

Getting CLEAN: Recovering from pesticide addiction

Gerry Marten and **Donna Glee Williams** report on the Indian village of Pudukula, so nearly destroyed by reliance on pesticides, yet now known as the 'pesticide-free village'



Around 20 years ago, a handful of families migrated from the Guntur district of Andhra Pradesh, south-east India, into Pudukula, a community of around 900 people farming plots of between two and 10 acres. The outsiders from Guntur brought cotton-culture with them. Cotton wooed farmers by promising to bring in more hard cash than the mixed crops they were already growing to eat and sell: millet, sorghum, groundnuts, pigeon peas, mung beans, chilli and rice. But raising cotton meant using pesticides and fertilisers – until then a mystery to the mostly illiterate farmers of the community.

Local agro-chemical dealers obligingly filled the need for information and supplies. These 'middlemen' sold commercial seeds, fertilisers and insecticides on credit and guaranteed purchase of the crop. They offered technical advice (tinged with self-interest) provided by the companies that supplied their products: Bayer, Syngenta, DuPont, Monsanto, and Denocyl. The farmers depended on the dealers. If they wanted to raise cotton – and they did – they had no choice.

A quick 'high' of booming yields and

incomes hooked growers during the early years of cotton in the region. Outlay on insecticides was fairly low because cotton pests hadn't moved in yet. Many farmers were so impressed with the chemicals that they started using them on their other crops as well. The immediate payoffs from chemically-dependent cotton agriculture both ensured and obscured the fact that the black dirt fields had gone into a freefall of environmental degradation, dragged down by a chain of cause-and-effect.

Soon, cotton-eaters such as bollworms, army worms, caterpillars, leafhoppers and aphids plagued the fields. Repeated spraying killed off the most susceptible pests and left the strongest to reproduce and pass on their resistance to generations of ever-hardier offspring. As the bugs grew tougher and more abundant, farmers applied a greater variety and quantity of poisons, sometimes mixing 'cocktails' of as many

as 10 insecticides. At the same time, cotton was gobbling up the nutrients in the soil, leaving the growers no option but to invest in chemical fertilisers.

The introduction of cotton had pushed them past an ecological tipping-point –

an abrupt shift between sustainability and unsustainability. This 'tip' had landed them in the trap of agricultural addiction to chemical pesticides.

Pesticide addiction pulled everyone and everything along in a net of interlocking feedback loops and chain-reactions that trussed up both the ecosystem and the social system. As outlays for fertilisers and insecticides escalated, the cost of producing cotton mounted. Eventually, the expense of chemical inputs outgrew the cash value of the crop. The farmers bought seeds and chemicals on credit and, as their incomes shrivelled, more of their livelihood was eaten up by interest on what they owed. They fell further and further into debt, compelling them to work even harder. As poverty pinched from every side and family survival required child labour, education went by the board, ensuring more generations of poverty.

The addiction to agricultural chemicals affected health as well as pocketbook. All members of farm families shared the work of spraying the fields with insecticides. They did this without training, and so used more than they needed. Lacking information about safe storage, use and disposal, everyone – including women and children – was exposed to toxic effects. Insecticide poisoning became common. People developed chronic health problems such as headaches, nausea, skin rashes, fatigue, mental symptoms and visual problems, as

The cost of fertilisers and insecticides escalated until the cost of producing the cotton exceeded the cash value of the crop



Clockwise from far left: An old pesticide can be used as a water dipper. Preparing botanical pesticide. Simple illustrations explain natural pest-control. Pouring chilli-garlic solution into a tank for spraying the cotton. A Punukula woman talks about their experience.



Suicide became increasingly common among the farmers, the favoured method being ingestion of insecticide

well as acute poisoning that required hospitalisation and sometimes caused permanent neurological damage or death. Humans were not the only victims. Cows and goats died when they grazed too close to treated fields.

By then, nothing but cotton offered the potential to bring in the cash that people needed to pay off their dealers, moneylenders and medical bills. By the time some farmers tried to break free of their chemical dependence, insecticides had already decimated the birds, wasps, beetles, and other predators that had once provided natural control of crop pests. Without their balancing presence, pests ran riot if insecticide use was cut back. The farmers were hooked.

