Lakkavarsu Mogili, S/o. Komuraiah, R/o, Kamaram, Athmakur Mandal	19-12-97	Father - 65 Mother - 55 Wife - 25 Son - 13 Daughter - 10	3.00	2.00	Cotton	85,000/- Private 20,000/- from Society in the past	Chalkas	Dried up Well	Dy. Director of Agriculture (Trg)	Due to crop failure.
3.	ChaparthyVeeraSwamy S/o.Doodaiah (v)Chintalapally Sangem Mandal	25-12-97	Wife - 25 Daughter - 6 " " - 5 Son - 3	4.00	—	Cotton- 1.20 Paddy- 1.00	60,000/- Private	BC Soil	Well without Water	D. D. A (Agro.)	Crop failure.
4.	Bandi Kalavathi, W/o, Somaiah, 45Y, R/o.Venkatapur Zaffargadh	18-12-97	Husband - 48 Daughter - 22 " " - 13 " " - 13 " " —	—	5.00	Cotton- 4.00	31,500/- Private	Redchalka	Dried Well	Asst. Director Agriculture (R) Ghanpur	Overburdening of debts.
5.	Samala Mallaiah, S/o, Somaiah, 40y, (V) Nagaram Parkal Mandal	21-12-97	Wife - 35	1.00	2.00	Cotton- 3.00	70,000/- Private	—	—	Agriculture Officer Parkal mandal	–do–
6.	Janga Ravi, S/o, Sammaiah, 30y, (V) Venkatapur Parkal Mandal	22-12-97	Mother - 50 Wife - 25	2.00	—	Cotton- 1.20 Paddy- 0.20	20,000/- Private 5000/- Cooperative	—	—	-do-	-do-
7.	Vynala Sambaiah, S/o. Komuraiah, (V) Keshavapuram Duggondi Mandal	24-12-97	Wife - 35 Daughter - 20 Son - 18 Son - 15	1.00	3.00	Cotton- 3.10 Jowar- 0.20	3,000/- Coop--rative 1,00,000/- Bank	Black Alkaline & Sandy loam	Dried Well of Agril., Narsampet	Asst. Director	-do-

1	2	3	4	5		6	7	8	9	10	11
8.	Naugari Kishan Rao S/o.Rajanna, Age: 30, (V)Yelukurhi (H) Geesugonda Mandal	15-12-97	Grand mother Mother Father Sister	4.00	—	Cotton- 3.00 Chillies- 1.00 1,00,000/- Private	30,000/- from Government	BC	No Irrigation	D.D.A (Agro.)	Crop failure.
9.	Kommula Mallaiah S/o. Kankaiah, R/o, Peddapuram, Athmakur Mandal	23-12-97	Father- 65 Wife - 35 Daughter - 22 ″″ - 18 ″″ - 15 ″″ - 12 ″″ - 09 Son - 05	0.10	—	Maize- 0.10 Cotton- 2.30 Chillies-1.00	70,000/- Private	Sandy Loam	Well	-do-	Overburdening of debts and Crop failure.
10.	Nellutla Ravi, S/o, Laxmaiah, 25 Y, (V) Kamaram, Athmakur Mandal	16-12-97	Mother - 55 Wife - 20 Daughter -	3.00	—	Cotton- 3.00	25,000/- Bank 2,25,000/- Private	Red chalka	Dried Well	D.D.A (Agro.)	1. Over-burdening debts, 2. Loss Money lending.
11.	Kanugula Sambaiah, S/o, Papaiah, Age: 50, (V) Shambaiahpally Duggondi Mandal	29-12-97	Wife - 38 Daughter - 20 ″″ - 18 Son - 15 Son - 3	3.00	0.15	Cotton- 2.15 Paddy- 1.00	5,000/- Cooperative 18,000/- Private	Sandy loam	Well Narsampet	A.D.A (R)	1. Mental Worries, 2. Overburdening of debts, 3. Crop failure.
12.	Banothu Mangya S/o. Mourya, Age: 50 (V) Nandanayakthanda (H) Vishwanathpur Geesugonda Mandal	29-12-97	Wife - 45 Daughter - 18 ″ - 14 ″ - 12 Son - 21 ″ - 17	1.20	2.00	Cotton - 3.00 Vegetables- 0.20	50,000/- Private	Red Chalka	Dried Well	D.D.A. (Agro.)	1. Crop failure, 2. Overburdening of debts.
13.	Kannepally Mallaiah S/o, Odelu, 35Y, (V) Keshvapur Venkatapur Mandal	29-12-97	Father - 70 Mother- 60 Wife - 33 Daughter - 13 ″ - 3	0.30	1.00	Cotton- 1.00 Paddy- 0.30	19,000/- Private	BC	Kunta	D.D.A, (FTC)	1. Overburdening of debts, 2. Crop failure.
14.	Ajmera Surya S/o, Kasna, 42Y, R/o, Narayan thanda H/o, Thimmampet, (M) Duggondi	30-12-97	Wife - 38 Son - 20 ″ - 18 Daughter- 15	4.00	—	Cotton- 3.00 Chillies- 1.00	80,000/-	Loany & Dubba	Well (Insufficient water)	A.D.A (R), Narsampet	1. Heavy debt. 2. Crop failure.

1	2	3	4	5		6	7	8	9	10	11
15.	Mankena Yella Reddy S/o, Chandra Reddy, 25Y, R/o, Veldanda Narmett Mandal	30-12-97	Wife - 20	2.25	—	Cotton- 1.00	30,000/- Private	Red	Rain fed chalka	A.D.A. Jangaon	Debt burden
16.	Akula Jagnaiah S/o, Venkataiah, 44Y, R/o, Mallikudurla	03-1-98	Wife - 40	—	2.00	Cotton 1.00 Chillies 1.00	5,000/- SBH 41,500/- Private	Red chalka	Dried Well	A.D.A., Ghanpur	1. Chillies & Cotton Crops Failure du
e to	Dharmasagar Mandal.										lack of water, 2. Heavy debt.
17.	Ijjagiri Rajabhadraiah S/o, Mallaiah, Age: 28, R/o, Papaiahpalli, H/o, Narasapur Venkatapur Mandal	04-1-98	Father - 57 Wife - 25 Daughter - 5, ″ - 2	3.00	4.00	Paddy- 0.20 Chillies 1.00 Sunflower 2.00 Maize 2.00	50,000/- Private	B.C.	Well	D.D.A., (F.T.C.)	Crop failure.
18.	Banoth Swamy, S/o, Sethaiah, Age: 28 R/o, Banchari Thanda H/o, Gollapalli, Gudur Mandal	8-1-98	Wife - 24 Daughter - 9 ″ - 2 Son - 6	1.32	—	Cotton 0.30 Chillies 1.00 Mahabubahad	20,000 Private	Red Chalka	Well	D.D.A (Trg.) A.D.A.(R);	Crop failure and heavy debts.
19.	Gundrati Bikshapati S/o, Ilaiah, Age: 23, R/o, Pegadapalli Hasanparthi Mandal	6-1-98	Father - 50 Mother - 45 Wife - 18	2.00	—	Cotton 2.00	55,000/- Private	B.C	Well	A.D.A.(R); Warangal	Crop failure & debt burden.
20.	Neereti Narsaiah, S/o, Yellaiah, Age: 23, R/o, Bairanpalli Maddur Mandal	13-1-98	Father Mother Brother	3.30	3.00	Chillies 1.00 Maise 1.20 Paddy 0.20 Redgram 0..20 Jowar 0.10	16,600/- Bank	Chelka	Bore Well (failed)	A.D.A., (R) Jangaon	Crop failure & heavy Debts.
21.	Bollakonda Jag-ham, S/o, Ayodya, Age: 50, R/o, Serols, Korvi Mandal	15-1-98	Wife - 45 Son - 25 Son - 20	14.00	—	Cotton 1.20 Chillies 1.00 G'nut 3.00 Redgram 4.00 Paddy 2.00	20,000/- Bank 70,000/- Private	Red	Well Chelka	A.D.A (R) Mahabubabad & A.D.A, (STL), Warangal	Crop failure & heavy debts.
22.	Nune Ramaswamy S/o, Komraiah, Age: 40, R/o, Mulug	16-1-98	Wife - 35 Son - 17 Daughter - 13	1.30	2.00	Coton 2.00 Paddy 1.30	50,000/- Private	B.C.	No Well	A.O., Mulug	1. Crop failure, 2. Loss in side business.

1	2	3	4	5		6	7	8	9	10	11
23.	K. Anjaiah, S/o, Mallaiah, R/o, Chitur, L. Ghanppur Mandal	10-1-98	Wife - Daughter Son	4.00	0.50	Caster & Redgram 4.00 Paddy 0.50	—	Red Chelka	Open Well	A.D.A, (R), Jangaon	—
24.	Pendle Anjaiah, S/o, Venkataiah R/o, Dharmaraopet Khanapur Mandal	12-1-98	—	1.20	—	Cotton- 1.10 Paddy- 0.10	30,000/- Private	—	—	M.R.O., Khanapur	Due to debts.
25.	S. Anandam, S/o, Yakaiah, R/o, Kadaver, Devaruppula Mandal	5-1-98	—	—	—	—	—	—	—	R.D.O Jangaon	—
26.	G. Yellaiah, Age: 52, R/o, Kogilvai, Atmakur Mandal	15-1-98	—	3.00	—	—	60,000/- Loans	—	—	Based on daily News Paper Dated 17-1-98	Crop Loss.
27.	Smt. Allepu Radhamma W/o, Ilaiah, Age: 40, R/o, Venkatapur Mandal.	—	—	—	—	—	—	—	—	–do–	Crop Loss since last 3 yrs.

Source: *Office of teh Joint Director of Agriculture, Warangal*

List of Farmer Suicides reported from Andhra Pradesh.

Sl.No.	*Farmer's Name*	*Village*	*Mandal*	*District*
1	Dubashi Rajayya	Narsimpalli	Doultabad	Medak
2	Chikkali Ramulu	Tumkimetla	Bomraspet	Mahaboob Nagar
3	Kommala Mallayya	Paddapuram	Atmakum	Warangal
4	V. Narasimga Rao	Papayya Palli	Bajjanki	Karimnagar
5	Jangu Ravi	Venkatapur	Parakala	Warangal
6	Narasimha Reddi	Gorlaveedu	Bhupalapalli	Warangal
7	Harmandlu	Modnooru	-	Nijamabad
8	Natutta Ravi	Kamaram	Atmakur	Warangal
9	Malkalla Ramreddi	Kammarvalli	Chennurce	Adilabad
10	Lakkarru Mogili	Kamaram	Atmakur	Warangal
11	Syamala Mallayya	Nargaram	Parakala	Warangal
12	Kallepalli Mallayya	Kesavapur	Venkatapur	Warangal
13	Srinivasulu	Dharmavaram	Tekmal	Medak
14	Chavarthi Veeraswami	Chintapalli	Samgem	Warangal
15	Katta Papi Reddi	Yacharam	Anumula	Nelgonda
16	Yara Sudhakar Raddi	Eessipet	Mogullavalla	Warangal
17	Kakamonu Veerayya	Visadala	Medi Konduru	Guntoor
18	Dasari Acunjayya	Goodem	Raghunadhapalli	Warangal
19	Ramelvar Gulab	Shampabad	Bela	Adilabad
20	G. Rajemdar	Usenpalli	Atmakur	Warangal
21	Nageri Kishan Rao	Eela Kurthi Haveli	Geesukondo	Warangal
22	Lurdu Raju	Khammam Goodom	Buvanagiri	Nelgonda
23	Bandi Kalavathi	Venkatapur	Jafargood	Warangal
24	Khadavat Mangya	Nandya Nayak	Tanda Geesugonda	Warangal
25	Manupalli Sarayya	Mangapet	Mangapet	Warangal
26	Arula Jaganayya	Malliudurla	Dharmasagar	Warangal
27	Gangaram Balayya	Peddapuram	Marpalli	Rangareddi
28	Eejagiri Ramabadra	Papayya Palli	Venkatapur	Warangal
29	Dasandla Bhumalingam	Chilva Codooru	Gollavalli	Karimnagar
30	Canugula Sambayya	Serabayyapalli	Duggondi	Warangal
31	Vyasa Srinu	Tanikella	Lpmogarla	Khammam
32	Gandra Biksapati	Pegada Palli	Hasanvarthi	Warangal
33	K.Sanjeevayya	Alirajpet	Jagadevpur	Medak
34	Banotuswami	Bollapalli	Gooduru	Guntoor
35	Galivelu Subba Rao	Peda Nandipadu	-	Guntoor
36	Dasari Pedda Chennayya	Veepanagandla	Medatooru	Karnool
37	Nerati Mallayya	Biranpalli	Madduru	Warangal
38	Pendli Aanjayya	Dharma Rao Pet	Khanapur	Warangal
39	Khallipalli Ashok	Peddapalli	Peddapalli	Kherimnagar
40	Ajmeera Surya	Narayan Tanda	Duggondi	Warangal
41	Pandari Sarayya	Mangapeta	Mangapeta	Warangal
42	Eedula Kanti Narasimha Reddi	Pochannapeta	Buchannapeta	Warangal

