important priorities outlined. It is well-known that aggregate agricultural production is much less price responsive than individual crops. Yet, recent experience in the case of cotton and oilseeds shows that even for these crops, whose domestic prices were out of line with world prices, and where fairly large changes in relative prices did take place, there has been no really marked break from pre-reform patterns in output growth.

More importantly, there are serious problems with the policy of liberalising international trade in agriculture now being advocated. Almost every serious analysis of such a policy shows that unless this is accompanied by a massive step up in public expenditure on agricultural investment and subsidies (along with the necessary rise in revenue to finance these), such trade liberalisation will be extremely counter-productive.

Agricultural exports would rise, but this would not be accompanied by a massive step-up in public expenditure on agricultural investment and subsidies (along with the necessary rise in revenue to finance these). Such trade liberalisation will be extremely counter-productive. Agricultural exports would rise, but this would not be accompanied by any significant increase in agricultural output.

Consequently, inflation would increase sharply and there would also be an adverse effect on non-agricultural output and employment. Poverty would increase unambiguously, and only the rich farmers would gain from the overall outcome whereby agricultural prices increase without much effect on agricultural output or employment. In these simulations, outcomes are less adverse if public expenditure can be stepped up. But, clearly the lesson is that agricultural trade liberalisation cannot offer an alternative to the current failure to address the real problems of financing public investment, carrying out land reforms, and improving, through greater decentralisation, the delivery of inputs and their efficiency in use.

Thus, the period since July 1991 has witnessed a slowing down of agricultural growth, accompanied by a significant rise (by more than 30 million people between 1990–91 and 1993–94) in rural poverty. These adverse trends were even sharper in the first two years of reform, and were mitigated somewhat by higher public expenditure from 1993–94 onwards. But with fiscal pressures mounting again, and with none of the real problems of agriculture adequately addressed within the reform strategy, the future does not appear particular rosy.

Indeed, the main policy thinking now—of international trade liberalisation for agricultural goods—is one which may have the support for the rural rich, but it promises further stagnation of agricultural output and a further increase in poverty.

Seven

SEEDS OF SUICIDE: THE ECOLOGICAL AND HUMAN COSTS OF GLOBALISATION OF AGRICULTURE

Vandana Shiva and Afsar H. Jafri

The failure of the cotton crop between the months of November 1997 and February 1998, in Andhra Pradesh (AP) due to pest devastation, and the suicide of over 100 farmers due to indebtedness caused by spending nearly Rs 12,000 per acre on pesticides, indicates how vulnerable our agricultural systems have become. It is a major signal that we need to shift to ecologically resilient agriculture. Failure of pesticides to control pests, as in the case of the Andhra cotton crop, shows that ecological problems need ecological solutions—they cannot be 'fixed' by magic-bullet technologies.

Weeds and pests in agriculture are symptoms of non-sustainable practices. The green revolution or chemical agriculture has led to the increase in weed, pest and disease occurrence. Herbicides and pesticides are toxic chemicals aimed at controlling weed and pest problems in crops. However, these reductionist 'solutions' have also proved non-sustainable. Herbicide residues in soils have led to a decline in yields, while pesticide use has led to an increase in pest occurrence both through

killing of predators and through emergence of pesticide resistance in pests. Genetic engineering is now deepening the reductionist paradigm of controlling pests through the creation of herbicide resistant and pest resistant crops. These applications account for more than 80 per cent of the biotechnology research in agriculture. Evidence is already available that rather than controlling weeds, pests and diseases, genetic engineering will create super weeds, super pests and super viruses.

The failure of the cotton crops and the resultant suicides in Andhra Pradesh, highlight these high social and ecological costs of the globalisation of non-sustainable agriculture which are not only restricted to the cotton-growing areas of this state but have been experienced in all commercially grown and chemically farmed crops in all regions. While the benefits of globalisation go to the seed and chemical corporations through expanding markets, the costs and risks are born exclusively 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 inputs such as pesticides which are associated with the use of hybrids.

