India farmers' 'seeds of suicide': 200-year old story behind a modern tragedy

In 1998, a farmer in Warangal, India killed himself after a failed crop by drinking pesticide. His body was found hours later lying amidst his one-acre crop, which was overrun by worms. This suicide was one of many that were reported on at the time; the incidence was particularly high among cotton farmers. It set off much hand-wringing in the press: how was India failing its farmers?

The stated cause of this farmer's suicide was debt, and many anti-GMO activists have linked a spate of similar tragedies to the introduction of GMO cotton — although the genetically engineered crop was not introduced into India until 2002. But if one looks deeper, one can see the real cause: modern crops and a modern economy abutted against a rural population that had changed little since the nineteenth century.

The story actually begins two centuries ago, in the 1820s. A cotton spinner in Bengal, India found herself at the edge of starvation. Her livelihood was disappearing; weavers didn't call for her handspun yarn anymore, and if sent to the market, her yarn was undersold by foreign yarn that came from England. Not only was English yarn drastically cheaper, it was finer than hers. The heart-breaking letter where she recounts her struggles appeared in the newspaper *Samachar Darpan*, and was later quoted by Gandhi.

In the letter, she evinces surprise that yarn that comes from England can be sold so much cheaper than hers. She takes this to mean that her English counterparts, who hand-spin yarn like her, must be even more down-trodden than herself. "I beat my brow," she writes, "…they have sent the product of so much toil out here because they could not sell it there."

Unbeknownst to her, it was not poverty-stricken spinners in England who were bringing down the price of yarn, but rather, machines. The farmer who killed himself in 1998 in Warangal and the starving spinner of Bengal in the 1820s were both victims of the same technological disruption that still reverberates in the subcontinent today.

The old days

By 600 BCE, India had become the center of global trade in cotton. Households grew their own cotton intermingled with grain, hand-spun and hand-wove the cloth, satisfied their own needs, and traded the surplus. Cotton cloth of Indian manufacture was carried along rivers and across land on the backs of donkeys; in the west to Egypt, Rome and Greece, in the East — to China.

Indian craftsmen were sitting at the pinnacle of innovation. It was said that the muslin woven in Dacca was so fine that an entire six-yard saree could pass through a ring that fit on a woman's finger. They had invented the spinning wheel which could triple the output of hand spindles, while the horizontal treadle loom made cloth with a finer weave than had been possible before.

The wild cotton plant grows hairs around its seeds to help them disperse. The cotton fruit splits along the sides when ripe, and exposes seeds studded in a coarse fluff. While many plants grow hairs around their

seeds, cotton fluff is unique — each hair, which is a single, long cell, is covered with cellulose that is laid down in an alternating spiral. This causes each hair to develop a kink. The kink allows hairs to cling together, so they can be twisted into bundles and spun into yarn.

The plant invests some energy in growing this hair long, but for its purposes, it need not be very long. The plant must invest the rest of its energy in fighting pests, surviving drought and other stressors. There is tension between how long it allows its fibers to grow and how much it invests in itself.