43	Kanakayya	Gummadidala	Jinnaram	Medak
44	Damodar Reddi	Ummentyala	Kodurgu	Mehaboobnagar
45	Golkonda Eellayya	Kogil Vayee	Atmakoor	Warangal
46	Allepu Radamma	Narsapur	Venkatapur	Warangal
47	Kumar	Veleeru	Vargal	Medak
48	Darga Aanjayya	Manikyamma Goodou	Maheswaram	Ranga Reddi
49	Jagiri Komarayya	Ninaala	Nellikuduru	Warangal
50	Piditalli Rajamallu	Dharmaram	Jammikunta	Kharimnagar
51	M.Ella Reddi	Veldada	Tanarmeta	Warangal
52	Gollavaggu Satteyya	Gundlapalli	Sivampeta	Medak
53	Gollavoggu Pramcela	Gundlapalli	Sivampeta	Medak
54	Vinaala Sambayya	Kesavapuram	Duggondi	Warangal
55	Madduri Hanimi Reddi	Aakunooru	Sidhapur	Karimnagar
56	Viswanadhan	Balugoppa	Kalyanadurgam	Buantapuram
57	Tirumala Reddi	Panderlapulli	Moddikara	Karnool
58	Nammi Reddi Srinivasa Reddi	Vernula Palli	Vemulapalli	Nelgonda
59	Machcha Chandramouli	Kamalapur	Kamalapur	Karimnagar
60	Mutyala Lakshmi	Kamalapur	Kamalapur	Karimnagar
61	Anand	Sitarampuram	Devaruppala	Warangal
62	Yausafmia	Aaliyabad	Kondapur	Medak
63	Buchayya	Pegadapalli	Hasanparthi	Warangal
64	Mediboina Ramulu	Chinnayagoodem	Devrapalli	West Godavri
65	Eemmani Balanjineyulu	Tekula Kurpa	Koonavaram	Khammam
66	Banootu Bitya	Sitampeta	Gaarda	Khammam
67	G. Krishnayya	Yeskoru	Yeskoru	Khammam
68	Tenali Nagulu	Marsukunta	Yeskoru	Khammam
69	Hillikonda Jagannadham	Siroolu	Kuravi	Warang Nagar
70	Venkata Reddi	Gummadidala	Jinnaram	Medak
71	Venkata Reddi	Lingampalli	Peddapura	Nelgonda
72	Dharmasotu Lakshmi	Jagannadapuram	Palvamcha	Khammam
73	Katla Komrayya	Narsingapur	Tadvayee	Warangal
74	Gousu	Teegul	Jagadevpur	Medak
75	Vemula Aayelayya	Bhupatipur	Peddapalli	Karimnagar
76	Battula Narasimhulu	Ganda Boyianapalli	Vayeelpaadu	Chitturu
77		Kumbamvaripalli		
78	Chinna Venkata Danayya	Chandragoodem	Milavaram	Krishna
79		Borragoodem		
80	Bhukya Sankar	Eeeryatanda	Chennaraopet	Warangal
81	Gaogu Ayyellayya	Gaorremkunta	Geesukondta	Warangal
82	Chinta Vijay	Vangavahad	Hasanaparthi	Warangal
83	Mamidi Lachavva	Rechapalli	Sarangaapur	Karimnagar
84	Vuyyuru Krishna Reddi	Vuppalachalaka	Penuballi	Khammam
85	Masetli Bhumanna	Yaaval	Aodilabad	Aodilabad
86	Somayya	Jamikunta	Mogullapalli	Warangal

87	Katkuri Kanakamallu	Gurrekunta	Geesukunta	Warangal
88	Pantulu	Papayyapeta	Chennaraopeta	Warangal
89	Aalasyam Venkateswaralu	Polisettigundam	Khammam Rural	Warangal
90	Negarakanti yellayya	Manasapalli	Yetoorunagaram	Warangal
91	Tuppata Mallayya	Timmapur	Jagadevpur	Medak
92	Kavarla Ramesh	Begampeta	Mirdoddi	Medak
93	Bonaala Saramma	Gurrampalli	Peddapalli	Karimnagar
94	Kalipeni Venkatayya	Srirampur	Srirampur	Karimnagar
95	Dhannasam Hanmayya	Mudgulchittempalli	Vikarabad	Rabgareddi
96	Bollineedi Siddarao	Rimmanagooda	Gajveel	Medak
97	Chaliti Nammireddi	Nagaram	Bhupalapalli	Warangal
98	Aasuaka Narsooji	Kadivendi	Devaruppala	Warangal
99	Eengoli Chinaramulu	Nandigama	Nallabelli	Warangal
100	Balabi Badrayya	Bagrolipeta	Regonda	Warangal
101	Samini Lakshmi	Ramanjapuram	Venkatapuram	Warangal
102	Lakshmamma	Tanduru	Tanduru	Khammam
103	Devara Srisilam	Pedda Madooru	Devaruppala	Warangal
104	P.Janga Reddi	Ganggalapalli	Nagarkarnool	Mehaboobnagar
105	Pittala Sankar	Jayagiri	Hasanparthi	Warangal
106	Choudarapu Yellayya	Mahmadapuram	Duggondi	Warangal

Source: *Vartha Newspaper*

Details of Farmers who committed Suicide during November-December 98 in Warangal District.

S.N.	*Name of Farmer*	*Age*	*Village*	*Mandal*	*Date of committing Suicide*
1	Ketapalli Sambi Reddy	40	Ogalpur	Atmakur	22.10.98
2	Bhukya Sarma	35	Harischandra Nayak Tandra	Hasanparti	08.11.98
3	Kari Kumari Lingayya	49	Gidde Muttaram	Chityala	11.11.98
4	Malotu Danja	40	Mangalvaripeta	Khanapuram	12.11.98
5	Nagelli Tirupati Reddy	26	Challlagarige	Chityala	14.11.98
6	Indla Ayilayya	36	Neredupalli	Bhupalapalli	18.11.98
7	Pacchi Kalaya Someswara Rao	48	Aakinepalli	Mangapeta	19.11.98
8	Kattula Yakayya	32	Samudrala	Stn Ghanpur	19.11.98
9	Akutota Venkatayya	65	Govindapuram	Sayampeta	21.11.98
10	Bolla Hari Krishna	22	Nadikuda	Parakala	24.11.98
11	Edelli Lakshmi	45	Rauvlapalli	Regonda	18.11.98
12	Cheviti Veeranna	28	Tehsildar Banjar	Dornakal	03.12.98
13	Pentla Odelu	42	Nagurlapelli	Regonda	16.12.98
14	Ragula Devender Reddy	25	Jubilee Nagar	Regonda	16.12.98
15	Tallapalli Lakshmayya	38	Solipuram	Narmetta	18.12.98

Source: *Prajasakhti Newspaper.*

Details of Farmers who have committed suicide during 1999 – 2000 in Andhra Pradesh

S No	*Name of Farmer*	*Age*	*Village*	*Mandal*	*District*
1.	Bhubanagiri John Reddy	40	Gannavaram	Yedanpudi	Prakasham District
2.	Ravipati Koteswar Rao	37	Poluru	Yedanpudi	Prakasham District
3.	Gogati Bali Reddy		Kuntalapalli	Nallamada	Ananthapur District
4.	Kalmula Ramayya	60	Macharam	Amrabad	
5.	Pallepu Ankamma	45	Paladugu	Medikonduru	
6.	Kethavathrathan	30	Inumulanarva	Kotthur	Mehboobnagar District
7.	Yadayya	28	Rajapuram	Balanagar	Mehboobnagar District
8.	Boya Pengayya		Gangapuram	Zedcherla	Mehboobnagar District

Source: *Rathu vani various issues.*

Details of Farmers who have committed suicide during 1997-99 in Yavatmal District of Maharastra

S.N.	*Farmer Name*	*Taluka*	*Age*	*Suicide Date*
1	N A Thakare	Darwa	45	27/3/98
2	M N Kinhekar	Kalawati	50	25/3/98
3	Z L Khandare	Umarkheda	55	26/4/98
4	B G Sainkar	Tanaregari	40	11/3/99
5	R C Ambarwal	Kelapur	35	21/1/98
6	P V Kanhake	Kalamli	24	26/4/98
7	M R Bahade	Rui	55	26/12/97
8	D A Bhoyaz	Kalamli	35	11/5/98
9	K P Bhise	Kalamli	59	21/2/98
10	M B Navarange	Darwa	40	19/5/98
11	G N Pawar	Yerad	29	30/5/98
12	S P Rathod			3/6/98
13	M D Samratwar	Kelapur	28	7/6/98
14	G T Dhote	Balihulgam	60	13/3/98
15	R K Rathod	Nes	55	5/5/98
16	P N Patil	Arni	43	22/4/98
17	N N Deotale	Zari Jamani	62	2/10/97
18	V R Kharmade	Zari Jamani	52	27/11/97
19	L B Chavan	Yavatmal	65	19/3/98
20	A P Matre	Durwha	50	3/5/98
21	V K Kathane	Balehutgoan	26	17/5/98
22	M D Waghmare	Kalamli	28	9/5/98
23	N V Zade	Maregoan	58	18/6/98
24	S B Yeotikar	Kalamli		12/9/98
25	H L Patil	Balehutgoan		5/7/98
26	N N Charak	Arni	48	20/6/98
27	N M Lokhande	Arni	55	8/8/98

28	R A Rathod	Yawali	23	5/3/98
29	J N Parande	Digwar	45	10/6/98
30	R T Chandhari	Ralegoan	35	25/6/98
31	A L Karnade	Yavatmal	44	2/7/98
32	Z G Atram	Maregoan	35	26/1/98
33	P D Mokhadkar	Kelapur	55	29/10/98
34	M R Tichkula	Darwa	30	11/10/98
35	S A Talware	Kelapur	28	27/10/98
36	S B Wankhede	Mahagam	40	1/11/98
37	B L Khandare	Kelapur	35	2/11/98
38	N K Gamamde	Kelapur	45	7/11/98
39	A K Kachore	Kalamli	40	22/11/98
40	M R Detale	Pandhar	40	7/11/98
41	D C Pambhare	Ralegoan	25	15/11/98
42	R N Hamid	Kelapur	25	15/12/98
43	I K Agrikar	Ghatana	45	16/12/98
44	R B Tajane	Wani	45	6/12/98
45	R C Gughane	Darwa	50	28/12/98
46	S N Kumare	Zari Jamani	75	20/12/98
47	Z D Wichu	Zari Jamani	40	2/1/99
48	A T Gurnale	Zari Jamani	35	29/12/98
49	M K Jadhao	Darwa	45	10/1/98
50	S B Rathod	Yavatmal	52	22/12/98
51	C T Game	Ralegoan	22	14/1/99
52	S P Dhagadi	Zari Jamani		16/1/99
53	L R Potkamtmar	Kelapur	50	23/1/99
54	B T Netam	Zari Jamani	45	19/2/99
55	S L Addimar	Kelapur	38	29/1/99
56	M N Deokate	Nandura	45	23/2/99
57	T G Karnewar	Umarkheda	37	20/2/99

Source: *Vidharbha Organic Farmers Association, Yavatmal.*

Suicides of Farmers in Sangrur District, Punjab

1994 to 1998

Village Chotian, Population approx : 3000

S.N.	*Name*	*Age*	*Year*	*Year Occupation*	*Cause*
1.	Mithu Singh S/o Sita Singh	27	1994	Agriculture	P
2.	Satpal Singh S/o Muktiar Singh	22	1994	Labour	H
3.	Sukhdev Singh S/o Chand Singh	45	1994	Agriculture	P
4.	Lala Singh S/o Cheta Singh	22	1994	Agriculture	A
5.	Raj Singh S/o Hari Singh	25	1995	Agriculture	P
6.	Mithu Singh S/o Sukhdev Singh	38	1995	Service	P
7.	Surinder Kumar S/o Panna Lal	40	1995	Agriculture	D
8.	Sant Ram S/o Roldoo	24	1996		
9.	Kale Khan S/o Sum-ul-din	28	1996	Labour	P
10.	Jaisir Singh S/o Gurdev Singh	21	1996	Agriculture	P
11.	Labh Singh S/o Banasi Das	23	1996	Labour	P
12.	Natha Ram S/o Kani Ram	40	1997	Labour	P
13.	Bhola Singh S/o Jagga Singh	30	1997	Labour	T
14.	Mitha Singh S/o Rasala Singh	32	1997	Labour	H
15.	Mangh Singh S/o Ralla Singh	25	1997	Agriculture	P
16.	Gurdev Singh S/o Mukand Singh	40	1997	Service	H
17.	Bhola Singh S/o Sarup Singh	30	1997	Agriculture	P
18.	Janta Singh S/o Hira Singh	25	1997	Labour	H
19.	Kala Singh S/o Mukhtiar Singh	23	1997	Agriculture	?
20.	Sukhdev Singh S/o Bana Singh	40	1997	Labour	P
21.	Niranjan Singh S/o Amar Singh	35	1997	Agriculture	P

Village Bangan, population approx. 3000

S.N.	*Name*	*Age*	*Year*	*Year Occupation*	*Cause*
1.	Prithi S/o Mangoo	29	1994	Labour	H
2.	Raja (Geja) Singh S/o Chanderbhan	251994	Agriculture		H
3.	Satbir Singh w/o Jagar Singh	27	1994	Agriculture	P
4.	Duni Kaur w/o Chanderbhan	60	1995	Agriculture	?
5.	Karnail Singh S/o Manga Ram	22	1995	Labour	P
6.	Bholaram S/o Sampath Singh	24	1996	Agriculture	H
7.	Bahurti w/o Dalbara	28	1996	Agriculture	B
8.	Jangir Singh S/o Mukhtiar Singh	36	1996	Agriculture	P
9.	Balbir Singh S/o M. Ram	23	1996	Agriculture	H
10.	Dharmvir S/o Hari Krishan	34	1997	Agriculture	B
11.	Mohinder Singh S/o Jeeruram	23	1997	Agriculture	P
12.	Reshma w/o Gaini Singh	24	1995	Agriculture	P
13.	Ratia S/o Tara Singh	27	1998	Agriculture	B
14.	Savianram S/o Sivnath	60	1998	Agriculture	T
15.	Bira S/o Tara Singh	30	1998	Agriculture	B