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

The focus of the cotton failure has been on the excessive use of pesticides, including spurious pesticides. However, pesticide use is intimately linked to hybrid seeds. Pesticides become necessary when crop varieties and cropping patterns are vulnerable to pest attack. 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-up.

The problem of pests is therefore a problem created by the erosion of diversity in crops and cropping patterns. *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, globalisation of agriculture is threatening both the environment and the survival of farmers. Biodiversity is being destroyed, the use of agri-chemicals are increasing, ecological vulnerability is increasing and farmers' debts are sky rocketing—leading to suicides in extreme cases.

THE NEW SEED POLICY AND THE SPREAD OF INAPPROPRIATE MONOCULTURES

For 10,000 years, farmers and peasants have produced their own seeds from their own land, selecting the best seeds, storing them, replanting them, and letting nature take its course in the renewal and enrichment of life. With the advent of the green revolution, peasants were no longer custodians of the common genetic heritage through their practices of storage and preservation of grain. The 'miracle seeds' of the green revolution transformed this common genetic heritage into private property, protected by patents and intellectual property rights. Peasants as informal plant-breeding specialists gave way to scientists of multinational seed companies and international research institutions like CIMMYT and IRRI. Plant-breeding strategies for maintaining and enriching genetic diversity and the self-renewability of crops were substituted by new breeding strategies of uniformity and non-renewability, aimed primarily at increasing transnational profits and First World control over the genetic resources of the Third World. The green revolution changed the 10,000-year evolutionary history of crops by changing the fundamental nature and meaning of 'seeds'.

For 10,000 years, agriculture has been based on the strategy of conserving and enhancing genetic diversity. According to former FAO genetic resources expert, Erna Bennet:

> The patchwork of cultivation sown by man unleashed an explosion of literally inestimable number of new races of cultivated plants and their relatives. The inhabited earth was the stage for 10,000 years, of an unrepeatable plant breeding experiment of enormous dimensions.[1]

In this experiment, millions of peasants and farmers participated over thousands of years in the development and maintenance of genetic

diversity. The experiment was concentrated in the so-called developing world where the greatest concentrations of genetic diversity are found, and where humans have cultivated crops the longest. The traditional breeders, the Third World peasants, as custodians of the planet's genetic wealth, treated seeds as sacred, as the critical element in the great chain of being. Seed was not bought and sold, it was exchanged as a free gift of nature. Throughout India, even in years of scarcity, seed was conserved in every household, so that the cycle of food production was not interrupted by loss of seeds.

The shift from indigenous varieties of seeds to the green revolution varieties involved a shift from a farming system controlled by peasants to one controlled by agri-chemical and seed corporations, and international agricultural research centres. 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 avail of credit from banks to use them. International agricultural centres supplied seeds which were then reproduced, crossed and multiplied at the national level.

World Bank finances were an important element in the spread of the vast network that was needed for the distribution of green revolution varieties. In 1963, the National Seed Corporation was established, and in 1969, the Terai Seed Corporation was started with a World Bank loan of $13 million. This was followed by two National Seeds Project (NSP) loans. NSP 1 of $25 million was given in 1976 and NSP II of $6 million in 1978—both to support the National Seed Programme. The overall objective of the projects was to develop state institutions and create a new infrastructure for increasing the production of certified seeds. In 1988, the World Bank gave India a fourth loan for the seed sector to make India's seed industry more 'market responsive'.

The involvement of the private sector, including multinational corporations, in seed production is a special objective of NSP III ($150 million). This was viewed necessary because as the project document notes:

> Sustained demand for seeds did not expand as expected, constraining the development of the fledgling industry. In the self-pollinated crops, especially wheat and rice, farmer retention and farmer-to-farmer transfer accounted for much of the seed used, while some of the HYVs were inferior in grain quality to traditional types and thus lost favour among farmers.[2]

The growth of marketed seeds is thus the main objective of 'developing' the seed 'industry', because farmers' own seeds do not generate growth in financial terms.