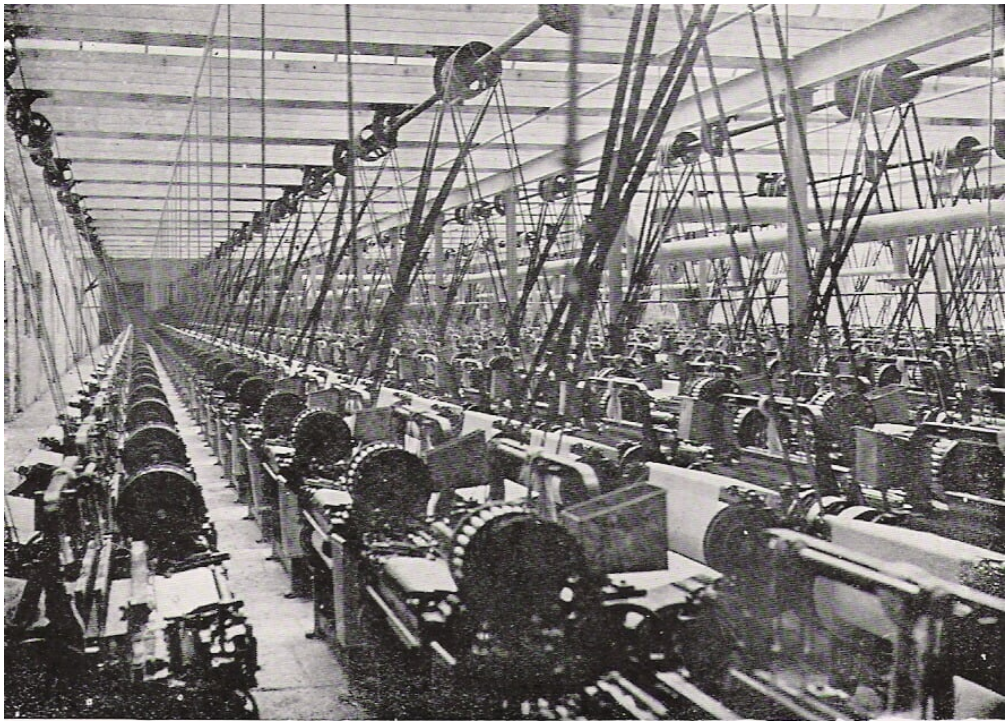
Wild Gossypium arboreum Credit: KENPEI, GFDL,Creative Commons Attribution ShareAlike 2.1 Japan License

Indian farmers cultivated a variety known as tree cotton (*Gossypium arboretum*). The cotton plant had evolved alongside their craftsmanship. The fibers were longer, finer and whiter than the wild cousins. But since this plant was native to India, it could also handle failed monsoons, it suited the soils, and it could beat the local pests. Its yield matched the speed of human harvesters. Before modern times the length of each hair had been bred up to half an inch.

Mechanization

In the early 1800s, England, which had until then been a bit player in cotton craftsmanship, caught up with India. In fact, Lancashire's cotton mills kick-started the Industrial Revolution. A cascade of inventions such as the flying shuttle and the spinning jenny took over from human hands, while steam power took over from human power. As historian Sven Beckert writes in *Empire of Cotton*, in a mere three decades productivity went up so much that the machines in Lancashire could spin in 135 hours what Indian spinner

would take 50,000 hours to do. It is no wonder that the spinner in Bengal found buyers wanting.



“Cotton mill” by E.L. Hoskyn

Lancashire’s vast hunger for raw cotton was satisfied by the American South — much ink has been spilled on slavery and how it powered cotton plantations there. But I want to focus on something not as well-known: the variety of cotton they grew. This was Upland cotton (Gossypium hirsutum), a native of the Americas.

Upland cotton is a remarkable plant. Much like its home country, its genome is a curious melting pot: united, but not assimilated. It is a hybrid of two wild cottons, one a new world native, the other an African. But their DNAs are not intermingled in the usual way: rather, they cohabit in each cell, so it retains the full characteristics of both ancestors. This strange form of hybridization, known as polyploidy, gives a plant vigor and robustness. Upland cotton obtained important qualities from each of its progenitors. The African parent gave it spinnable fibers, while the new world parent made it exquisitely responsive to cultivation.

Its fibers could be bred long and strong enough to handle the stress of machines, and yet fine enough to not make coarse cloth. Its yield grew as innovations in mechanical harvesting came along in the 1940s. More than 90 percent of world commercial cotton crop today is some variety of Upland cotton.

India’s messy progress

Meanwhile, Indian cotton craftsmen floundered. Even though Gandhi made some rather heroic (some say quixotic) attempts to revive the hand-spun cloth industry, it was ultimately in vain. Even in his day, cotton mills in the style of England’s began opening around the country. In the 1970s, when I was a child, the

smokestacks of Girangaon (‘mill village’) that I could see from my window in Mumbai had been in place for a hundred years. The mechanization of cotton was complete. Today hand spun cloth in India is a boutique niche; even handlooms, which are a popular fashion statement, are made from machine-spun yarn.