Village Balran, population approx. 10000

S.N.	*Name*	*Age*	*Year*	*Year Occupation*	*Cause*
1.	Gurtej Singh S/o Shera Singh	18	1995	Agriculture	H
2.	Pala Singh S/o Khushiram	24	1995	Agriculture	P
3.	Mehar Singh S/o Ganda Singh	28	1995	Labour	P
4.	Sita Singh S/o Mohinder Singh	24	1995	Labour	P
5.	Gurcharan Singh S/o Kehar Singh	24	1995	Agriculture	P
6.	Bhola Singh S/o Ruliaram	24	1995	Labour	P
7.	Lady	27	1995	Labour	P
8.	Baghail Singh S/o Mithu Singh	26	1995	Agriculture	P
9.	Kirpal Singh S/o Dhan Singh	20	1996	Agriculture	P
10.	Bhola Singh S/o Mehar Singh	24	1996	Labour	P
11.	Gurcharan Singh S/o Nabha Singh	19	1996	Agriculture	P
12.	Ranbir Singh S/o Ruldu Singh	22	1996	Agriculture	P
13.	Jeet Singh S/o S. Singh	20	1996	Agriculture	P
14.	Sehnsi Singh S/o Balhar Singh	24	1996	Agriculture	P
15.	Bhola Singh S/o Saon Singh	20	1996	Agriculture	P
16.	Ganpati w/o Ker Singh	42	1996	Agriculture	P
17.	Sukhar Singh S/o Balhar Singh	30	1996	Agriculture	P
18.	Aki d/o Gurmail Singh	19	1996		P
19.	Gejha Singh S/o Sohan Singh	24	1997	Labour	P
20.	Pithu Singh S/o Puran Singh	25	1997	Agriculture	P
21.	Kaka Singh S/o Gumdoor Singh	23	1997	Agriculture	P
22.	Telu Singh S/o Gurdial Singh	24	1997	Labour	P
23.	Kala Singh S/o Karnail Singh	24	1997	Labour	H
24.	Tota Singh S/o Jaseer Singh	25	1997	Labour	P
25.	Desraj S/o Labh Singh	22	1997	Labour	P
26.	Lady w/o Kuldip Singh	28	1997	Labour	P
27.	Mithu Singh S/o Bugher Singh	26	1997	Agriculture	P
28.	Karnail Singh S/o Dhana Singh	35	1997	Agriculture	P

Village Bakhora Kalan, Population approx. 3500

S.N.	*Name*	*Age*	*Year*	*Year Occupation*	*Cause*
1.	Naib Singh	25	1994	Agriculture	B
2.	Parmi Singh	23	1996	Labour	P
3.	Virsa Singh	30	1995	Agriculture	?
4.	Kulvinder Singh	26	1995	Labour	H
5.	Bhola Singh	30	1995	Labour	T
6.	Rampal Singh	33	1996	Labour	H
7.	Satpal Singh	24	1996	Labour	P
8.	Shingara Singh	20	1998	Agriculture	H
9.	Ram Singh	23	1998	Agriculture	B
10.	(illegible) S/o Bant Singh	15	1994		T
11.	Gurmail Kaur w/o Niranjan Singh	30	1997	Labour	B

Village Chural Kalan, Population approx. 4000

S.N.	*Name*	*Age*	*Year*	*Year Occupation*	*Cause*
1.	Jarnail Singh S/o Prabhudayal	20	1996	Labour	
2.	Bhola S/o Naik	21	1995	Labour	
3.	Charan Singh S/o Gujar	60	1997	Labour	
4.	(illegible) S/o Ramdasia	15	1997	Labour	
5.	Gachar S/o Bachan Singh	19	1996	Labour	
6.	Milkhi Singh S/o Jagir	30	1995	Agriculture	
7.	Ram Singh S/o Sukhdev Singh	16	1997	Labour	
8.	Surmi w/o Dhan Singh	20	1997	Agriculture	
9.	Gurbachan S/o Jit Singh	32	1997	Service	
10.	Magan Singh S/o Arjan Singh	40	1997	Labour	

Village Bushehra Population approx. 3000

S.N.	*Name*	*Age*	*Year*	*Year Occupation*	*Cause*
1.	Bachni w/o Bhana Ram	30	1994		P
2.	Mukhtiar Singh S/o Mehar Singh	35	1994		H
3.	Niranjan Singh S/o Moman	30	1995		P
4.	Juga Singh S/o Ram Singh	60	1996		H
5.	Kartara S/o Jagga Ram	60	1996		H
6.	Bhola S/o Fateh Singh	19	1996		H
7.	Karnail Singh S/o Mukand Singh	28	1997		P
8.	Puran S/o Baru Ram	30	1998		H

Source : *Inderjeet Singh Jaijee, Convener, Movement Against State Repression, Chandigarh.*

Abbreviation Key:

B - burns
H - hanging
P - pesticide
T - under a train
D - Drowning

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CHAPTER IV

Bija Panchayat

The Farmers' Verdict

Responding to the deepening crisis of seed and agriculture, the Research Foundation for Science, Technology & Ecology (RFSTE) and Navdanya, the National Biodiversity Conservation Movement, took the initiative to organize a *Bija Yatra* or Series of Seed Events in India during September- October 2000. The *Bija Yatra* covered issues related to Seed Rights, Seed Conservation and Sustainable Agriculture.

The events addressed the current problems that are faced by the farmers in India and abroad, including their rights to seed, and strengthening farmers' alternatives. The events were organised in collaboration with the International Forum on Agriculture and various national and international farmers' groups and organisations.

1. Bija Panchayat

Bija Panchayat, which was held on 24th and 25th September 2000 at Bangalore, was timed to precede *Asian Seed 2000*, which was to be hosted by the Asia and Pacific Seed Association (APSA) in collaboration with the Seed Association of India and the Association of Seed Industry. Primarily comprising of private seed corporations, the APSA's main agenda is to facilitate business development and seed trading in the region. The CEOs of international seed companies were expected to participate in this meeting.

Increasingly farming communities are losing their family members, driven to death by either increased cost of seeds, increased debts and crop failures. There have been several cases, in which farmers had to sell their land and even their kidneys to pay off their loans, or their houses or tractors have been mortgaged to the loan providers and often subsequently they have been arrested in case of failure to pay back the loans. There are also cases of contract farming in which farmers' seeds/ produce were rejected or not lifted, leading the farmers to commit suicide.

> 78% of our farmers own less than 2 hectares of land. 48% farmers are below the poverty line. They are incapable of resisting the multinational corporations as individuals. Only the unity of farmers 'organisations, agricultural workers' organisations, concerned scientists and citizens working together can preserve the lives and jobs of some 89 –90% of people in the country.
>
> **- Suneet Chopra,**
> All India Agricultural Workers Union

In India most of the cases of seed failures are being reported from these "truthful" seeds of commercial crops e.g. cotton. Today there are few examples in which farmers have taken the companies to the court

and have received compensation in case of failures of their seeds. The liberalisation, privatisation and globalisation trends in agriculture have resulted in the creation of an unregulated seed industry. At the same time, existing rules and regulations have been either abandoned or modified to accommodate multinational and transnational corporations. This "corporate control over the seeds" becomes complete with the introduction of transgenic crops. The farmers' seed supply and direct exchange networks have been adversely affected with the proliferation of unregulated seed market.

Son of a Andhra farmer giving testimoney on his father's suicide because of crop failure

The biotechnological innovations in the Indian context rely heavily on the technologies and investments of the First World. Development in these areas proceed either through transnational companies setting up their branches or through marriage of convenience between western biotechnology firms and national seed companies. In the latter case, the transnational usually operates by retaining the name of the national seed company to retain the loyalties of the farmers.

The introduction of genetically engineered seeds linked with the introduction of Intellectual Property Rights threatens farmers' livelihood and the national food security. IPRs in agriculture have been introduced as part of the implementation of the TRIPs Agreement through the proposed Plant Variety Protection Act. These IPRs threaten the inalienable right of farmers to choose what they grow, and to save, exchange and improve seed, and force them to buy seed every season or pay royalties.

The threat from IPRs is also posed through the phenomena of "biopiracy", wherein western corporations claim indigenous biodiversity and farmers innovation as their "invention". Examples of such erosion of the rights of Indian farmers include patents on Neem, Turmeric and Basmati. Even the Biodiversity Act, to be legislated under the obligation of the Convention on Biological Diversity fails to stop this phenomenon but rather encourages biopiracy of agricultural wealth by excluding it from the purview of the proposed Act.

The **Bija Panchayat** sought to articulate the people's voice so that the whole discussion and policy on the seed is not determined by the corporate sector and interests driven by profit motives. It provided an opportunity to collect evidences of seed failures, farmers' suicides cases, cases of lack of compensation to farmers by companies and public sectors in event of seed

failures, evidences on trials of genetically engineered crops as well as the monopolistic controls of seeds by companies. The first of its kind in India, the Tribunal was designed as farmers' hearing. Farmers through the Panchayat - an ancient Indian system of dispute settlement and governance – gave evidence and passed their verdict.

2. Seeds of Distress and Seeds of Suicide

The testimonies of farmers and their kith and kin from Andhra Pradesh, Punjab, Karnataka, Orissa, Bihar, West Bengal and Garhwal reflected the dimensions of the nation-wide seed and agricultural crisis. The evidence showed on the one hand the growth of corporate monopoly in the seed sector and on the other hand farmers' increasing dependency on these monopolies, which leads them to choose death as the only possible way out.

That the independent farmer is struggling to survive against immeasurably difficult odds is borne out by the number of suicides by farmers: over 2000 known deaths have occurred in Punjab, Andhra Pradesh, Karnataka, Maharashtra and Madhya Pradesh alone. Alaka Karar of West Bengal testified that in Manasavi village alone, 19 young farmers had committed suicide.

Prof. K. Gopal Iyer, Dept. of Sociology at the Punjab University (Chandigarh), in a comparative study of such suicides in Punjab, Andhra Pradesh and Karnataka, highlights the factors that contribute to such deaths:

- cumulative crop loss;
- cumulative debt;
- supply and use of spurious seeds and pesticides;
- seeds not tested enough before distribution;
- increase in the number of dependents in a family; and
- private money-lending agencies which charge a high rate of interest.

The Myth of Corporate Efficiency

Liberalisation of agriculture is being justified today on grounds of efficiency. It is presumed that corporate agriculture is a product of efficiency and intelligence. And thus corporate monopolies take control over agriculture and agricultural decisions. The farmer today is becoming just one factor in a giant food production, manufacturing and delivery system called agribusiness. This includes owning and cultivating the land, financing agriculture, controlling inputs like seeds, fertilisers, and pesticides, transportation of commodities from farm to market, wholesaling, agroprocessing and packaging, and, of course, trade in commodities both nationally and internationally.

Corporations presumably increase their efficiency through growth. Such growth occurs both through horizontal and vertical concentration: Monsanto, an agrichemical giant, merges with leading seed

Uday Dey from Balasore District in Orissa procured Proagro 6201 variety of paddy at the rate of Rs 120 per bag. He cultivated the paddy as per the instruction booklet that was supplied by the Hybrid Rice International, Hyderabad. Flowering was highly disturbed. The assured yield of 35-40 quintals was not achieved. Only 8 quintals could be obtained. He was informed by the agricultural officer that the paddy failed because of climatic conditions. Consequently he was not able to repay his loan which he has taken from the State Bank of India.

corporations, and Cargill, the giant trader in agricultural commodities, institutes contract farming, gets into agroprocessing on one hand and seed business on the other. In this form of concentration, there is no place for the small and marginal but independent farmer.

> The role of panchayats should bring to the notice of state the problems - land reforms, bonded labor policy, concealed tenancy. The immediate relief that can be given to farmers is conversion of his short term loan to medium term loans so that he is not a defaulter. Agro meteorology should be used to provide information on the climatic conditions. Absence of local market and storage facilities needs to be corrected. Compensation is flawed and it does not rehabilitate the farmer.
>
> ***Prof. M.K. Ramesh,***
> *National Law School of India University*

Profiting Through Disaster : "Truthful" Seeds or Killer Seeds?

The seed, which is the cornerstone of agriculture, becomes the best place to start generating profits. The leading cause of farmers' suicides is debt linked to crop failure due to the spread of exotic monocultures and "truthful hybrids seeds".

Before a company can launch certified seeds, it has to spend at least six to seven years of conducting trials and verifications under the supervision of regulatory authorities. In order to avoid such delays in the launch of seeds in market, seed companies sell the seeds as *truthful* seeds, which means that the company sells seed taking the farmers into 'confidence'. There is no regulation to prevent marketing of *truthful* seeds. In actual practice, however, rarely are the seeds *truthfully* sold to the farmers, as the testimonies of farmers bear out.

For example in Warangal in Andhra Pradesh, commercial crops have been grown since mid 1980s but because of major losses incurred in agriculture the farmers are desperate now and turn to anyone for inputs, promising them high yields.

Thus, though there was total crop failure of cotton in the district in 1997-98, leading to hundreds of suicides among farmers, the acreage under cotton increased in 1998-99. Aurangabad-based seed producers came with a variety of cotton and all the farmers took that variety. The plant in vegetative phase has been robust but with no flowering. Several farmers complained of it and brought to the notice of government, which constituted a commission to look into the crop failure. Many farmers were left out of the enquiry, and the commission felt there was no adequate proof of seed failure. The farmers, who were given with no compensation, were lured into planting Excel 35 variety of cotton this year in the hope of high yields. 36,000

Punjab farmer giving testimoney on his brother's suicide due to debt.

acres have been planted with this variety, which has been found to perform.