Some farmers escaped to different places, different work. Others resorted to illegal activities, such as teak smuggling, to cope with their debts. Despair came easily. Suicide became increasingly common among the farmers, the favoured method being ingestion of insecticide.

What broke this vicious cycle was the arrival in Punukula of a man called

K Venu Madhav. Venu Madhav grew up in Kokkeireni, a village about 100 kilometres from Punukula. He was raised on a farm that relied on insecticides. He had seen them drag his own father into debt.

Breaking free

After working for a few years as a farmer himself, Venu Madhav took a job doing fieldwork for a local NGO called SECURE (Socio-Economic and Cultural Upliftment in Rural Environment). The organisation went to Punukula to develop a watershed project but, as its staff listened to the villagers' concerns, they became aware of the hardships caused by the pesticide trap.

Around 1998, Madhav started talking to the farmers about changing the way they raised their cotton. They visited a woman in Warangal who had learned from another NGO how to control pests successfully without chemical pesticides. From her, they learned what was possible.

The villagers were sceptical, but SECURE was persistent. Finally, after a year, SECURE found the influential pioneer they needed: Margam Mutthaiah, a prominent

village elder. His son had collapsed with insecticide poisoning and the hospital bill for his treatment was 18,000 rupees, a staggering sum for a farm family. Mutthaiah was ready to try something different. He had been among the first villagers to raise cotton. Now he would be the first to try it without chemicals.

Venu Madhav and the SECURE staff coached Mutthaiah, their early adopter, in what they called Non-Pesticide Management (NPM), a sort of Twelve-Step Programme for abstinence from agricultural chemicals.

The first step was turning to neem. The neem tree (*Azadirachta indica*) is a fast-growing broad-leaved evergreen tree related to mahogany. It protects itself against insects by producing a multitude of natural pesticides that work in a variety of ways. Because of its wide array of chemical defences, its insect enemies cannot develop pesticide resistance through simple single mutations. And because neem's arsenal of toxins evolved specifically to defeat plant-eating insects, they are generally harmless to humans

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and other animals, including birds and insects that eat pest insects. Neem thrives in hot regions like the Khamman district. In this, Punukula was calling on ecological and social memory, frequent allies in eco tipping-point stories with happy endings. The plant is native to India and Burma, where it has been used for centuries to control pests and promote health. It could still be found in the Khamman district. The ecosystem

still 'remembered' it. And even though it seemed far-fetched that a humble local plant ('neem that we use to brush our teeth', as Hemla Nayak put it) could outperform sophisticated exotic chemicals, villagers using it would simply be adapting a traditional remedy for the troubles of today.

To protect cotton, neem seeds are simply ground to a powder, soaked overnight in water, and sprayed onto

the crop at least every 10 days. The neem treatment disrupts the feeding, development, and reproduction of destructive pests without harming the birds and beneficial insects that provide natural pest control. Neem cake, applied to the soil, kills insect pests and doubles as an organic fertiliser high in nitrogen. Neem grows locally and is easy to process, so it is also much less expensive than the chemical insecticides sold for profit by the dealers and their corporate suppliers.

Margam Mutthaiah's results were good enough to persuade 20 farmers to try NPM the following year. SECURE posted two of its staff to Punukula to teach, help, and facilitate community problem-solving.

Women had a key role in getting the new approach off the ground. They knew the toll that pesticides were taking on their families. They prodded their husbands to pursue NPM and to do it properly. They collected seeds from the scattered neem trees that still survived. They prepared neem and chilli-garlic solutions. Like the devastating effects of pesticide addiction, the work of breaking free was shared.