The fact that, in spite of miracle seeds, farmers in large parts of India prefer to retain and exchange seeds among themselves outside the market framework, is not taken as an indicator of the better viability of their own production and exchange network. It is, instead, viewed as reason for a bigger push for commercialisation, with bigger loans and better incentives to corporate producers and suppliers. The existence of the indigenous seed industry as a decentralised community-based activity, is totally eclipsed in the World Bank perspective according to which, 'before the 1960s, the seed industry was little developed'.

PRIVATISATION OF THE SEED SECTOR AND THE SPREAD OF MONOCULTURES

Privatisation of the seed sector has induced three major changes in agriculture.

First, it has led to a change in cropping patterns of farmers' varieties, from mixed cultivation based on internal inputs to monoculture of hybrids based on external inputs. Second, it has changed the culture of agriculture. Instead of growing food and maximising ecological security and food security, farmers have been induced to grow cash crops for high profits, without any assessment of the risk, cost and vulnerability factors. Third, the shift from a public system approach to a private sector approach in agriculture has also meant a reduction in public sector low-interest loans and extension, and an increased dependence on high-interest private credit, pushing sales of seeds and agri-chemicals as a substitute for information and extension.

The Andhra Pradesh cotton crisis is a result of a seed policy which has encouraged the privatisation of the seed sector and the displacement of ecologically adapted local crops by monocultures of ecologically vulnerable hybrid seeds.

The growth of the Indian seed industry will be worth some Rs 20 billion (around $600 million) annually, by the turn of the century. Indeed, a former managing director of Monsanto estimates that it will be worth Rs 60 billion (around $2 billion) in 7–10 years' time. As the 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 others who 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 Rs 12–16,000 million per annum. Estimates placed the value of the industry (both public and private) at Rs 10,000 million back in 1994.[3]

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 seeds. As K.R. Chopra (Managing Director of Mahendra Seeds, President of the Seed Association of India, and consultant to the World Bank) writes: 'The commercial exploitation of hybrid vigour in recent years has been a crucial factor in the phenomenal increase of private sector contribution to the total turnover'.[4] The managing director of Mahyco estimates that the distribution of the market has shifted since 1994. He suggests that currently, some 30 per cent is attributable to the public sector (state seed companies), 40 per cent to 'large' private companies, and 30 per cent to 'small' seed companies. If he is right, this represents a small shift away from the public sector and a significant shift within the private sector, in favour of larger companies, over the last three years.[5]

The seed policy has inflicted a big blow to biodiversity of cotton, and with it, the freedom of the cotton farmers, who are now in the vicious grip of seed and pesticide companies, and moneylenders. India is the country of origin of cotton diversity, and has been the supplier of cotton seeds to the entire world. But today, thanks to the new seed policy, the country of origin has become a country of dependence. As a consequence, of the AP cotton disaster, the government has announced that emergency import of cotton seeds is likely.[6] The import of cotton seeds may bring even worse consequences in the form of toxic seeds of *Bacillus thuringiensis* (Bt) cotton.[7] The alternative is to introduce indigenous cotton varieties and move away from poisonous pesticides which are driving farmers to suicide.

SEEDS OF SUICIDE: THE COTTON DISASTER IN WARANGAL

FROM MIXED FARMING TO MONOCULTURE: THE LURE OF 'WHITE GOLD'

Warangal in Andhra Pradesh is not a traditional area for cotton cultivation. In this predominantly food crop area, cotton is a relatively new crop introduced under trade liberalisation. Farmers switched over from their traditional paddy, pulses, millets, oilseeds and vegetable crops, which had sustained them all these years, to the sowing of cotton, which was sold as 'white gold' and which promised to yield high profits. However, as the disaster which visited the cotton farmers in 1997–98 shows, cash crops like cotton may fetch higher prices but they also demand a higher level of expenditure and are more vulnerable to pests and disease.