In Bidar and Gulbarga in the Northern Karnataka, Mahyco (a Monsanto subsidiary) sold around Rs 1 crores worth of seeds of Bajra in 7 days which failed. Farmers approached the agricultural officers and demanded action in the case. The officer informed that they are helpless and only thing they can do was to cancel the license of the dealer. Farmers lost all the inputs which used for cultivating the spurious seeds.

Andhra Farmers who sold their kidney to pay off their debt, showing the cut mark during the Bija Panchayat

Seeds, Chemicals and Finance: Unholy Nexus

Farmers testified to the fact that the dealers of seeds also supply the pesticides and fertilisers (often spurious). They are the extension agencies who advise the farmer as to what to spray and what not to. In addition they also handle the credit facilities and give loans at a very high rate of interest (36% in parts of Andhra Pradesh), thus pushing the farmer into deep debt.

Increasingly, multinational corporations that are in both the seed and the chemical business are directly marketing their products. For example, Monsanto has taken its *Roundup Ready* and *Machete* weedicides deep into villages. According to Uday Bir Singh of Chaprauli in Uttar Pradesh, the company has started to fund schooling of children from selected villages in order to win the farmers over to its products. Similarly Cargill Seeds (which has now tied up with Monsanto) also has a scholarship programme for school children in selected villages in Karnataka.

The nexus between the government and the industry becomes evident when the farmers approach government agencies and for help. In almost all the cases, the government officials blame the climate rather than the seed. Sometimes, the officials go to ludicrous limits to exonerate the corporations. In Andhra Pradesh, a government study on farmers' suicides found the cause to be illicit relations or consumption of liquor or family problems. The suicides were thus said to have been the result of social failure rather than crop failure.

The National Farming Farm Coalition also have to facilitate a class action law suit against Monsanto asking the court to give the plaintiffs triple damages for violation of US Trust law to award punitive and compensatory damages and seeking an injunction to prohibit Monsanto allegedly and taken punitive behavior. We also seeks to require testing of GE seeds and crops and we asked these tests to be subject of independent scientific review and the results of these test made public. The trial will be taking place next year and our lawyers are every hope of success.

Ms. Dena Hoff, *Chair of Northern Plains Resource Council, USA*

"Farmers are not Criminals"

Most of the farmers who committed suicide or sold their kidneys belonged to the lower socio-economic strata. They often worked on leased land. Even the grant the government gave to the survivors of the farmers' who committed suicide has now been stopped as the government claims that such grants have become the reason for farmers to kill themselves.

Punjab farmers growing cotton and paddy have suffered a loss of 1000 crore but the government has

not done anything as yet. In Karnataka out of 200 crore loss some money was given to the farmers, though a very meager amount of Rs. 4 crores from state funds. The A.P. government gave a compensation of 1 lakh rupees to the suicide families in the year 1997-98 but soon it was discontinued.

With the backing out of the government from agriculture, farmers have had to turn to private money lenders to finance their survival. 90% of the farmers take loans from private money-lending agencies that charge a very high interest rate. The problem is compounded, particularly in Punjab, by the withdrawal of government agencies like the Food Corporation of India from procurement. In the second half of the year, paddy prices fell drastically on the open market, and farmers had to resort to distress sales of farm machinery, strikes and agitation before the government stepped in to enforce the Minimum Support Price. Prof. Iyer asserted 'There are white collar criminals and elite criminals; farmers are not criminals. Farmers commit suicide in order to preserve their self-respect, which they are in danger of losing when harassed by money lenders.'

3. IPRs : Legal Control of the Seed

Seed is one agricultural input that has traditionally been in the hands of the farmer. Farmers save, exchange and sell seeds to one another. Till a few years ago, over 70% of the seed supply in India was farmer-to-farmer based. If agriculture has to be controlled, the seed itself has to be controlled both structurally and legally.

Mr. Percy Schmeiser is a farmer from western Canada who had been sued by Monsanto for his allegedly using Genetically Modified rape seeds. Mr. Schmeiser grew rape seeds for the past 50 years and had maintained his own seed bank. Monsanto did a aggressive campaigning claiming that the genetically engineered rape seed provided by them was more nutritious, had high yield and would consume less chemicals. But this was not entirely true. His neighbor sowed genetically engineered rape seed, which resulted in contamination of his indigenously grown seeds. Monsanto sued Mr. Schmeiser for having 'illegally' acquired Monsanto's patented seeds after having illegally entered his field and examined the plants. In the pre-trials although Monsanto admitted that they had no evidence of Percy illegally acquiring them. Mr. Schmeiser counter-sued Monsanto for polluting his fields and the environment with an uncontrollable technology.

Percy Schmeiser, Canadian farmer, giving evidence in Bija Panchayat

Percy Schmeiser is one among the thousand farmers who have been sued by Monsanto for 'stealing' the company's seeds. The evidence of Percy Schmeiser

I come from Peru from the Andes, the land of potato. My people have domesticated corn, potatoes, beans and so many other crops. All the richness that my people have created in the Andes has been attacked by big corporations who want to make them slaves. Since colonial times my people have resisted all their (MNCs) different attempts to take away our seeds. We have our own heroes, from Patamaru, to Nikhaila Basterus, to so many other people that rose against the Spanish, because they forbade us to use our seeds and to eat our food.

Today, the spirit of resistance against the colonisation of seed is still strong. Throughout the Andes, from Venezuela down to Chile, the communities have joined together to establish a food security corridor. This means linking different micro centres of origin and crop diversity to traditional agriculture corridors. And we want all these area to be genetically modified free and patent free zone.

Also we are establishing our biodiversity parks because we think as a civilization we have to have all the diversity we have created. The parks are means of controlling our lands and controlling our resources. These parks will be free of patent and free of GMO's.

- Mr. Alejandro, *Indigenous People Biodiversity Network, Peru*

shows that patent and Intellectual Property Rights being forced through WTO/ Trips inevitably turns farming into a *police state*. The new Patent laws, Plant Varieties laws and Biodiversity Act introduced in India therefore have serious consequences for the Indian farmer already burdened with high cost corporate control seed supply.

Intellectual Property on Seeds and Monopolisation of Life

The inherent right of the farmers to save and exchange seeds is under threat. The proposed Plant Variety Protection Act fails to protect the rights of the small and marginal farmers. The Patents (Second) Amendment Act 1999 provides for patenting on life and promotes biopiracy of our indigenous knowledge and resources.

The Plant Variety Protection Act is being amended to allow corporate IPRs on farmers' varieties. The processes involved in challenging corporate IPR claims and/or claiming compensation/ royalty are not merely drowning in red tapism, they turn the farmer from being the custodian and steward of biodiversity and its knowledge into a supplicant for benefits to be given at the pleasure of the corporations. Further, the benefits, if any are given, will be given in the form of arrears of land reforms, which further distances the farming community from custodial stewardship of the biodiversity and its knowledge.

IPRs on biodiversity, as evidenced in Canada, the US and other countries where they are in place, increase the cost of seed for the farmers leading them deeper into debt. They also lead to the destruction of biodiversity, as the IPR claims of corporations are so broadbased that they cover the genetic material contained in the variety. For example, the RiceTec patent on a rice variety derived from two basmati varities from the Indian subcontinent claims protection for the genetic material that has gone into making the variety. The two parent lines have themselves been derived from many traditional as well as domestically derived varieties. Thus the patent claim in effect is a claim on all these varieties, and if enforced strictly, will prevent farmers from using these varieties on grounds of patent infringement. Lack of use over a period of time will destroy the vast agricultural biodiversity that exists still in many Third World countries including India.

Similarly the Biodiversity Act 2000 too fails to fulfill the obligations under the Convention on Biological Diversity (CBD) to protect the rights of the communities to use their biodiversity resources of the country. It operates at cross purposes with many of the biodiversity related laws that we have in India. There is absolutely nothing like developing cross linkages and synergies between various institution and laws that have evolved in relation to

biodiversity, like the Forest Act, the Forest Conservation Act, the Wildlife Protection Act and so many other legislation in relation to biodiversity in the country. The Act does not clearly define the roles of the various bodies that either exist, such as the Panchayat, or are especially created, such as the Authorities. The Gram Sabha, which is the custodian of the biodiversity according to the Constitution, has little role to play in taking decisions to protect it. There is also hardly any mention of biosafety in the Act, even though India is a signatory and a party to the Biosafety Protocol.

The main aim appears to be the documentation of biodiversity and knowledge related to it, to assist its exploitation for private use, as there is mechanism to maintain it in the public domain. For example, according to the Act, agricultural biodiversity is outside its purview and shall be governed by the PVPA, which allows IPRs on seeds and plant varieties. The Biodiversity Act is better as a Biopiracy Act, as it takes away the rights of our communities and indigenous healers to use biological resources for their livelihood and survival.

> We also have started selling food donated by our members at a farmers' market because we want people to know that there is abundance of good food, safe foods, right in their area. We are now organsing locally and nationally to prevent Senate Bill 1155 from becoming Law. This Bill would keep states from passing their own laws on their own food safety standards and they also can not institute any requirements for food labeling.
>
> ***Ms. Dena Hoff,*** *Chair of Northern Plains Resource Council, USA*

Such IPRs, in today's age of mergers and acquisitions, control who has access to seed, to knowledge about it and to the technology. This means that fewer and fewer companies are making critical decisions about the agricultural research agenda, and the future of agriculture worldwide.

The importance of IPRs to agri-chemical and agribusiness corporations revolves round the fundamental issue of control. Seed is the first link in the food chain. Whoever controls the seed controls the food supply. Therefore Monsanto spent over $8.5 billion acquiring seed and biotech companies, Dupont spent over $9.4 billion to acquire Pioneer Hi-Bred, the world's largest seed company and Dow Chemical bought Cargill Seeds North America in mid-September 2000. In spite of this, the control cannot be total as long as farmers can save, share, exchange and sell seeds among themselves. Today, the farmer-saved seed and state-run seed programmes are worth around $22 billion, which is almost equal to the $23 billion total commercial seed market worldwide.

It is expensive and rather inconvenient for companies like Monsanto to enforce their patents. Thus the Gene Giants are developing new mechanisms such as the genetic engineering technology to enforce their corporate monopolies. IPRs on seed become even more powerful when they are linked with powerful technologies like genetic engineering.

4. Genetic Engineering and Threats to Agriculture and Life

Genetic engineering technologies attempt to create seeds that cannot reproduce themselves, and thus biologically control the complete enslavement of agriculture.

The terminator technology which is not yet commercialised in India, has as its primary aim, the maximization of the seed industry's profits by destroying the ability of farmers to save their seeds and breed their own crops. Genetic seed sterilization goes far beyond intellectual property. A typical patent provides

Along with other organisations the National Family Farm Coalition is beginning a farmer-to-farmer campaign to inform farmers with regard to genetic engineered crops: Are genetic engineered crops cost effective and marketable? How do these crops perform in the field? What are the legal issues involved: liability, growers contract and insurance? What are the environmental impacts on soil, plants, insects, wildlife? What about gene contamination? What do GE crops do to farmers' independence? How do genetic engineered crops contribute to further corporate control? Are GE foods safe from the health point of view? At local level in Montana and six neighbouring states, we have begun a food safety campaigns. We call it "safe to harvest safe to eat". And we have a fact sheet that has been entitled "Think before you plant and think before you eat". And it gives very basic arguments to farmers and consumers why they should not be planting genetic engineered seeds, while they should not be eating genetically engineered foods and it gives them places to go for more information.

an exclusive legal monopoly for 20 years but Terminator is a monopoly with no expiration date. It is the perfect tool for the corporate seed industry in a global market - because it destroys the concept of national seed sovereignty.

Last year, Monsanto and AstraZeneca bowed to public pressure and made a public commitment not to commercialise Terminator seeds, leading people to believe that that the crisis has passed. However, both Monsanto and Astra-Zeneca have merged with other companies since they made their announcements. A RAFI study released earlier this year shows that there were seven new patents on Terminator Technology issued in 1999 alone and 2 of them are jointly held by USDA and its seed industry partner, Delta and Pine land, which is the world's largest cotton seed company. In the face of massive international public protest, the US government continues to defend and support Terminator. It is, quite literally, the public sector in service to the corporate oligopoly - yet another indication of how the State the world over has become subservient to corporate interests rather than that of the public.

Another GE technology that is potentially more dangerous than the terminator technology is the Genetic Trait Control Technology. With genetic trait control the goal is to turn a plant's genetic traits "on" or "off" with the application of an external chemical. In mid-September this year, researchers in the United States announced that they have succeeded in turning mouse genes on and off like the switch of the light bulb. When fully grown the mouse is fed an antibiotic to activate the gene's switch and to shut off the gene of interest. Then the gene can be activated again when the antibiotic is removed from the animal's diet. This research is in the very early stages but the implications are staggering because it means that someday the genetic traits of commercial livestock could be turned on and off by chemical feedings. Similarly, if companies can successfully engineer seeds to perform only with the application of a proprietary pesticide or fertiliser, for example, it will reinforce chemical dependencies in agriculture - and both farmers and food security will be held hostage to the gene giants. In 1999, at least 43 patents were issued relating to genetic trait control technology, and the patent owners include virtually all of the gene giants and their subsidiaries. Seeds like *Roundup Ready* and those with the Bt have already been commercialised, and are creating massive ecological and economic devastation.

Public Good vs. Private Profit

The battle for the control of seeds, of agriculture and of food has clearly pushed the concept of public good to beyond the background. Given the vast economic power of the corporate sector and the stagnant budgets for public research, not only latter has been totally marginalised, but the benefits of public sector research are being privatised through the patent regime.

Even more frightening is the control that corporations exercise over such research.

