

Is There a Case for Growing Cotton in India?

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Abstract, Summary and Conclusion

On grounds of sustainability, cotton has been the subject of trenchant critiques. India has more land under cotton than any other country in the world, and just about the lowest yields. Pest infestations are quite severe comparatively, leading to heavy pesticide loads that poison people, water and fauna -- including insects that prey on cotton pests, deepening the treadmill cycle. Pesticides for cotton consume more than half India's massive hard currency pesticide bill. Lint quality has been generally low, yields unstable. Suicides among cotton farmers aroused national and international alarm. Subsidies to growers consume about US\$500 million a year. Cotton thus absorbs fungible water, hard currency, domestic resources and land -- all with high opportunity costs, but with insecure returns for average cultivators. Transgenic [Bt] cotton has spread rapidly from farmer to farmer, evading national regulatory authorities and making India's biosafety regime mandated by the Cartagena Protocol a subject of ridicule. Though transgenic cultivars improve farmer profits and reduce pesticide use, many in the scientific community fear the genetic roulette unleashed in the countryside. Moreover, powerful political forces continue to oppose any products of biotechnology. International market rigging by richer nations and improvements in yields in nations such as China threaten Indian cotton farmers both domestically and internationally. Yet it is difficult to imagine an India without cotton.

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Locating Indian Cotton

The United Nations Conference on Trade and Development [UNCTAD] publishes a highly technical and esoteric series on commodities – projections, trade directions and volumes, price elasticities, costs of production, technical advancements, and so on. When they discuss the commodity generally, they point to the centrality of cotton to India:

Mahatma Gandhi portrayed while spinning cotton with a wheel is still an outstanding symbol in the collective unconscious. The wheel itself, a device deeply embedded with national history, stands at the centre of the Indian flag.

Few crops carry the symbolic weight of cotton for India.

The cotton plant itself belongs to the genus *Gossypium*, of the *Malvaceae* family, a large family that also includes the *baobab* tree and the *bombax* -- the Silk-cotton tree of the West Indies -- or mallow. The family includes many commercially important members – eg. balsa, or corkwood (*Ochroma lagopus*), which yields the lightest lumber in the world (remember all those balsa-wood kits from which boys make airplanes?) and the *kapok* whose seed fibers are used as filling material. The plant naturally is a tropical or semi-tropical perennial tree [I found one in the Arizona desert recently], that can grow up to 30 feet high in the wild, but has been domesticated to an annual shrub for commercial cultivation.

Cotton has new world and old world ancestors. The most important cultivars belong to *Gossypium hirsutum*, which originated in Mexico; *G hirsutum* accounts for more than 95% of world fiber production. "Old World" or "Asiatic" cottons include *Gossypium arboretum*, which originated in the Indian subcontinent. This species, along

with another of South African origin, features such short staple-length fiber as to have no commercial value, though there are derivatives from this source that do have commercial importance.²

Cotton is the leading fiber crop not only in India, but in the world. Of the 85 cotton-producing countries in 2005, 80 were officially classified by UNCTAD as low-income [“developing”] countries, 28 of which were indexed by the United Nations among the least developed countries, meaning the bottom of the international hierarchy of wealth [UNCTAD Secretariat]. Cotton is critical to some of the poorest countries and people in the world, particularly in West and Central Africa.

In the imagination of India, within and without, cotton is alluring because of what its fibers can become, which is fabulous indeed. But cotton is also important in India, as elsewhere, for providing edible oil and seed by-products for livestock. Cottonseed oil ranks fifth in world use among edible oils (accounting for about 5% of world consumption of vegetable oil) [UNCTAD data]. Cottonseed meal is often added to cattle feed.

India has about 9 million hectares under cotton, the largest acreage of any nation in the world. This acreage is about 25% of the total cotton acreage in the world, and 5% of India’s cultivated area. Cotton accounts for livelihoods of about 60 million people in India, if we include the full range of cotton from raw to finished products. India is deeply involved in the international trading network of cotton and cotton products. In marketing year 2001/02, U.S. raw cotton exports to India more than tripled to over one million bales, and the U.S. share of total Indian imports rose from 20 percent to 60 percent. For a

² "Old World" or "Asiatic cottons" include as well *Gossypium herbaceum*. This section relies on UNCTAD 2005.

time in 2002 it looked as though India would become the largest importer of cotton in the world, but a recovery of domestic production headed off that outcome. India has become the third largest foreign destination for U.S. cotton, after Mexico and Turkey, representing 9 percent of total U.S. cotton exports [USDA, Foreign Agricultural Service Feb 2003].