In Warangal 30 years ago, the total acreage under cotton crop was negligible. According to the data available in 1986–87, the total area under cotton cultivation was 32,792 hectares (81,980 acres) which increased to 1,00,646 hectares (2,51,615 acres) in 1996–97, over a three-fold increase in one decade. The area under *jowar* in 1986–87 was 77,884 hectares, which increased to 27,306 hectares in 1996–97. The acreage under the traditional paddy has also shrunk. The land under *bajra* (millet) has also decreased in the last 10 years. In 1986–87, total land under *bajra* was 11,289 hectares which 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 heavy damage to the cotton crop in this season due to several reasons. The most important were bad weather and a severe pest attack. There was a drought in June–July, which is the main sowing season for cotton. Due to the drought, only 15 per cent paddy could be planted. During October to November, 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 wintery conditions in November to December led to the emergence of pests.

The pests first emerged in the chilli fields and the weather helped them to multiply. They then attacked all the crops in the fields, e.g., chilli, cotton, red gram, etc., and the yield thus fell heavily. Since several sprayings 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 dosages of pesticide spraying at frequent intervals in the cotton fields.

The frequent spraying and spurious quality of pesticides used made them even more ineffective. Most farmers spent between Rs 12,000–15,000 an acre on pesticides when Rs 7,000 worth of pest control should have been enough. The heavy investment made in purchase of pesticides could not be recovered because the yield was much below the usual level and it did not even cover the input cost. The small farmers who had taken money and material on credit were driven into debt and then to suicide. In Warangal district alone, 27 farmers committed suicide while the total figure in the Telangana region reached 80 by mid-January. Most of those who committed suicide were small farmers owning small landholdings. The point to be noted, however, is that if a cotton crop succeeds, the returns can be Rs 12,000 to Rs 15,000 per hectare.

PRIVATISATION AND THE SPREAD OF MONOCULTURES

Since Warangal is a non-traditional cotton zone, no native variety of cotton is available. Today, all varieties of cotton seeds used in Warangal are hybrid commercial seeds. Due to the huge demand for cotton seeds, various companies have made HYV cotton seeds available. But during the last three years, the most popular variety in Warangal has been the hybrid Research Cotton Hybrid-2 (RCH-2). The reason for its popularity has been the good yield in the three years preceding 1997–98. Other varieties of cotton seeds and the acreage grown under each variety in Warangal in 1996–97 is given in Table 7.1.

In the 1970s, cotton cultivation in Warangal was dependent upon the varieties developed by the government. During that time the most popular variety was Hybrid-4, a short staple cotton. However, some non-hybrid or fine, straight varieties were also in use but their yield was a little less than that of the hybrid varieties. Besides Hybrid-4 (H-4), the other varieties used during the 1970s and 1980s were MCU-5 (developed by Coimbatore Research Station); L. K. varieties (which

Table 7.1 Cotton Seed Varieties and Acreage

Variety	*Hectares*	*Cost per 450 gm packet*
1. RCH-2	60,080	Rs 250–300
2. H-4	2,500	Rs 260–300
3. NH-44	4,100	Rs 250
4. JKHY-1	3,800	Rs 250
5. Mahyco	8,100	Rs 250–350
6. Nath	8,200	Rs 250–350
7. Vanapamula	4,800	Rs 250–300
8. Others	9,066	Rs 250–350
Total	1,00,646	

Source: Joint Director of Agriculture, Warangal.

Table 7.2 Cotton Arrival in the Warangal Agriculture Market and its Prices

Year	*Arrival*	*Price per quintal*
1985–86	1,77,929 qtls.	Rs 437
1986–87	1,62,332 qtls.	Rs 585
1987–88	6,08,592 qtls.	Rs 793
1988–89	5,10,296 qtls.	Rs 786
1989–90	5,64,290 qtls.	Rs 761
1990–91	4,32,364 qtls.	Rs 785
1991–92	3,73,430 qtls.	Rs 1,233
1992–93	5,72,643 qtls.	Rs 1,040
1993–94	7,72,999 qtls.	Rs 1,257
1994–95	6,76,993 qtls.	Rs 1,809
1995–96	11,35,972 qtls.	Rs 1,742
1996–97	13,38,330 qtls.	Rs 1,618
1997–98	8,33,000 qtls.	Rs 1,800
(Till 21 Jan. '98)		(approx.)