Dr. Pusztai, Fellow of Royal Society of Edinburg, is a scientist in the Rowett Research Institute in Aberdeen, has done pioneer work in the isolation and characterization of lectins. Lectins were supposed to be harmful, but it was discovered that they have natural insecticidal properties. This led to the potential of introducing lectin genes in food crops. Dr. Pusztai, researching the health impact on mice of food genetically engineered with the lectin, found that potatoes genetically engineered with lectin were not 'substantially equivalent' with non GE potatoes of the same parent line. This finding contradicted many earlier often repeated assertions.

Corporations claim patents on genetically engineered products on the grounds of predictability of the behaviour of the inserted gene. However, it was evident from Dr. Pusztai's research that the snowdrop gene was not behaving in a predictable manner, and that its behaviour could be affected by the crop into which it was engineered - ie., the new environment into which it was inserted.

Corporations deny any possible negative health impact of genetically engineered foods by claiming 'substantial euqivalence' - ie., the chemical and behavioural properties of genetically engineered food is in no way different from those of non-GE food. Thus they deny the need for any labelling information as to whether the food is produced from GE crops or not, or the need for segregation. Dr. Pusztai's research revealed that even when the parent lines are the same, the insertion of an alien gene has impact on both the chemical composition of the food. For example, the genetically engineered potatoes had significantly different levels of proteins and enzymes from the parent line potato. The research also revealed that consumption of such foods had significant impact on the reproductive, immune and digestive systems of mice, including causing structural changes in their physiology.

When Dr. Pusztai shared his concerns with viewers on a TV programme on 10th Aug, 1998 with the permission of his institute, Novartis (the company with the patent on the gene) together with the rest of the gene industry attacked his findings. The research institute for which he worked was pressured into gagging Dr. Pusztai and repudiating his study. It was only after the intervention by the British Parliament that he could publicise his findings and his concerns.

Concerns of the safety of genetically engineered foods has led to a Europe-wide consumer movement that has resulted in the virtual ban of GE foods in the continent. In the UK, in mid-September, a group of environmentalists from Greenpeace were acquitted of causing criminal damage to the GM crops, which they had ripped up and torn from the ground during field trials. The environmentalists argued that they wanted to prevent GE crops from pollinating and therefore polluting the farms that were nearby and in the neighbouring farmers' fields. They claimed to have learned protest tactics from Indian from Mahatma Gandhi and his followers.

The conflicts and debate over the safety of genetically engineered food and crops highlights the inability of genetic engineering to feed the world.

Firstly, as corporate profit rather than people's hunger and nutritional needs is the driving concern, genetic engineering is geared towards increasing these profits. Bovine Growth Hormone, for instance, is directed towards increas-

Since several years we are fighting in France and in Europe against the industrial agriculture. Last year we win two very big battles. The first battle, begun in 1977, was against GMO's. Novartis and Monsanto wanted to sell their GMO's and wanted to impose their GM corn and soya on us. We fought this battle very strongly since 1997. We have to made non-violent direct action to achieve this success, to inform the population and to say also these big corporation that we don't want them. In January 1998 Novartis was doing trial of its seeds to ultimately sell these but we made an action and about 200 farmers carried their own seeds and we opened the bags of GM seeds and mixed our seeds with them. So Novartis could not use any more its own seeds. That was a very good action.

At the same time we are also having a big battle against the WTO. It is unacceptable that the WTO will decide what we should eat. That's why in August 1999 we protested against the (WTO) decision (against Europe who did not want to import US beef for health/taste reasons) and the tax put on European products in United States. In protests we also dismantled the Macdonald's which was in construction.

It is very important farmers from Europe, from India, from United States and Africa and South America fight together against the corporations.

- José Bowé, *Founder of the Confederation of Paysanne (CP) in France and himself a farmer from Larzac region of Languedoc*

ing the production of milk and other dairy products. However, this increased production will be available to those who need it only at a very high price as both the technology and the product is controlled by the patent holding corporation. Similarly, genetic engineering is being used to develop crops resistant to branded pesticides and herbicides of the corporations.

Secondly, as has been shown above, the health impact of consuming such products over a period of time is not known. Very little research, either public or private, has been done on the health impact of genetically engineered foods, and whether such foods can really meet the nutritional needs of the people. The potential for unpredictable behaviour and gene expression, the potential for trans-species migration of marker genes carrying antibiotic resistance, and the increased use of chemicals in the cultivation of genetically engineered crops raises serious implications for public health.

Consumer demand for labelling of genetically engineered foods becomes even more complicated as the food miles between the producer and the consumer increase. As the distance food has to travel increases, the process involved increase, and the middleman - the corporation in this case, becomes more anonymous and elusive. When food is imported from other countries where there are no special labelling laws in force, identifying foods as genetically engineered can become almost impossible.

For example, the large scale planting of GM foods so far have taken place mainly outside the Europe, in countries such as US and Canada, Argentina and Australia, where they have been approved for commercial growth and sale. These crops are then sold to enter on to the international food market, where grain merchants like ADM and Cargill, buy up the grain, ship it and distribute it through out the world. Much of these grains then enter into processed foods; often the same corporations are the processors, who also own the lesser ingredients like thickening agents and emulsifying agents, which again may be produced by genetic engineering.

Globalisation, if it has to become truly people-oriented, has to make universal laws that protect people's health from corporations, rather than making universal laws that protect corporate profits and control at the cost of people's health and livelihood.

A third conflict is the North-South dimension. The Northern countries are set to explore Southern countries for genetic resources. Several countries rich in biodiversity have been exploited by the Northern corporations. However, governments the world over, including Southern governments are not opposing this as they are viewing the technology as the force that can drive their

economies forward and give them the cutting edge in the competitive world market. This mindset seems to ignore the fact that neither is the technology controlled by governments, nor the market in which they need to be competitive. Both of these are controlled by the corporations.

Fourthly, the debate on genetic engineering raises questions related to the role of science for public good. One industry representative recently wrote that, in the age of biotechnology and intellectual property "the time honored and noble concept of international public goods is essentially obsolete." Dr. Pusztai's experience clearly shows that when governance does not honour its commitment to the people, public interest suffers. Decisions that should be made in the public institutions for promoting public good are made in corporate offices for promoting corporate interests.

India already has experienced such decision making and governance by the gene giants. When the first boll guard trail took place in 1998, the trials were secret, the planting had taken place before they got official government permission, in violation of every law. This year too in September the Government of Karnataka has given clearances for trials including for multiplication of seeds in a 150 hectares in spite of the fact that no multiplication of seed is allowed in field trials. Especially when testing the safety of a crop, law requires that every bit of the plant material is burnt. In spite of such violations, the science is considered 'strong science' as opposed to people's science, which is based on sustainability and leads to ecological and harmonious production systems.

Taking Up the Challenge

Consumers are a powerful force against market driven governance. Consumers first raised the health implications of chemicals in agriculture, and helped the rejuvenation of organic, non-GE, ecological agriculture.

Consumers of Europe have led the battle against genetically engineered foods, and their demand for non-GE foods has led to a decline in share price of GE companies; and this led them to question their biotechnology operations or to seek to separate them in financial terms.

The challenges to ensure sustainability and equity for all life on earth - plants, animals, people of the South and the North - calls for continued and concrete action against monopolistic forces. As Justice V.K. Krishna Iyer, put it at the conclusion of the Beej Panchayat.

> *This is not the end. This is the beginning. Our enemy is strong and they have a power to corrupt. Open your eyes and see what is happening in this country. Open your eyes and see what is happening in the world.*
>
> *The seriousness of the occasion must be understood. We are struggling for seed. What shall I say, if the seed itself is corrupted, if the seed itself is monopolised where is the hope for us? For us means for people of the earth. We are one billion strong. I speak here with the authority of one billion, not because of vote cast in the booths but because I represent the feelings of the common people. The nation shall never commit suicide.*

5. The Verdict of Bija Panchayat

The accounts given as evidence by the large number of relatives (widow, son, brother) of farmers who killed themselves and given directly by the farmers who sold an organ for money, all point to a common scenario. This in brief is cumulating debt owing to high cost and substandard seed and other inputs pushed by companies and their agents for their own profits. A number of big companies which are connected to a part of transnational companies (TNCs) as well as smaller companies are involved in the cases.

The World Bank Seed Act of 1988 opening up the seed sector to the MNC, control and domination of Private Industries and simultaneously withdrawal of government sector has played a major role in pushing farmers into debt, suicides and trade of body part.

Low interest, agricultural credit system have disappeared and farmers have been pushed to borrow at high interest rates from the same agents who also push seed and chemicals.

The MNCs have taken over the control over India's seed supply without any responsibility and liability. "Seed business has become a business of genocide, forcing the farmers to pay for the corporate profit with their very life." Govt. have totally failed to provide security and protection to vulnerable peasants.

The farmers were persuaded to go in for growing more high risk, alleged high yielding varieties of cotton, chillies etc. As institutional credit is either not adequately available or there is a ceiling on it they took large loans from private money lenders and input dealers, the former at 36 to 48 percent rates of interest, the latter against delivery contracts. It is clear that there is big influx in the villages of fly-by-night operators supplying substandard seeds, pesticides and fertilisers, who persuade the farmers to buy their expensive inputs on credit. Even in the case of genuine inputs the risk is borne entirely by the farmer while spurious inputs supply itself guarantees failure and further enmeshes the farmer in debt. The farmer tries to repay debt by selling land, selling even his body organ; but when cumulated debt exceeds all hope of repayment he is driven to suicide.

An organised racket appears to have developed to exploit the farmers distress to obtain organs for transplantation. Evidences were given mainly by the affected farmers from Andhra Pradesh, Karnataka and Punjab. The crisis has developed to this point, owing to the complete deregulation of the markets in credit and inputs and owing to the withdrawal of the state from its responsibilities in the course of the last decade. The crisis will affect larger areas of our agriculture unless immediate steps are taken to halt the process described. Government has a responsibility to intervene because it cannot shirk its duty of safeguarding the public interest.

The burden of high prices of the corporate seed combined with high unreliability and unaccountability will further increase with genetically engineered seeds.

Patent and IPR's regime as system of monopoly control will further aggravate the severe crisis the farmers are facing. The Trade Related Intellectual Property Rights (TRIPS) regime of the World Trade Organisation (W.T.O.) will therefore create conditions for a deepening of the economic crisis for the farming community in India.

6. Recommendations

1. The role of the multinationals in the seed production and distribution should be balanced with liabilities and responsibilities.
2. The public seed sector which is being dismantled needs to be reinvigorated through strengthening its research and development and farmers participation.
3. Seeds being distributed should be tested by Agricultural Universities for their agro-climatic suitability, germination characteristics and vulnerability to pests and diseases.
4. It should be the responsibilities of the State to provide adequate checks and balances to ensure healthy seeds and genuine agriculture inputs. Setting up of the regulatory bodies at the state and district levels which will permit only the supply of those inputs whose samples have been tested and whose distributors have been licenced. There must be penal provisions for supply of substandard inputs. Farmers seed supply should also be strengthened through programmes such as in-situ Conservation and Community Seed Banks.
5. The credit requirement for the under privileged farmers could be established with the support of the organisations that have participated in the Bija Panchayat by setting up a legal defense fund. This would be an important step towards helping farmers fight the giant and reckless multinationals.
6. Strict punishment should be awarded to persons who are involved in the trade, storage and distribution of spurious agri-chemicals.
7. A moratorium should be imposed for a period of ten years on the commercialisation of the genetic engineering in food and farming in India.
8. Traditional rights of the farmers to freely conserve, develop, use, share, exchange their seeds are fundamental rights which cannot be alienated by any IPR law. We must develop our indigenous “sui generis” system to protect farmers’ seed sovereignty.
9. The Protection of Plant Varieties and Farmers Rights Act 1999, the Patents (second) Amendment Act 1999 and the Biological Diversity Act 2000 are harming farmers rights that should be changed.
10. In order to defend the rights of the small farmers and for the food security of people there should be a call for exclusion of seeds, life and life forms from the TRIPs / WTO.
11. There should be guarantee of minimum support price to the farmers for their agriculture produce.
12. In order to safeguard the interest of the farmers, the representative of the farmers should be adequately represented in the Commission on Agriculture on Commodities and Prices.
13. It should be the endeavor of all the organisations, the State and the Central Governments to support the farmers in achieving the self-sufficiency in food production.

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CHAPTER V

Rebuilding Seed Security

The most important component in the agricultural sector is the seed. Seed is considered as the answer to the problems of making other agro-inputs productive and cost effective. In fact, seed is the most crucial, critical and vital input, which is well-recognised carrier of production technology.

About 70% of the India's population is engaged in agriculture. Due to increased pressure of population and lowering land fertility levels it is mandatory to increase the productivity of the area. To achieve this goal, availability of high quality seed in adequate quantity is of paramount importance.

Agriculture and civilization have progressed simultaneously along with seed husbandry and the history of the development of new crops and their varieties. Many people ended nomadic lives to settle permanently as they learnt to plant, harvest and preserve seeds of certain grasses over the season. The development of major human civilizations had their bases in the culture of three cereal staple grains: wheat, rice and maize. The Mesopotamians planted wheat along the banks of the rivers Tigris and Euphrates, the Chinese grew rice on the banks of the Hwang Ho and Yangtze, and the Mayans cultivated maize along the dry flat plains of the Yucatan.

Seeds of agricultural crops have been and will continue to be the major source of food worldwide. The large–seeded grasses or cereals belonging to the plant family Poaceae contribute more food than any other family, followed by Fabaceae, constituting legumes and pulses.

The present scenario demands for importance of strengthened network of seed production, supply and its delivery system. The government of India decided to reorganise and expand the seed industry following the recommendations of 1968 Seed Review Committee in the country, so as to create institutional framework for support and coordination of all the facets of production.