For all the allure and symbolism of cotton, the cultivation of this crop is deeply problematic, both for those who grow it and for its externalities. The international market is rigged – like Pakistan’s nuclear program, an open secret long known to most of us, but seldom acknowledged in official discourse – to the detriment of poor farmers in poor nations. This fact was only recently ratified by a World Trade Organization appeals panel – in March of 2005. The official finding was that US policy rigs cotton markets in ways that depress incomes in low-income countries. Though this ruling went against the US, it will be a long time before the global system changes: power makes gears sticky.

Facing a rigged market adds to the hazards of growing cotton. Suicides of cotton farmers were prominent in the global concern about farm crises in India and elsewhere.³ The opportunity costs of growing cotton are high: it is a thirsty crop that uses land and water that might have higher callings, and it grows poorly without massive infusion of pesticides that degrade water sources throughout India.⁴ And it seems incapable of growing in most countries without subsidies from the public pockets.

³ On suicides and the politics surrounding in India, see Herring 2005, Parmar and Vishvanathan 2003; Glenn Stone (2002:1) correctly emphasized that “... both sides [in the “GMO” debate] interpret the Warangal suicides as supporting their position.”

⁴ In the summer of 2003 the Indian Lok Sabha banned the sale of Coke and Pepsi on their premises because of levels of toxic pesticides that exceeded greatly the EU limits for health standards. My colleagues in Palakkad district rallied against Coke and Pepsi – the multinationals – when the great tragedy was that the water for Indian soft drinks comes

Market Rigging

“The WTO is under particular pressure because the U.S. cotton program, in the eyes of subsidy critics, has become the poster child of misguided agricultural assistance. Poor nations see themselves pitted against wealthy and heavily protected American rivals.” Schlachter 2005

Another of the hazards of growing cotton is the deep interest of powerful political forces in the most powerful nation in the prospects for its cotton. The United States has had more trouble with the World Trade Organization than most nations, most recently in the case of cotton. An appeals panel of the WTO upheld the claim of Brazil that the United States was illegally subsidizing cotton exports to the detriment of other producers, by suppressing cotton prices.⁵ These subsidies are heavily skewed toward the richest farmers in the United States. The attack on world market effects of US policy was led by Brazil – an economy heavily dependent on agricultural exports – and by the very low-income African countries of Benin, Burkina Faso, Chad and Mali, where cotton farming is critical to rural and national economies. These nations contributed to delaying the Doha Round of international trade-reform talks until a rather ambiguous compromise was reached in the summer of 2004. The compromise was for looking into the effects of US cotton subsidies on poor nations. Brazil’s claim was that American subsidies suppressed

from Indian groundwater, which is quite saturated with various toxins in many places. When I suggested that pesticide-use reduction might make more sense than protests against multinationals in this specific case, I received numerous lectures on the threat of The Terminator – the hoax attached to pesticide-replacing transgenic cotton. See Herring 2005b.

⁵ On March 3, the WTO upheld a ruling that various U.S. programs either contain illegal export subsidies or make payments that are higher than allowed. Federal programs paid \$14 billion to U.S. farmers, processors, warehouses and exporters from 1995 to 2003. This section is based on Schlachter 2005; Oxfam 2004; Oxfam 2005.

world prices by creating incentives for overproduction. The claim was that in 2001 Brazil was damaged to the extent of US \$600 million.⁶

Subsidizing cotton is not entirely a rich-country phenomenon. The International Cotton Advisory Committee reports that about three-fourths of the world's cotton growers received direct assistance in the 2001-02 financial year; moreover, up to 20% of world cotton income came from government support.⁷ Because of the size of the economy, subsidies in the United States dominate those of other nations: about US\$ 2.3 billion. India subsidizes cotton by ICAC data at the rate of US\$ 500 million a year; this expenditure is about half the aggregate of China: US\$ 1.1 billion.⁸

Global subsidy regimes do not indicate a sustainable crop; some would argue that rich countries can afford subsidies, and poor cannot, but in reality any money that goes into cotton farmers' pockets could go elsewhere. The money that subsidizes cotton obviously has extensive opportunity costs.

Bollworms and Other Bugs

⁶ The claim relied heavily on the work of the International Cotton Advisory Committee and an American professor, Daniel Sumner of the University of California at Davis. Sumner produced a study that indicated on the basis of USDA data for the three-year period 1999-2002 cotton prices dropped by nearly one-third. In the absence of subsidies, he argued, 41 percent less cotton would have been exported and world prices would have been more than 12 percent higher, he estimated. This estimate has been challenged, and the long-term appeal of the WTO judgment will certainly produce much conflict over the [social] science.