“India United Mill 1” by Rohidas Gaonkar – Licensed under CC BY 2.0 via Commons

With Indian Independence in 1947, what Upland cotton fields India once had once were lost to Pakistan. Native cotton did not have fibers long enough or yields high enough to feed the mills. The onus then shifted to the Central Institute for Cotton Research, where scientists succeeded in breeding Upland hybrids honed for performance and suited to Indian soils. Yields by 1997 increased seven times greater than at the time of Independence.

This progress was welcome and necessary but did not come cheap. The new hybrids were cash crops. They did not put much energy into surviving drought, poor soils and pests. They were not resilient against monsoon failures so irrigation was needed. But 60 percent of farming in India was (and still is) rain-fed.

Aside from the expense of irrigation, farmers now needed inputs such as pesticides and fertilizers. But regulated credit has been impossible for most Indian farmers to get: most are tenant farmers, with unofficial holdings and unofficial agreements.

Many thus resorted to moneylenders who charged interest as high as 24 percent. Debt drove them to devote more lands to cotton (‘white gold’), because in good years it could make enough profit to fulfill their loans. Cotton often replaced food crops that they might have been wiser to grow.

What they had was a modern crop, a result of modern science. It had been bred for abundant fiber, which made it an unceasing attraction for pests. But farmers were ill-equipped to deal with it. Their knowledge came mainly from traditional farming. American farmers, learning the hard way, had moved on to integrated pest management (IPM) techniques, only using chemical pesticides as the last resort. But Indian farmers are plagued with illiteracy and insularity, and most were unaware of these advances. When they needed to fight pests, they reached for the 'medicines' on sale: chemical pesticides.

They were not educated in safe usage. Farm workers would go on foot across the fields with possibly just a piece of cloth held over their mouths as they sprayed. Overuse led to one particular pest, the old world bollworm, becoming resistant to four generations of pesticides in quick succession — from DDT to pyrethroids. By the late 1990s, this moth larva, which bores through immature bolls, had infested fields from the north in Punjab to the south in Andhra Pradesh. They were spraying more and more but fighting a losing battle. Some years, they would lose half their cotton to it. Eventually, although cotton is grown on only about 5% of land, it consumed up to 50% of all pesticides in India.

Bollworm damage in green boll

Bollworm damage in green boll

Farmers found themselves pinched on the side of profits as well. The Indian government liberalized trade policy around agriculture due to the WTO agreements in 1995. As a result, farmers found themselves exposed to world cotton prices that rose and fell capriciously. Nor was this truly free trade, since there continue to be large subsidies given to farmers in advanced countries, which brings down prices for those exports. By the mid-1990s, almost a decade before the introduction of GMO cotton, farmer suicides were in the news. They reached a peak in 2004, a drought year, when only a small number of Indian farmers used GM seeds.

Source: Nature 2013

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Source: Nature 2013

In search of a villain

You might notice that one name has been conspicuously absent from my account — Monsanto. In fact, the greatest tragedy of this slow-moving tragedy was the lack of a villain. Yes, there were villains, but they were multiple and diffuse. Most were circumstantial. And the solutions were not glamorous: Loan Eligibility Cards for farmers. National Agricultural Insurance. Training. Research.

Monsanto brought GM technology to India in 2002. Even at the time, its promise was clear from the fact that the technology was energetically bootlegged in Gujarat. Over the next decade, it had shown benefits both in 50 percent reduced pesticide usage and doubling of farm incomes.

Nevertheless, the symbolism of Monsanto as the suicide-causing villain became an irresistible mind-worm that spread globally. One can see from interviews of activists at the time that Monsanto was being implicated due to guilt by association with industrial agriculture before GM technology had even taken root. Rumors spread that Monsanto was going to program their cotton to produce sterile seeds. Their product was thus derided as ‘terminator’ or suicide seeds, which morphed in meaning to seeds that cause (farmer) suicide. This notion gained currency from the deep suspicion with which people viewed genetically modified crops.

Thus, well-meaning people across the globe protested Monsanto’s entry into the Indian market, unaware that they were rejecting seeds that had been designed to solve specific problems. The search for a villain

derailed any attempt to address the farmers' real issues.

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