The Green Revolution did engender a form of food security; however, this form of food security, which was driven by centralised control over agriculture, its resources, its technology, credit and food distribution, was not based on ecological security and livelihood security. As governments and people wake up to the devastation caused by the Green Revolution and the centralised control system exemplified by it, corporate control over food production and distribution systems is being pushed as the means of ensuring food security.

Liberalisation has allowed the entry of multinational corporations into the sectors of food production and distribution. Seed companies like Monsanto and Novartis, through mergers, acquisitions and IPRs, are acquiring global rights to seed; the same seed companies are pushing new ecologically perilous GE technologies that could have an equally risky impact on human, animal and plant health. Global trading giants such as Cargill are taking over the food distribution systems of country after country, and placing the food security of the ordinary citizen on international markets.

The food security system, put in place during the Green Revolution, were centralised systems, like the Food Corporation of India (FCI), the Agriculture Price Commission of India and the Public Distribution System (PDS). The PDS during the green revolution was an instrument to subsidise the food that was being produced at high costs through green revolution technology to reach the consumers at lower price. This was a capital intensive subsidised and centralised system which failed in its attempt to serve the most neediest and starving people. This later led to its diminishing role and dismantled with the beginning of liberalisation and globalisation process in the country. The multinationals are seen as the viable alternative thus creating corporate monopolies, which were earlier state monopolies.

Nowadays the threat of GM seeds is looming over the Indian horizon. India's total imports of seeds in 1998-99 were 244 tonnes valued at $9.8 million. The total exports were 4,900 tonnes, worth $15.4 million, marginally up from 4,700 tonnes in 1997-98 worth $14.6 million tonnes (R. P.Singh et al, Research Paper CIMMYT).

The hijacking of the food system by the MNCs will lead to the complete control over seeds and fertilisers and would provide farmers with credit extension services and marketing support. This would be a sort of bonded farming, as the MNCs would later on dictate their terms and conditions, which would be market driven. Little concern in terms of the welfare of the farmers, the ecology of the area and natural resource management would be taken into account.

To subvert the attack on our food and livelihoods by the MNCs, it is very important to reinvigorate the public sector seed production, supply & distribution and at the same time help building community initiatives of seed conservation. These are the systems which need to be built which are being threatened by the entry of seed and agri corporate. The corporates are posing the threat through monopolisation of seed.

Many leading economists have cited that the private agencies though with their aggressive marketing are able to set aside the PSU, but the fact remains that these companies long-term viability remains uncertain. All seed companies owe a debt to the government-funded agencies that have provided them funds for research, extension and development services. The private seed industry is motivated by the quest for profits, the private seed companies and the MNCs aggressively pursue the most lucrative commercial markets; at the same time, they largely ignore marginal areas were there is real need of research and development.

Thus in this scenario it becomes very important to rebuild the farmers' seed security through building public sector seed research and control as exemplified

by the case of Tarai Seed Development Corporation and through farmer-based in-situ conservation and exchange of traditional varieties of seed by local communities as initiated by Navdanya.

1. Strengthening Public Sector Seed Supply: A Case Study of Tarai Seed Corporation

Cooperation has been a way of life with family norms and discipline as well as social morals and obligations in the Asian countries at large and India in particular. Such an ethos has flourished under decentralized agriculture economy. But now the industrialization of both the heavy industries and the agricultural scenario disrupted the joint family structure and the microfamily units emerged. The age-old traditions and value orientation has changed yield competition succumbing to the market driven economy. Developments and breaking of social fabric has seen the intrusion of multinationals and transnational to carve a niche by displaying themselves a part of the society. This has lead to disparities and gaps in the social relationships but also proving to be agents of instability and destruction.

Against this background, the proven experience of cooperative movement offers a ray of hope for an egalitarian order even under the modern circumstances. The major thrust of cooperatives in the post independence era has been towards the support of agricultural production through provision of agri credits, quality seeds machinery etc. and creating post harvesting facilities for the farming community

Towards this, a system aiming for involvement of farmers in a corporation was envisaged. The involvement of the farmers right from the farm fields (seed production and farming) to the board rooms (decision making process) would ensure that the policies formulated would aim to work for the farmers betterment. The cooperatives are needed very much for supporting basic research and research targeted at marginal production environments. It is the corporations that strive to formulate policy which are designed to meet the broader needs of potential end users and are able to strike a balance between the efficiency goals (best achieved by large scale farmers) and the equity goals (that are achieved by addressing the needs of small scale and marginal farmers).

The National Seed Corporation (NSC) was registered as a public Sector Company on 19th March 1963 under the companies Act, 1956. It was set up with the aim of making available to the farmers' seeds of superior crop-plant varieties/ hybrids developed through scientific methods and improved technology to achieve higher and stable yields. The NSC and the State Seeds Corporation over the years have been downsized by the entry of private and multinational companies for capturing the markets that were held by the SSC and prior to that by the NSC. This gradual takeover of the National and State facility by the private companies and MNC's will propagate the vested and selfish motives of these parties. This would further deteriorate the position of farmers, both the small and marginal.

Still in the present dismal scenario a seed corporation known as TARAI SEED CORPORATION comes as refreshing change were the priorities are set by the farmers within a Government set-up.

Tarai Seed Corporation

It was at this juncture that the Tarai Development Corporation (TDC) was established at Pantnagar, U.P. in 1969 with the assistance of the World Bank. Prior to this, the Seed Production Department of the G.B.Pant University of Agriculture and Technology was accomplishing the work of seed production. TDC was restructured in 1978 in order to expand its production activities to 55 districts of U.P., which were only 3 districts. The Corporation functioning since then under the name of Uttar Pradesh Seeds and Tarai Development Corporation (UPS & TDC), has enormously increased the infrastructure and diversified its production programme. Under the auspices of Tarai Development Corporation (TDC), land reforms work for the benefit of farmers viz. leveling grading, development of irrigation facilities; electrification, sinking of deep and shallow tube wells were carried out. Also import of agriculture implements such as tractors, combine harvesters in order to provide basic input to the shareholders/farmers (seed producers) for efficient and quality seed productions were carried out.

Objective

The TDC's emergence as a powerful seed certifying and seed distribution agency in the Tarai is well recognized. The Corporation's close working relationship with the farmers has allowed them to set objectives such as to achieve growth of 15% per annum on the average, a return of 12.5% after tax on Net Worth has been planned. The Corporation with the farmers participation aims to diversify its product mix based on the market intelligence, so as to produce an increasing quantum of high value added products, rising to 25% of the total turnover.

The corporation along with the Tarai farmers as their main seed producers is gearing up to maintain its name and quality standard in the region. The main marketing strategy includes treating the farmer as the focus of all activities. Its emphasis on the promotion, packaging and customer relations with the farmers by looking into their needs, by giving them technical as well as financial support especially during the sowing and harvesting time.

Further, the Corporation aims at strengthening the co-operation and tie-up with other players in the market. The aim is to involve the agricultural universities, the extension workers of the Agriculture Department/ Universities to spread the aims, objectives and the facilities extended to the farmers by the Corporation. A research and development cell is being set up with the responsibility for keeping liaison with various research organization and maintaining the data bank on the seed varieties that are being developed. Besides the cell will actively be involved in giving direction to diversification of production and marketing operations. The farmers have trust in the TDC as the TDC aims at achieving self-sustaining growth, primarily based on internally generated resources.

The Organisational and Capital Structure

The Corporation is an autonomous institution with the Principal Secretary/ Agriculture Production Commissioner of the State as the Chairman. The apex policymaking body in the organization is the Board of Directors having six

farmers and powers to decide over the policies and decisions matters. The farmers are also having stake in the Corporation. The farmers contribute to about 33% to the capital share.

Seed Production Activities and Farmers Involvement

To produce quality certified seeds as per the targets laid down in the "State Seed Plan", the TDC works with close co-ordination with the farmers. The TDC organizes annual meet with the farmers so as to inform them about the latest developments. In order to achieve utmost success in work plans a system has been evolved in which the TDC sends out requisition forms to farmers asking them about their capacity for production of the seeds for the production and supply of the Foundation and Breeder seeds of various crops/varieties. The Corporation then certifies the seeds obtained from the farmers. The Corporation subjects the seeds for certification to artificial drying, grading, upgrading, treating, rigorous quality control and packaging sizes to suit the farmers need. During the seed production the aim activities in which the Corporation and farmers work in close co-ordination are:

1. To organize the seed production programme at shareholders farm as well as at the farms of other progressive seed growers as per target fixed.
2. Arrangement for the foundation seed production and its distribution to the seed growers, inspection of the seed production fields to ensure genetic purity and disease free seeds. Assist seed producers in crop management and adoption of plant protection measures.
3. Installation, management and operations of seed processing plant. Proper storage of unprocessed as well as processed seeds.
4. To ensure the availability of foundation seed
5. Providing gunny bags free of cost to its seed growers, to ensure timely supply of pure seeds.
6. Providing all the other facilities to the seed growers, which are required from time to time for quality seed production.

Procedure Adopted

The Corporation handles only three categories of seeds; Breeder, Foundation and Certified seed. Breeder seed is produced by a Research Institute/Agricultural University under the direct supervision of concerned Plant Breeder and monitored by a team of experts duly constituted by Central Seed Committee. As per provisions of Seeds Act, Foundation Seed is the progeny of Breeder Seed and used for Certified Seed Production. Certified Seed is the progeny of Foundation seed and is used by the farmers for commercial crop production. Foundation Seed and Certified Seed need to meet the minimum Certification Standards specified under the Seeds Act.

The Corporation sends qualified staff to the field to assist the farmers about various precautions to be taken at field, as well as at plant level, for the quality production of above classes of seeds. Good quality foundation seed is given to the farmers (seed producers). The inspection by technical staff of the TDC

is done from time to time at vegetative, flowering and maturity stages of the crop. The farmers are advised about the shortcomings if any and suggestions to overcome them on the spot are done by the staff. The seed plots meeting the standards above the minimum seed certification standards are allowed as seed crop and a field sample is drawn from each lot after proper threshing, packing and sealing and subjected to vigorous seed analysis. Seed lots meeting certification standards at seed level, as pre-intake test, are allowed to move to the processing plants.

On arrival at plant, another sample is drawn from the produce at the plant before a particular lot is subjected to various steps of processing. On the basis of Before Processing Sample (BPS), test result processing procedure is adopted, and specific attention is paid to every seed lot as per requirement. The drying up of seeds as per specifications is done passing the particular lot through indented/disc/cylinder or spiral and gravity separator. At the time of processing, every care is taken in quality seed production and finally a sample is drawn after processing by us as well as UP State Seed Certification Agency, an official authority for seed certification in Uttar Pradesh. The seed lots meeting certification standards as per our tests as well as the tests carried out by UP State Seed Certification Agency, are allowed to move to the buffer godowns maintained at various divisional levels. The Corporation always endeavors to maintain much higher standards that the ones prescribed in the Minimum Seed Certification Standards.

Area of Operation

The seed production work is organized in the state of Uttar Pradesh and some contractual production is organized in the other states also. There are the 8 regional offices located in Haldi Pantnagar, Kashipur, Meerut, Aligarh, Kanpur, Varanasi, Faizabad, and Gorakhpur.

Crop Varieties Produced by TDC

At present the Tarai Development Corporation is producing 151 varieties of 43 crops. Brief accounts of main crops that are distributed by TDC are mentioned below.

	Kharif Crops	
1.	Paddy	Sarju 52, Pant Dhan 4, Saket-4, Mahsuri, Sita, IR 36, Ratna, Narendra 80, Govind, Usar 1, Ashwani, Pusa Basmati-1, Narendra 118, Kasturi, BC 370, Pant Dhan 10, MTV 7029, PNR 381, VL-16, HKR-228, Pant Dhan 6, Pant Dhan 11, BP T 5204, MTV 7029, PNR 381.
2.	Maize	Naveen, Sweta, Kanchan Surya, D 765, VL- 42.
3.	*Urd*	T 9, PU-19, PU-30, PU-35.
4.	*Arhar*	UPAS-120, T-21, Bahar.
5.	Groundnut	ICGS 37, ICGS 44, Kaushal, Chitra.
6.	*Bajra*	ICTP 8203, ICMV 155.

	Rabi Crops	
1.	Wheat	HD 2329, UP 2003, HD 2285, HD 2428, PBW 154, PBW 226, HUW 206, HUW 234, Sonalika RR-21, UP 262, UP 1109, Raj 3077, Sonali, WH 542, WH 174, SANGAM, Lok 1, Kundan, VL 616, VL 421, K 8020, K 8027.
2.	*Lahi*	T9, PT 303, PT 3O.
3.	*Rai*	T 59, Rohini, Vardan, NDR 8501.
4.	Gram	Avrodhi, Radhey, Pusa 267, Pusa 256, K 850, PG 114.
5.	Pea	Rachna, Aparna, Pant 5, HUP 2.
6.	Lentil	K 75, PL 234, PL 639, PL 406, PL 4.

	Spring crops	
1.	Sunflower	Morden, KBSH 1.
2.	*Moong*	T-44, Pant 1, Moong Pant2, Moong Pant 3.

	Vegetable crops	
1.	Peas	Arkel, Azad
2.	*Dhania*	PD I
3.	*Methi*	Pusa Early Bunching, Kasuri
4.	*Tinda*	Arka

Apart from providing the necessary seeds for the seasonal crop/ vegetable the TDC provides pamphlets and information brochures. These pamphlets are distributed free of cost to the farmers to educate them on the various aspects of planting, maintenance and care of seedling. The main aspects covered in the brochures is the type of crop, its variety, number of seeds to be sowed in unit area, the time of sowing, method of sowing, time of transplantation, distance from row to row, between the seedlings, depth to which sowed, time of harvesting, yield per unit area, important features of individual crop, manure and fertilization, preparation of field, irrigation schedule, control of weeds and pests, plant protection and details about the final harvest are mentioned.