*Annual Average Rate per quintal.

were resistant to white fly and jassids); Waralakshmi (developed by Cotton Research Station, Nandial); JKHY-1 (a HYV developed by Jawaharlal Nehru Krishi Vidhyalaya, MP) among others. All these varieties were government varieties which were cultivated in the Telangana region.

However, during the cotton boom in the 1980s, a handful of private companies participated in cotton research and evolved a number of hybrid cotton varieties. These included the Maharashtra Hybrid Seeds Company, Jalana (Mahyco), Mahindra Seeds Company, Jalana, Nath Seeds Company, Aurangabad, among others. These companies captured the entire market for cotton seed production and distribution.

The most popular variety of cotton in Warangal during the three years preceding 1997–98 was RCH-2, a long duration variety, produced by Rasi Seeds Company and marketed by JK Company, Secunderabad. Similarly in Adilabad, the most popular variety was the L. K. variety which is a short-duration variety. The MCU varieties are popular in Khammam district. The choice of seed for a particular region depends upon the soil conditions, water availability and the inclination of farmers. 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, suited for areas with assured irrigation. The drought conditions in the beginning and the erratic power supply, compounded the problem of poor irrigation. The reason for the popularity of RCH-2 in Warangal was the good yield obtained in the two years immediately before 1997–98

In 1994–95, the total area under cotton cultivation in Warangal was 69,286 hectares which increased to 1,00,646 hectares in 1996–97. Commensurate with 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. Ironically, the increase in cotton production led to a decline in its prices. In 1994–95, the average price per quintal of cotton was Rs 1,809, which went down to Rs 1,618 in 1996–97. However, there was no decline in the input cost per acre. Rather, the input cost in cotton had been increasing every year, according to Dr Jalpathi Rao.

In Warangal district the cotton crop replaced the crop rotation based on *jowar* (*rabi*) and green gram (*kharif*). Now these two crops have almost been finished. The acreage under the green gram–*jowar* sequence, has shown a drastic decline in the last one decade. In 1987–88 the area under the green gram and *jowar* sequence was 1,43,500 hectares which declined to 31,952 hectares in 1997–98. Besides *jowar* and green gram, cotton has also replaced oilseeds, especially sesame, groundnut and castor. Today, cotton is grown on 20–23 per cent of the total cultivable area in Warangal. Total agricultural land of Warangal is around 4.5 lakh hectares, according to Dr Jalpathi Rao.

In 1997–98, the total area under cotton was 99,150 hectares. This figure is minus the acreage of cotton during *rabi*. In 1997–98, 80 per cent of cotton farmers used RCH-2. The other varieties used by the

farmers were Somnath and Shaktinath (of Nath Seeds), MECH-1, 12 and 13 of Mahyco Seeds, and Sunjiv of Indo-American Seeds. RCH-2 has been the most vulnerable to pest attack. One of the reasons for the more severe pest attack on RCH-2 was the compact planting or bushy planting of this variety. This variety grows horizontally and it has a closed canopy, which protects pests because the sun rays do not reach the base of the plant.

In one acre, 450 gm of seeds (of any variety) are sown. The cost is between Rs 250–Rs 350 per 450-gm packet. However, when the farmers find that some of the seeds have not germinated, they again sow seeds at that point. So, about 500–600 gm 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 at higher prices in the black market.