⁷ Subsidies varied from from 2 US cents in Ivory Coast to 76 US cents in Spain on a per-pound basis. The American subsidy of about 24 US cents per pound ranked in the middle. ICAC data. Nevertheless export subsidies are provided only by the United States and China.

⁸ The most active nations in challenging the US in the WTO case, Brazil and Benin, also subsidize cotton farmers, but on a small scale US\$50 million for Brazil, and US\$20 million for Benin.

The most serious pest of cotton in India is the American bollworm (*Helicoverpa armigera*), which also infests other crops – tomatoes, legumes, etc. King (1994) estimates that this bollworm alone causes US\$ 300 million a year in damage. Pesticides to treat cotton run in the range of \$US 350 million annually. Protecting crops from bollworms that may potentially destroy the entire crop, breaking the farmer's livelihood, necessitates cash or credit purchase of pesticides – in India, among the most toxic substances known to human imagination.

As most farmers operate on credit at some point, loans must produce sufficiently more crop at prevailing prices to repay the loan with interest; this is critical for sustainability of the individual farm economy and farmer livelihood. Unserviceable cash debts to pesticide firms figured prominently in the suicides of ruined farmers in 1998. As farmers in India have encountered the pesticide treadmill -- more poisons are required over time for comparable, or less, effect – the search for alternatives has become rather desperate. But there is an enormous social externality of pesticide use: contamination of farm workers, soil and water as well as damage to non-target insects, birds and aquatic life. Moreover, cotton in India is often in crisis, as dramatized by the farmer suicides, particularly in Warangal district, AP. India has more acreage in cotton than any other country, almost nine million hectares, but yields are among the lowest in the world – about 320 kg of cotton lint per hectare. Maharashtra has the most land under cotton, about 3.2 million hectares, but the cotton belt is large, stretching from Tamilnadu to Punjab, Orissa to Gujarat.⁹ The highest pest control costs are incurred in Karnataka, at

⁹ On the biology and economics of cotton production, see Clive James, 2002, **Global Review of Transgenic Crops: 2001 Feature: Bt Cotton**. ISAAA Briefs No. 26. ISAAA: Ithaca, NY; On desperation of farmers, consider the example of Popatbhai

US\$ 291 per hectare; the cost in Gujarat, where the underground Bt cotton was first discovered, is US \$ 124.¹⁰ It is the desperation of the bollworm problem that drove a wedge between farmers and NGOs claiming to represent them: farmers need protection, and the transgenic Bt cotton – whether Mahyco-Monsanto’s official varieties or home-brewed combinations, saved seeds and illegal backcrosses – reduces pesticide outlays, especially in years of heavy infestation.¹¹

Incomes:

The primary problem for India’s cotton farmers is instability of income. Holding sizes are small: the average size of cotton farm varies from 0.93 ha in Tamil Nadu to 4.74 ha in Punjab. Yields are highest in Gujarat, averaging 416 kg per ha in 2000; the lowest average yields were in Punjab – 180 kg/ha.¹² Cotton is a high-input crop, necessitating either deep pockets or extensive borrowing for cash inputs. Yields are unstable, producing fluctuations in income, depending on water, insects and prices. In the ICAR study for the GEAC’s biosafety assessment of Bt cotton, even though the three Bt hybrids yielded from 60-90% more than their isogenic non-Bt hybrid comparisons, **gross** income per hectare came to only Rs 23,604 [about US\$ 487].¹³ It is easy to imagine a farmer of a

Ramjibhai Patel, a farmer in Gujarat: he explained that his costs of cultivation had doubled in the previous five years and many farmers were thinking of abandoning cotton. “This new seed may be a good alternative for us. We have run out of options.” Dionne Bunsha, 2001, “A Can of Bollworms,” **Frontline** Vol 18, Issue 24, November 24-Dec 7.

¹⁰ Pawar 2002; James 2002 Table 56.

¹¹ Early attacks by sucking insects – aphids, jassids, thrips – are not affected by the Bt toxin, nor are all bollworm varieties equally affected in all regions, but bollworm spraying is typically reduced significantly. See Herring 2005; James 2002.

¹² Data for 2000, Directorate of Agriculture and Co-operation, New Delhi and James 2002 p 106.