Certified Seed

The seed after been certified are labeled with a post card size certificate. The UPS & TDC has eleven points which give a fair amount of knowledge to the buyer or supplier the status of the seed. The label consists of the following information:

Label number, crop, variety, lot number, date, month and year of test, valid upto, germination including hard seeds, physical purity, genetic purity, weight while packing, preservative used.

Facility Extended to the Seed Growers

❑ **In Seed Production**

- To ensure targeted production, foundation seed is distributed to the seed growers at the nearest place to their destination by sending teams for distribution.
- Payment of their produce is made at the nearest place by establishing Accounts office is done at the accounting offices in all the Regional Offices of the areas concerned.
- The Corporation provides technical guidance and supervision from time to time.
- The Corporation pays the better price to its seed growers, which is 10% to 15 % higher than the others.
- The Corporation makes arrangement for the registration of the seed growers with the Certification Agency instead of bothering the growers themselves. They are encouraged for foundation seed production seed production, so that they are trained for higher skill of seed production and as well as able to get more price for their certified seeds.
- Arrangement are made for the intake as near as possible to their place by opening Collection Centers and they also given transport rebate for bringing their seed to the Seed Processing plants of the Corporation, if the distance is above the prescribed limits.
- To ensure quality of intake as well as for the facility to the growers, they are provided twill Bags free of cost

❑ **Finance and Accounts**

- For an early payment to the growers, the Corporation has made an arrangement with the banks for the "D.D. at par' facility, free of charge. Wherever the facility is not extended, the financial charges are being borne by the Corporation.
- The farmers are paid remunerative prices of the seed, which is fixed having taken into account the opportunity cost of the seed and other related cost ingredients.
- The farmers who have to bring their seeds beyond a certain distance from the location of the plant are provided transport subsidy, which mitigate their financial burden.
- The farmers need working funds therefore the Ist installment of the total paytment is immediately made on the intake at the plant. The payment is higher than the market or the support price, whichever is higher. After processing of the seeds the farmers are made their final payment. In adverse circumstances, the interim payment is also made.
- The farmer payment is regularly monitored and it is ensured that the payment is made within a week from the date of supply.

Marketing

The main objective of marketing is to make available the latest and the best quality seeds as per the requirement of the farmers in time, within 5 kms of the field and at the most reasonable price. The seeds of crop varieties that are to be made available are planned for production according to the requirement based on the facilities available to the requirement based on the facilities available to the land of the farmers including the natural resource. Specifically in case of certified seed, minimum planning of three years is essential for making available requisite quantities of the crop varieties of seed in time i.e. one year of production of Breeder, Foundation and Certified seeds. The Corporation has played a pivotal role in the preparation and execution of 5-year Seed Plan at the state level. On the basis of the demand so worked out, the producing agencies are given the responsibility of production of certified seeds one year in advance; corresponding production of the foundation seeds by the responsible agencies 2 years in advance and production of Breeder seeds in 3 years in advance. The State Seed Plan also provides for the introduction of the latest varieties found suitable during the plan period. Timely availability of seeds is the essence of the Seed Plan. The targets of timely availability of seeds fixed in the seed Plan against the sowing period are:

Crop	*Normal sowing time*	*Time fixed for providing seed at sale points*
Kharif	June-July	30th April
Zaid	February- March	31st January
Rabi	November- December	10th October

Distribution and Transport System

As per the terms and condition set out by the Corporation the distributor has to reserve its accepted indent almost 4 months before the actual sale time covered with 10% advance. Crop/varieties of the seeds are available at the regional godowns according to the reservations made by different distribution agencies. These distribution agencies sell the stock to the farmers at the retail stock fixed by the government. The dealers get the commission of 9 % and the distributor between 2.5 to 4.5 % on the slab basis, which is quite remunerative to them. In case of states other than U.P., the stock is supplied by wagons directly to the payments of 25% advance and remaining cost through the Bank and Regional Office before delivery of the Railway receipts. The Dealers and Distributor also get stocks from our buffer godowns.

The seeds as soon as processed at the Seed Processing Plants, are to be transported to the different storage godowns as per the area requirement. The transportation is made through road and rail; which ever is economical for carrying-out, the transportation work. Reputed transport companies are appointed on yearly contract to carry out the safe and timely transportation. The transportation by any means is insured for any risk enroute.

Present Scenario

The seed production for the year 1999-2000 was 10.85 lac quintals whereas the projected target for the year 2000-2001 would be 11.87 lac quintals. Whereas the seed distribution achieved for the year 1999-2000 was 8.07 lac quintals, the target for the year 2000-2001 is 11 lac quintals. The achievements of the TDC are a record certification of 7.00 lakh quintal seeds of different crops was achieved for the year 1999-2000 rabi season. In the year 1998-99 an area of 39,086 hectares of land was undertaken for seed production activity. A new record in vegetable seed production of 20,000 quintal was achieved in the year 1999-2000. Opening up of sale counters for vegetable seeds in regional offices. To promote kitchen garden TDC is marketing rabi and kharif kitchen garden packs.

TDC thus, signifies that with the help of farmer's participation, a Corporation can achieve remarkable success. The policies are for the interest of the farmers. By lending the farmers the necessary technical support the Corporation has earned the goodwill of the local people. The farmers being the producers as well as the consumers of the seeds are considered during the decision making process. The TDC has the seed producers- farmers close to their door. The farmers being part of the management and decision making bodies have ensured until now that the farmer's interest has not been hampered. The Co-operative thus run with the close association with the farmers ensures that it has a motto for the farmers, by the farmers and of the farmers. The bond is so strengthened that the farmers see the TDC as the only reliable source of seed in the Tarai region.

2. Strengthening Community Seed Supply : A Case of Navdanya Conservation of Agricultural Biodiversity

Conservation of agricultural biodiversity is impossible without the participation of the communities who have evolved and protected the plants and animals that form the basis of sustainable agriculture. In agriculture, in-situ conservation strategies are impossible to separate from sustainable utilisation and production methods.

The *Navdanya* initiative (a programme of the RFSTE), which began in 1987 in response to the crisis of agricultural biodiversity, has grown into a national movement for a democratic and equitable food security. The programme combines conservation of agricultural biodiversity with the assertion of farmers' rights to their knowledge, resources and technology. Similarly, people's right to food and food security encompasses their right to livelihood and to safe food.

The *Navdanya* programme works for promoting ecological agriculture based on biodiversity, for economic and food security. Agricultural diversity can only be conserved by biodiversity-based production systems. The programme works with farmers helping them shift from monoculture to AGRIculture - sustainable agriculture based on biodiversity - through demonstrations and workshops on seed conservation, seed development, pollinators, maintaining soil fertility through composting and use of soil micro-organisms, biodiversity based pest and disease control.

The struggle for seed, for agriculture and for the protection of the environment and of livelihood is the most vital struggle of our times. The challenge lies in not just taking on the corporate might of the market drivers, but in also devising ways to make sustainability with equity the core of existence.

The *Navdanya* Movement - nine seeds movement - for conservation of agricultural biodiversity on farmers' field is one such movement, where farmers in many parts of the country are actively involved in conserving not just hundreds of varieties of rice and wheat, but are striving to bring back into cultivation the numerous ecologically prudent crops that have almost vanished - millet varieties, pseudocereals, pulses, etc.

The *Jaiv Panchayat* Movement - Living Democracy Movement - is an offshoot of such conservation activities, and was born as people perceived the threat that IPRs posed to their natural resources. The Movement places control over the natural resources with the Gram Sabha or the community, and makes them the final arbiters of who will use the biodiversity and how.

Movements to protect the small family farm and to rejuvenate organic agriculture are mushrooming all over the world.

The Navdanya *Initiative for the Conservation of Seed Biodiversity*

The conservation of biodiversity requires action at many levels. It requires *in-situ* or on-farm conservation of all biodiversity, especially agricultural biodiversity. It also requires that biopiracy be challenged at the local, national and international levels. It further requires the defence of community rights to natural resources including biodiversity and knowledge about it.

Farmer-based in-situ Seed Conservation and Exchange

Navdanya is primarily concerned with facilitating *in-situ* seed conservation and seed exchange of traditional varieties by local groups and communities for the preservation of agricultural biodiversity and to protect farmers' rights to seed. The movement has grown into a national network of community seed banks and *in-situ* conservation programs. *Navdanya* sees its role in seed conservation as a catalyst, creating an ever widening circle of awareness at many levels from the micro to the macro, stepping in to facilitate local groups and communities to take up seed conservation activities and then stepping out when the local capacities have been built up.

Navdanya's efforts have resulted in the conservation of more than 1000 rice varieties from all over the country including indigenous rice varieties that have been adapted over centuries to meet different ecological demands. These include dryland varieties that require only one shower a year, varieties that grow more than 8 ft. tall and are adapted to waterlogged, flooded conditions, as well as varieties with distinctive medical and health benefits. Crops such as millets, amaranth, buckwheat, pulses have been promoted and saved from being pushed out by expanding monocultures.

The *Navdanya* philosophy of farmer-based agricultural biodiversity conservation is spreading throughout the country. The objective of the conservation programme is to empower local farming communities to protect and regenerate genetic diversity and the knowledge systems that support it.

Navdanya has set up 20 community seed banks in 7 states over the past 6 years. Many seed banks are now running independent of *Navdanya's* support e.g. in Karnataka and Tamil Nadu. The programme has also established a conservation and training centre at its farm in Doon Valley. More than 2000 farmers are primary members of *Navdanya*. These farmers are the backbone of the organisation so far as the conservation activities are concerned. They are also promoters and messengers of *Navdanya's* philosophy and movement in their neighbouring villages, cities and states through *Bija Yatras*. Today biodiversity conservation programmes which are directly run by *Navdanya* or supported by it, are underway in five states of the country - Uttar Pradesh, West Bengal, Orissa, Tamil Nadu and Kerala. Moreover in 1999 *Navdanya* has initiated its conservation activities in the Punjab and Haryana, which are hinterland of Green Revolution, and Andhra Pradesh in Southern India.

Limitations of *ex-situ* collections in gene banks

The last three to four decades have witnessed increasing concern over the loss of agricultural biodiversity. Institutions like CGIAR, NBPGR, IBPGR, ICRISAT, have been expressly created to start and maintain *ex-situ* collections so that a constant and reliable supply of diverse plant genetic material is readily available.

However, gene banks have failed to conserve biodiversity because their concept is based on three flaws/inadequacies:

- The scientific basis on which the concept of *ex-situ* rests is based on the 'germplasm' theory, which holds that plant genetic material can exist independent of both the plant itself and the environment in which it grew, as well as the environment in which it is stored. This assumption has been proved false.
- The technical problems include the difficulties associated with constant power supply, regular servicing of machinery, lack of staff and storage space, and limited facilities for regenerating material.
- Political inadequacy of national and international gene banks stems from the fact that while the seeds available to them are supposed to be available to farmers, public sector research institutions and to the private sector, they are, in actual practice, most accessible only to the last, and very rarely to the first. Gene banks also cannot challenge the very broad-based IPR protection the private sector seeks and often gets on the characteristics of varieties stored with and developed from varieties taken from them. As these varieties are mainly farmers' varieties, gene banks have no mechanism for protecting farmers' rights.

Farmers in in-situ conservation

The programme's *in-situ* require the participation of four kinds of farmers:

1. Farmers who continue to use and conserve diverse varieties. In general, these are small peasants in marginal or remote areas which were left out of the Green Revolution as they did not have the necessary resources to shift to resource-capital- and chemical-intensive agriculture. Marginal farmers in marginal regions are thus the source of rejuvenation of agricultural biodiversity. They are the seed savers or *beej rakshaks.*
2. Farmers whose agriculture biodiversity has been eroded but who feel the ecological, economic and political imperative to reintroduce diverse species and crop varieties for ecological food security. They become *beej rakshaks* by introduc-

On Garhwal, where Navdanya has been working for a long time, many farmers have converted to traditional farming and have completely abandoned the chemical farming. One valley has now been completely free of chemicals and about 30 village in that valley don't use chemical pesticides and fertilisers at all. And we hope that in coming three – four years the whole Pauri district will be a chemical free zone. Over 10,000 farmers have already taken a pledge on the initiative of Navdanya that they would not use any chemical fertiliser, pesticides, MNC's seeds and patented seeds and practice their traditional farming and use our indigenous seeds.

- Darwan Singh Negi, Kotdwar, Pauri Garhwal

ing diversity from farmers who have conserved seed through community seed banks and exchange networks. For example, the *Navdanya* seed bank in Garhwal region gave organic rice varieties to farmers from Bhatinda in Punjab, whose declining yields and increasing debts caused them to shift to organic farming. These seeds, without any external input, have given a yield of 19 quintals/ha, while the best hybrids, with all the chemical and water inputs have given just 22 quintals/ha. Similarly, saline-resistant seeds conserved by the *Navdanya* programme in Orissa have helped the victims of the supercyclone that hit Orissa in October 1999 re-establish sustainable agriculture.

3. As the number of farmers wanting to shift to ecological agriculture increase, farmers are required for strengthening seed supply. Farmers who become seed producers - multipliers - for the community seed banks are *beej utpadaks.*

4. Given the rapid erosion of biodiversity through the spread of monocultures and export-oriented agriculture, many species and varieties have lost their utilisation value due to market forces. Farmers who conserve these species and varieties *in-situ* for their biodiversity and possible future value are an important part of the *Navdanya* programme.