Quick, short-term gains had once pushed Punukula past the eco tipping-point into chemically-dependent agriculture. Now they found that similar immediate rewards helped to speed change in the other direction: the harvest of the 20 NPM farmers was as good as the harvest of farmers using insecticides, and they came out ahead because they weren't buying insecticides. Instead of investing cash (in short supply) on chemicals, they

The use of neem is complemented by other methods:

- Spraying chilli-garlic solution onto the cotton.
- Applying a mixture of cow dung and urine to repel and disrupt the growth of leafhoppers and aphids.
- Applying a naturally-occurring nuclear polyhedral virus that infects bollworms and army worms. The virus is fatal to them, but harmless to other creatures. Farmers can manage this 'biological warfare' themselves. Infected larvae hang upside down from the leaf edges of the crop, so they can be easily gathered and ground into a solution that is sprayed on the crop, with lethal results for the pests.
- Planting 'trap crops' such as sorghum, marigold, castor, and green gum in and around the fields to attract pest insects away from the cotton.
- Monitoring the abundance of pest insects by observing the plants, as well as by using inexpensive pheromone tablets to attract bollworm moths so they can be

- counted. With surveillance, farmers can save time and money by treating their fields only when they really need it.
- Removing and burning branches that are heavily infested.
- Putting out coloured wooden discs covered with sticky grease, to attract and trap whiteflies and sucking insects such as mites and thrips.
- Lighting small bonfires on moonless nights, to attract and kill bollworm and army worm moths.
- Enlisting birds as allies by planting perches in the fields.
- Deep summer ploughing to disrupt the life cycle of cotton bollworms, army worms and other pests whose pupae are in the soil.
- Enriching the soil with vermi-compost and cow-dung manure, effectively turning the villagers into organic growers – which could benefit their future income, as the market for organic cotton swells.



invested time and labour (their more abundant resources) in NPM practices.

Feedback loops began to lock in change – this time, for the better. Pesticide abstinence led to less pesticide resistance and greater resilience in the ecosystem and social system. It allowed the birds and other pest

predators (still in the ecological ‘memory’ outside the village) to return and exert natural control. Using fewer chemicals reduced medical expenses and the costs of bringing in a cotton crop, which meant less debt. Less debt meant less child labour, more families intact and more education for the next generation. More schooling led to improved incomes and better understanding of NPM.

The status and economic opportunities of women improved. Neem became a source of income for some of them, as they collected seeds from the surrounding area to grind and sell for NPM in other villages. The improved financial situation meant that families could afford to put more land under cultivation, assisted by hired farm labour (and unpaid allies in the form of birds and other pest-predator species) that freed up farmers’ time and energy. And with the time, energy, cash, and health that returned when they stopped poisoning themselves with pesticides, villagers were

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as well. The change gathered momentum as NPM became even more effective once everyone was using it. Fields were no longer infested by pest outbreaks from neighbouring fields. Populations of natural pest predators bounced back, with the consequence that neem no longer needed to be applied as often.

In 2004, the *panchayat* (village government) formally declared Pudukula to be a pesticide-free village.

A new beginning

Today, insecticide containers no longer litter Pudukula. The village no longer reeks of chemicals. Villagers say that they didn’t realise how much the poisons were sapping their strength until they stopped using them. And the women smile and say, ‘the men have more vigour, so there are more babies.’

Fighting against pesticides and winning has increased Pudukula’s solidarity and confidence. When dealers punished

able to launch new entrepreneurial and community projects, all of which led to an enhanced sense of village solidarity, autonomy, assertiveness, and self-confidence. Desperation gave way to optimism.

Starting in 2000, all the farmers in Pudukula village used NPM for cotton, and they began to use it on other crops

From far left: A meeting at Margam Mutthaiah’s compound. Ingredients for chill-garlic solution. Neem seed-grinder – simple mechanics and a local plant that have helped farmers break free from the pesticide trap. Crushing neem fruits: women’s involvement in NPM has improved their status and provided a source of income

NPM users by paying less for their cotton crops, village farmers formed a marketing cooperative that sought out and found fairer prices outside the village.

They have big plans for the future (such as water purification, higher education, and cotton ginning in their own village) and they are no longer timid about demanding appropriate attention from the government. Pesticide companies and dealers have tried to block the spread of NPM but, in spite of their efforts, the state government has added it to their agricultural extension programme. SECURE is now training local NPM promoters under that programme. The village now serves as a model for disseminating NPM to other communities, with around 2,000 farmers visiting each year. SECURE and eight collaborating NGOs have helped around 200 farmers to launch NPM. SECURE is teaching the programme to children in 27 village schools. What began with a few farmers desperate to find a way to farm without poisons, has become a movement with the potential to pull an entire region back from ecological disaster.

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