¹³ It is important to note that the 2001 season was particularly bollworm-infested, and thus the difference in income between Bt and non-Bt farmers would be exaggerated, a

medium sized plot of cotton making less than US\$1.50 a day even with the high-yielding and more profitable Bt hybrids. As holding sizes are small, and yields low, fluctuations in yield are less tolerable to Indian cotton farmers.¹⁴

What has infused cotton income with such dramaturgy in India is the apparent, but not statistically established, anomalous number of suicides starting in 1998 – for which Vandana Shiva’s book *Suicide Seeds* is iconic.¹⁵ All agriculture is risky business, and *barani* cotton remains, in Gunnar Myrdal’s memorable characterization of Indian agriculture in general, “a gamble on the rains.” It is also a gamble on the insects. What farmers prefer about the transgenic cottons is that some insurance is provided against bollworm infestations of greater than normal ferocity, preventing perhaps the one disastrous season that leads to debt and disaster.

On March 26, 2002, India became the 16th nation in the world to approve a genetically engineered crop for commercialization, albeit provisionally and in the face of continuing opposition (Bharathan 2000, Bunsha 2001). Since then, there has been a veritable explosion of entrants into the transgenic cotton-seed arena in India, some sanctioned by the state and some generated by an opportunistic rural anarcho-capitalism enabled by underground biotechnology (Jayaraman 2001; 2004). This outcome had been

point not fully appreciated in the **Science** article by Qaim and Zilberman that raised so much international controversy. Data from Department of Biotechnology.

¹⁴ Holding sizes are much smaller in China; this higher risk situation may be responsible for the astonishingly rapid adoption of Bt cotton, from Monsanto and public sector sources, by Chinese farmers.

¹⁵ Given the state of statistics on rural suicides, there is no way to know what is a “normal” rate for farmers, and therefore how anomalous the current situation is. See Centre for Environmental Studies Warangal, 1998; Department of Agriculture and Cooperation 1998; Stone 2002; Shiva et al 2000: pp.64-110; Srinand Jha 2001; Parmar and Vishvanathan, forthcoming; Vasavi 1999.

presaged by the announcement of the Government of Maharashtra that its farmers were to be allowed to grow transgenic cotton as of January 1, 2002, before Delhi had completed its biosafety assessment and the refusal of the Government of Gujarat to enforce the order from Delhi to destroy its transgenic cotton crops in November of 2001 (Sahai 2002). The final statement from Delhi of the Genetic Engineering Approval Committee in March 2002 simply ratified facts on the ground. GEAC approval was out of the hands of regulators and scientists and in the hands of politicians, farmers and operatives of the underground anarcho-capitalism unleashed by stealth seeds (Herring forthcoming).

Transgenic cotton is experiencing an explosive growth in India, as it did in China much earlier (James 2002). The promotion of biotechnology in India is more that of taking advantage of the “information revolution,” than specific targeting of research for farmer-driven objectives. It was Mahyco, India’s largest seed firm, that identified bollworm resistant cotton as a critical need and petitioned Delhi for permission to import seeds. Delhi did not have this specific objective in mind, but instead promoted biotechnology as a potentially vigorous sector for generating investment and growth, capitalizing on India’s scientific knowledge capital, and preventing descent in the global hierarchy (CII 2001). Delhi knows that China’s public sector makes very good Bt cotton, and most Chinese farmers grow Bt cotton, including the smallest and poorest; that version of Bt cotton is joining the increasingly crowded field of transgenic hybrids in India via an Indo-Chinese collaboration led by Nath Seeds. China’s developmental state spends twice what India’s does subsidizing cotton, and larger multiples on biotechnology research and development. Brazil’s developmental state has likewise supported biotechnology, resulting in much the same outcome as India: opposition from civil

society and acceptance by farmers trading on underground tactics to avoid both biosafety regulators and technology fees. Public sector support for biotechnology has been much less than that of China, but there are signs of change. Cotton has been at the center of vigorous new institutional arrangements and developments of new consortia in biotechnology in India. In the global rift on genetic engineering, India was long balanced between the polar worlds of American optimism and European caution. With Bt cotton, it has joined the transgenic bloc of nations.

So, Is There a Case?

Most of us who enjoy cotton, and can afford it, export our externalities to distant places. We do not suffer the pollution of body and water, income instability and insecurity of cotton producers. The loss of biodiversity from pesticide overkill is of no immediate or direct harm to wearers of T-shirts and sleeping gowns in distant cities or nations. That land and water devoted to cotton could grow nutritious food is unimportant to wealthy consumers who have the world as their grocery mart. Biotechnology may make Indian cotton more competitive internationally, more secure a source of income locally, and more environmentally friendly, but a social consensus on Frankenpants has yet to be reached at the global level, and not even in India, despite decisions of state and farmers to go biotech. More troubling, biosafety regimes mandated by Indian law and international treaty have high costs and uncertain results. Gene police will be hard to come by in the villages. The best thing about writing an introductory paper is that one has the freedom to raise issues, with no expectation of resolution.

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