Community Seed Bank Network

The *Navdanya* programme operates through a network of community seed banks in different ecozones of the country, and thus facilitates four types of rejuvenation:

- Rejuvenation of agricultural biodiversity as a common property resource;
- Revujevnation of farmers' self-reliance in seed locally and nationally;
- Rejuvenation of sustainable agriculture as the foundation for food security, both locally and nationally; and
- Rejuvenation of farmers' rights as common intellectual and biodiversity rights of agricultural communities.

The farmers of Orissa have come together and formed Jaiv Panchayats through which they hope to and are inspired to fight and resist the impact of globalisation. The Jiav Panchayats are under oath to preserve and conserve the local paddy varieties and other variety at any cost, to maintain their right to seed, to maintain their fundamental right to produce food, feed themselves and feed the people.

We have shunned the use of chemicals and have developed methods of composting indigenously which maintain the yield of paddy compared to HYV. Our normal paddy yields about 16 to 20 quintals per acre. We have produced paddy upto 16-20 quintals in an acre using organic manure. In vegetable production we use vermi wash and it has tremendous effect. With the use of organic manure and fertilisers we can do away with the chemical fertilisers that contaminate our fields.

After the neem victory the Orissa farmers have developed more confidence and started planting neem trees along the village roads and they are now using the neem oil, and neem cake as pest control mechanism.

- Ashok Panigrahi, *PPBSA, Balasore*

Farmer - Consumer Linkages

The last but vital link in the network for conservation of agricultural biodiversity is the consumer of this biodiversity, as regular consumption is be best way to conserve biodiversity. *Navdanya* is the

first initiative in India to have started direct marketing of organic produce from *Navdanya* farmer members to *Navdanya* consumer members. More than 2000 members participate in its biodiversity conservation, organic production or organic consumption.

Navdanya's involvement in issues of biodiversity conservation emerging from a concern for peoples' rights to natural resources and sustainable livelihood, has led to pioneering contribution in linking trade issues with issues of ecology and gender equity. Through participatory research, the Foundation has given scientific support to social movements like Chipko, farmers' movements, and movements for the conservation of biodiversity and peoples' rights. The Foundation has launched several campaigns and movements for the protection of peoples' life and livelihood e.g. *Neem Campaign, Beej Yatra, Bija Satyagraha, Jaiv Panchayat, Lok Swaraj Abhiyan,* etc.

Initiatives in Defence of Community Rights to Biodiversity and Knowledge

Third World countries including India have provided the world with most of its agricultural crops and medicinal plants. These crops, which have been developed primarily from farmers' varieties and indigenous healers' knowledge, are being usurped by corporations through IPR systems that promote biopiracy to create monopolies over resources and knowledge.

The defence of community intellectual and biodiversity rights are thus indispensable for the protection of community rights.

Community Intellectual Rights to Counter Biopiracy

To counter biopiracy it is mandatory to forge a Community Intellectual Rights (CIR)* movement. Collective and community nature of the innovation and rights related to indigenous biodiversity utilisation are called CIR. The CIR movement is essentially based in the idea of sovereignty of the community. It is concerned with the recovery of the intellectual commons and restoring power back to the people.

The Defence of CIRs is possible through

- Maintaining CIRs by keeping the knowledge alive and vital through regular use.
- Maintaining Community Biodiversity Registers to challenge instances of biopiracy. These registers give proof of 'prior art' or the existence of knowledge and technologies developed by communities in relation to biodiversity. As the majority of biodiversity-related patent claims, particularly in the fields of food production, agriculture and medicine are built on indigenous knowledge and traditional practices related to biodiversity use, community biodiversity registers are a vital tool for preventing the grant of such patents.

* The concept of Community Intellectual Rights and Community Biodiversity Registers was initiated by RFSTE/*Navdanya* and other groups in the 80's and has since been developed in diverse ways by various groups, NGOs and communities to express diverse priorities.

The Community Seed & Biodiversity Register

The US and EU suggest that documentation of biodiversity-related knowledge be done by WIPO on computer databases - this will erode and push to extinction oral knowledge, it will further disempower local communities and those who actually generate and carry knowledge. It will create a bioprospecting technology and a documentation of knowledge by experts, and it will not be used for sustainable production.

A Community Biodiversity Register (CBR) is the documentation of the resources and the knowledge of local communities at the local, regional and national levels by the people themselves for the purpose of rejuvenating the ecological basis of agriculture and the economic status of the community.

The Community Biodiversity Register

- ensures acknowledgement of alternative knowledge systems which recognise the informal, collective and cumulative systems of innovations of indigenous peoples and local communities;
- consonant with this, defines innovation broadly to include not just the technologically improved end product, but knowledge relating to the use (or enhanced use) of properties, values and processes of any biological resource. This definition can be wide enough to include any alternation, modification, improvement or derivative which utilises the knowledge of indigenous groups or communities in the commercialisation of any product, as well as more sophisticated processes for extracting, isolating or synthesising the active chemical in the biological extracts or compositions used by the indigenous peoples and communities;
- makes local communities/indigenous peoples the custodians or stewards of such innovations, defining such rights as 'non-exclusive' and 'non-monopolistic' and encouraging its non-commercial and free use and exchange;
- permits such rights to be held in common with other communities/ indigenous peoples.
- prevents the erosion of knowledge in communities. As knowledge about biodiversity becomes eroded, and only a few remember it, corporations find it easy to steal the knowledge and pirate it, as it has already vanished from the commons.

  The act of locally building up such a register serves many purposes.
- It makes the people aware of their rights to seed, food and medicines, and more empowered to challenge biopiracy and resist monopolisation of knowledge through IPRs.
- It provides the community with a means to assert rightful sovereign control over what is their own and better equips them with bargaining power.
- It is an instrument for building self-rule in the management of biodiversity.

The CBR is owned by the community, maintained by the Gram Sabha, and documented by all those who use the biodiversity, especially women and children. This ownership by the community gives the community the right to

set the ethics and laws for biodiversity governance and management, including siting disputes (even the international disputes) at the community level.

However, since community needs and community rights also need to be recognised and taken into account in national policy formulation, the CBRs serve as the basis for building a national community biodiversity register.

The Community Seed Biodiversity Register

The CBR, when it documents only seeds and plant varieities, becomes the Community Seed Biodiversity Register. By making farmers' varieties freely accessible to other farmers across the country, the region and the world, the register rejuvenates agricultural biodiversity, people's knowledge and sustainable agriculture.

Access to traditional varieties revitalises the role of the farmer as a plant breeder, and strengthens his resistance to seed monopolies. By acting as a seed catalogue, it assists seed exchange between farmers, which shrink the market for corporate seeds. Such exchanges help farmers and farming communities retain agricultural freedom and economic control over agriculture.

In order to effectively challenge IPR claims by the private seed sector, the Community Seed Biodiverstiy Register must be as complete as possible. The documentation needs to include:

- farmers' nomenclature and farmers' classification systems
- the names of the farmers growing the variety
- agronomic details such as type of soil, flowering time, harvest, yield, etc.
- taxonomic details such plant length, awn length, leaf length, colour of various parts, weight of seed, etc.
- other details such as cooking time, starch content (if possible), flavour, aroma, and so on.
- Details of medicinal use if any
- Details of uniqueness

Navdanya organised the **Beej Milan** - International Organic Farmers' and Seed Keepers' Gathering - represented hope for a sustainable and equitable future at the dawn of new millenium. The Gathering brought together more than 200 farmers and seed keepers on 3rd and 4th October at Navdanya's Agro-ecology and Biodiversity Farm in Dehradun to celebrate diversity and renew their vow to keep agriculture and biodiversity free and in the commons.

The four pillars of ecological agriculture, that were also the themes at the Gathering, are:

- Seed Conservation
- Composting
- Pest Management and
- Marketing.

Farmers from all over shared their experience of seed conservation, including drying and storage methods. Organic seed conservation differs from institutionalised seed conservation in many ways. Seed conservation by farmers is through its regular cultivation, allowing the seed to evolve and adapt to new

We have formed Jaiv Panchayat in more than 100 villages in Garhwal. We are documenting and recording every living resources found in each village and the Biodiversity Register is kept with the headman of the village. We have also prepared herbarium of the different living resources of each village.

We have been doing a programme called Sagwari where we encourage village kids to grow vegetables for the own consumption so that they don't forget their farming tradition.

Mr. Chandra Shekher Bhatt,
Agastyamuni village, Rudra Prayag, Uttranchal

conditions. Navdanya Orissa, which alone is conserving 400 local varieties of paddy, has set up seed banks and grain banks to ensure food security in the four districts where it operates. It could thus supply saline-resistant indigenous varieties to farmers in the region devastated by the supercyclone of 1999, where commercial and public sector varieties had failed.

Conservation of indigenous agricultural biodiversity necessitates ecological agricultural practices which renew earth's fertility. The participants discussed the merits of various methods of composting, including NADEP composting, Heap method, Biodung method and Vermicomposting. Harish Mishra of Orissa informed that by using seeds of health paddy plants with good phenological characteristics and a mixture of cowdung and poultry litter, he has been getting an annual yield of 5qtl./bigha, which is better than most Green Revolution varieties.

Mixed cropping and crop rotation, which are vital to successful organic farming, are themselves an extremely important insurance against disease and pest attacks and total crop failure. Farmers shared other pest management methods that included the use of neem, *vitex negundo*, and cow's urine. A farmer from Baghpat shared his method for controlling termites. He scatters a mixture of rice and sugar over his fields. The termites come out for the rice. Ants, which arrive for the sugar, take the termites instead, and leave his fields termite-free.

Regular cultivation and consumption is necessary for keeping agricultural biodiversity alive. The participants discussed various methods to improve awareness and demand for organic, chemical-free food. *Navdanya Foods*, the direct marketing initiative of Navdanya, where farmer members deal with consumer members and get a 20% premium on their products, was one of the models considered for large-scale replication.

Ecological agriculture is not possible unless biodiversity is in the commons, and is free from the threat of extinction posed by technologies like genetic engineering. The *Jaiv Panchayat* - Living Democracy - Movement initiated by Navdanya to keep biodiversity in people's control, has spread widely, particularly in Orissa and Garhwal. There are 85 *Jaiv Panchayats* in Garhwal alone, where people have asserted their inalienable and common rights to their natural resources. In many of the *Jaiv Panchayats,* the elected village leaders are also the leaders of the Movement. Many of them have declared their villages GM-fee zones as well. Almost all of them are in the process of compiling their Community Biodiversity Registers.

The two days also gave the farmers a chance to display their histrionic and musical skills through plays, skits and songs that conveyed the message of organic agriculture and resistance to corporate takeover, and their culinary skills by taking turns to provide diverse foods from their region.

Thus we see that how the seeds in the hands of community and in public control spreads the message of diversity and hope among the generations to come.

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Vandana Shiva, Afsar H. Jafri, Ashok Emani & Manish Pande

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Dedicated to
the Farmers of
India
who Committed
Suicide.

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Seeds of Suicides

Introduction

Seed is the first link in the food chain. It is the primary means of production in agriculture. Over the centuries, seed has been evolved by farmers. Farmers have been breeding diverse varieties to adapt to diverse ecosystems, diverse economic and cultural needs. Farmers seeds have been tested over centuries. Farmers have freely saved and exchanged seed, they have freely planted diversity of crops to maintain ecosystems, meet their diverse needs and earn incomes.

In the mid 60's, new varieties with high response to chemicals were introduced. The public sector seed supply was made a major component of agricultural development with funds and aid from the World Bank. However, farmers seeds continued to account for 80% of the seed supply.

In 1988, the World Bank which had financed the growth of the public sector seed supply in the 60's and 70's demanded its dismantling and recommended the shift to the private sector and an entry of MNC's in the seed sector.

The report on "seeds of suicide" covers three aspects of the impact of the new policies of the so called "liberalisation" of the seed sector. Firstly, it shows that the trends towards privatisation and concentration of the seed industry and displacement of farmer varieties. A shift from government control to farmers control was the option foregone at the national level. The consequences of giving seed companies a free hand through privatisation and deregulation has been increasing the costs of seeds and agrichemicals for farmers, increasing farm debts and increasing crop failure. Farmers suicides are the extreme result of these policies of market freedom. Farmers are falling prey to the marketing strategies of seed companies. Globalisation is leading to the emergence of a new kind of corporate feudalism – the convergence of global market forces with the worst forms of feudal control. The removal of the public sector and the undermining of the community in the seed supply has allowed the reemergence of the feudal power of land lords and moneylenders, empowered by global corporations, their products and their capital. This Corporate power is working through feudal structure to capitalise seed markets. The seed and agrichemical companies use the local rural elite, the land lords and money lenders for selling seeds and pesticides for providing credit to poor peasants for buying those high cost inputs. This Corporate feudalism is leading to an epidemic of suicides. It has rendered agriculture socially, economically and ecologically non-sustainable.

Into this context of non sustainability is being added the new threat from GMOs to the socio-economic survival of farmers and the conservation of biodiversity – Chapter 3 is a report of the first large scale trials of a genetically engineered crop – Monsanto's Bollgard Cotton in India. The final chapter offers alternatives to the corporate control over seed by rejuvenating the public sector under farmers control and strengthening farmers seed supply through community seed banks. The case study on the Terai seed farm also shows how privatisation and globalisation was not the only alternative. The Tarai Seed Corporation is an example of revitalising a public sector seed farm through farmers participation and control. Navdanya is a pioneer in setting up community seed banks. The Navdanya movement was started to conserve farmers varieties and agrobiodiversity, to make ecologically adapted organic seeds available to farmers so that farmers have alternatives to high cost seeds, toxic chemicals and patented and genetically engineered crops.

The freedom from patents, from genetic engineering, from toxic chemicals and from debt is what seeds of freedom bring to farmers. Navdanya defends the farmers inalienable right to freely save and exchange seed. It brings seeds of hope as an alternative to seeds of suicide.

Vandana Shiva