SEEDS, PESTICIDES AND DEBT: THE INTIMATE NEXUS

In Warangal, land is easily available on lease because of the heavy migration of people from the villages to the city. Farmers with small landholdings often take land on lease to grow cotton. Those who take land on lease have to pay Rs 1,800–Rs 3,000 as annual rent. Rajmalla Reddy of Atmakur Mandal has 40 acres of land. Of the 40 acres, 35 acres are on lease and he gets Rs 1,800 per annum as rent for one acre. Those lands which have irrigation facilities, fetch up to Rs 3,000 per annum, said Mr Reddy. Lured by the prospect of getting rich overnight, farmers spent thousands of rupees on buying pesticides and fertilisers that were necessary for the conventional cotton cultivation. Besides putting in their own resources, the middle and small farmers borrowed money, paying high interest rates, to private moneylenders, who also provided seeds, fertilisers and pesticides on credit. The private moneylenders took on the role of 'pest management advisers', extended credit to farmers, sold spurious pesticides produced by fly-by-night companies, charged rates higher than the prevailing prices, and recommended application of excessive doses of these pesticides.

These private moneylenders were mostly pesticide dealers or shopowners. In Warangal, there are 13,000 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.[8] In each village there are five to eight shops. The shopowners and dealers

get their supply of stocks from the pesticide companies on credit. So there exists a chain of credit, and the shopowners are only mediators. In reality, the farmers indirectly get the credit from the company itself. The interest rate varies from 36 to 60 per cent per annum. Since the chemicals are easily available on credit, the farmers have no hesitation in using these at short intervals, usually once a week or even at a higher intensity. There is no government agency to finance the farmers and bank loans are negligible. This forced farmers to approach the private moneylenders.

The cotton farmers spend about Rs 1,500 on preparing the field (especially 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, farmers carry out the first spraying of pesticides. This is done without ascertaining the existence of pests in their fields. The first spray is considered to be 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 in Warangal have suggested an integrated pest management (IPM) strategy to the farmers to control pests by growing 'trap crops' like castor and marigold and placing pheromone traps in the fields, to check whether pests exist.

But the 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 a lower concentration of chemicals. The chemicals that are used in the initial stage of spraying are Monocrotophos 36 per cent EC, Dymethet 30 per cent, Oxydemeton Methyl, etc. Mixing of two chemicals is very common. In the first spray, only 250 ml of chemicals are used on one acre of land. But from the second spray onwards 50 ml is added, and at one stage they end up using 1 litre 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. Pesticides are a major input in cotton. Once a week 300 ml to 500 ml of pesticides are sprayed per acre, and in one season (June–March) 25–35 sprays of pesticide is normal practice in Warangal.

Among all the Indian states, the maximum use of pesticides can be found 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 the 1980s, pesticide consumption in Warangal was less than Rs 10 crore. But as hybrid cotton cultivation picked up, pesticide use also increased by 1985–86. Currently, the approximate sale of

pesticides in Warangal district alone is Rs 200 crore,[9] which is the highest in Andhra Pradesh, and about 80 per cent of this is used on cotton.

The pest problem is not new in the Telangana region; the farmers of this area had 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 this season. The cotton farmers were more affected because input costs in cotton were higher and the yield was not as expected. Usually the cotton farmers get 10–12 quintals in one acre, spread over four to five pickings. But in 1997–98 they could hardly get 4–5 quintals and some 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, wife of 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 a Rs 35,000-loan from private parties. Bandi Kalavathi was one of the farmers who committed suicide due to the crop failure.

This season, 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 is not the first time that such suicides have taken place in Andhra Pradesh. In 1987, in the Guntur and Prakasham areas, 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 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 a huge expenditure on inputs like fertilisers and pesticides.

For the pesticides industry, pests are a blessing in disguise. They have, over the years, sustained the profit margins of the pesticide manufacturers and traders, irrespective of the extent of crop damage. The more the incidence of pests the more lethal is the pesticide cocktail. Consequently, the insects become 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 pesticide trade push in the pyrethroids that the insects also developed immunity against 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, spiders, ladybird beetle, crysopa, wasps, rats, frogs, snakes and birds, etc. But the tragedy is that it is these parasites and predators are the first victims when pesticides are sprayed. Bereft of its natural enemies the pest appears with greater strength in the crop field. In Warangal, the indiscriminate use of pesticides has reduced the bird population. When the pesticides disturb nature's equilibrium, many of the little known and insignificant cotton pests 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 selling their products in Warangal district. There are also several companies selling spurious and low quality chemicals that contribute to pest resistance. As a result, farmers use higher concentrations and more expensive pesticides. The mixing of two-three chemicals has become a normal practice.

Besides pesticides, the cotton farmers also use fertilisers. In one season, about 150 kg of fertiliser which costs about Rs 1,500–2,000, 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, CAN or DAP, etc.

The two pests that attacked the cotton crop in Warangal were *Heliothis* and *Spodoptera*. Before these pests attacked, the 'sucking and chewing' pest, i.e., white fly, had attacked groundnut, chilles, etc. In October – November of 1997, *Spodoptera* attacked the cotton crop. Though this is not a major pest for cotton, this year it heavily attacked cotton, besides groundnut, chillies, pulses, etc. The *Spodoptera* eats everything that is green—leaves, buds, flowers and capsules. It is a voracious eater and moves in groups, attacking one field after another. *Heliothis*, on the other hand, eats only cotton capsules and buds. It remains under the soil from morning to evening and comes up in the evening for eating. That is why pesticide sprays do not affect them. The farmers had to use poison baits to kill this pest in the 1997–98 season. They prepared pellets with rice bran, jaggery and pesticides and spread them in the fields. This helped in controlling the pest. The natural occurrence of a fungus, 'Bavaria' also helped control the pest menace in the cotton fields.

In the first 30 days of planting, the chemicals that are usually used by the cotton farmers are Monocrotophos 36 per cent, Dimethoate 30 per cent or Oxy-D-methyl 25 per cent, etc. During 30–60 days of planting the farmers usually spray Cyper Mythrin 10 per cent EC, Chlorpyripos, Quinolphos 25 per cent, EC Acephat 75 per cent (SP) and Fen-valrate 20 per cent EC. However, after 60 days the chemicals which are used very commonly in Warangal and adjoining areas are Cypermethrin 25 per cent EC. Those companies which have Cypermethrin 0 per cent EC also sell Cypermethrin 25 per cent EC. There are more than 75 major registered companies selling these chemicals.

CONCLUSION

FREEDOM FROM THE SECOND COTTON COLONISATION

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

Today, cotton colonisation is not restricted to cotton textiles but goes deeper into the colonisation of the cotton seeds as well. 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 hands to make our own cloth again.

Freedom from the second cotton colonisation needs to be based on liberation through seeds. India is the home of cotton and cotton diversity. Indigenous seeds are still available in large parts of the country. Organic cotton is promising to become a major route to prosperity for farmers in marginal and rainfed areas. Indigenous cotton seeds and organic cotton production is equivalent to Gandhi's *charkhas*. The freedom of the seeds and freedom of organic farming are simultaneously a resistance against the monopoly of corporations like Monsanto and a regeneration of agriculture that brings fertility to the soil and prosperity to the farmer. The seeds of suicide need to be replaced by seeds of prosperity. And those seeds are in our hands.

NOTES

1. Erna Bennett, 'Threats to Crop Plant Genetic Resources', in J.G. Howkes, Conservation and Agriculture, London: Duckworth, 1978, p. 114.
2. World Bank, National Seeds Project III.
3. Vandana Shiva and Tom Crompton, *Monopoly and Monoculture: Trends in the Indian Seed Industry*, Research Foundation for Science, Technology and Ecology, 1997.
4. *Ibid.*
5. *Ibid.*
6. *The Pioneer*, New Delhi, 20 April 1998.
7. Bt cotton has been genetically engineered with the soil bacterium *Bacillus thuringiensis* to resist pests.
8. Asish Chakrabarti, *Pesticides, Moneylenders Play Havoc with Andhra Farmers, Farm Digest*, February 1998.
9. *Ibid.*

III
CORPORATISATION OF AGRICULTURE

- The Corporate Reapers: Towards Total Globalisation of Our Food Supply
- US Agriculture Policy and the Uruguay Round: Implications for Food Security and Global Democracy
- Hi-tech Floriculture, Sustainability and Food Security Issues: The Case of Rose Cultivation around Bangalore, Karnataka