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Toward Genetic Democracy? Seed Sovereignty, Neoliberal Food Regime, and Transgenic Crops in India

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Abstract

Biotechnology has become the central form of technology in global agriculture since the neoliberal reformulation of global capitalism in the 1980s. Powerful transnational corporations have emerged as the major promoters of transgenic technology (a form of advanced biotechnology) in the global South. The Indian democratic developmental state (which has invested in biotechnology research since the mid-1980s) has its own interests regarding transgenic technology. Has the Indian state succeeded or failed in creating a genetic democracy even as it interacts with biotech transnational corporations and the civil society? A 'genetic democracy' is defined as an ideal-type of society and polity where all citizens participate democratically in the shaping of the nation's biotech agenda and policies; where the state has complete regulatory control over transgenic crops, and where the public sector plays a decisive role in researching and commercializing transgenic crops. I argue that the Indian democratic developmental state (in existence since January 1950) has failed in the creation of a genetic democracy partly because of three major cases of state failure with reference to the development and regulation of transgenic crops. I discuss these cases of state failure: first, the introduction of Bt cotton through unauthorized seeds resulted in a regulatory nightmare for the Indian state which it is still unable to end; second, the failure of the Indian public sector to successfully commercialize Bt cotton undermined the developmental efforts of the Indian state to deliver low-cost, savable seeds to agriculturists; and third, the bitter and unresolved debates in Indian civil society over attempts to introduce Bt brinjal (through a public-private partnership) have led to a situation where the apex governmental institution that clears transgenic crops recommended the commercialization of Bt brinjal in 2009, but the Indian state later backed out and imposed an indefinite moratorium on Bt brinjal's commercialization in February 2010. Cumulatively, these three major cases of state failure (together with the resistance of anti-GM activists) have not allowed a genetic democracy to flourish in India. If the national goal is the construction of a genetic democracy, then the Indian state and the food/seed sovereignty movement have to co-operate with each other in this creative task. I offer some suggestions as to how the Indian state and the food/seed sovereignty movement can develop trust in biotechnology among Indian citizens and co-create a genetic democracy.

Introduction: Seeds, Agro-Biotechnology, and the Gene Giants

Seeds constitute the delivery system of agricultural biotechnology. The choice of seed is an important one for the agriculturist[1] because it determines what kind of nutrients (manure or fertilizers?), pesticides (built-in pesticides or synthetic pesticides or integrated pest

[1] Following Vasavi (2012), I use the term 'agriculturist' to encapsulate and represent all cultivators/farmers who engage in production for subsistence (or only for their own and family's needs) and/or the market and who occupy a range of positions from that of cultivators-cum-laborers to that of landlords.

management?), water (whether irrigation is needed, or will rainfall be enough?) and care (e.g. is weeding required?) the plant will need. For the agriculturist, the decision regarding the type of farming to be done (i.e., whether he or she should follow industrial or traditional or agro-ecological/organic/sustainable agriculture model) generally[2] begins with the choice of seed.

Seeds were crucial to the Green Revolution in India. The Green Revolution technologies—whose introduction marked the beginning of industrial farming in many regions of India--were a package of high-yielding varieties (HYVs) of seeds together with fertilizers, pesticides and irrigation technology[3]. Seeds continue to be central to the Gene Revolution or the biotechnology era. Instead of HYVs, the seeds that are of vital importance to the biotechnology era are the 'genetically engineered' (also known as transgenic or biotech) seeds which constitute a technological marvel in that genes belonging to organisms from other kingdoms are transferred to the organism that is to be engineered. For example, the *cry1Ac* gene from the soil bacterium *Bacillus thuringiensis* was inserted into the cotton genome to create one type of 'Bt cotton' plant that is known by the brand name 'Bollgard' in India[4]. This 'Bollgard' plant expresses the *cry1Ac* gene and produces a protein that is toxic to certain lepidopteran pests. Thus the Bt cotton plant produces pesticide-like substances, and the farmer growing Bt cotton would not have to spray pesticides for those target pests. Biotech advocates argue that this would result in savings for the agriculturist (as costs of synthetic pesticides are not incurred) and also protect his or her health (as the agriculturist would not have to endanger her or his health by spraying pesticides, which are often very toxic).

Before we embark on a discussion of the polarized Indian debates over agro-biotechnology and genetically modified organisms (GMOs), let us familiarize ourselves with some statistical information about transgenic crops (which will help us better understand why the debate between the biotech advocates and detractors has become so bitter of late). The global area under transgenic crops grew from a modest 1.7 million hectares in 1996 to a record 170.3

[2] I use the term 'generally' because I have documented adoption of transgenic cotton seeds (which are associated with the industrial agriculture model and eschewed by organic farmers in the West) by self-identified organic farmers in Gujarat, India (Roy 2010, 2012).

[3] HYVS have been called 'high response' varieties by some experts because they respond well to increased levels of synthetic fertilizers and water (often, irrigation water made available through mega-dams constructed by the developmental state). In contrast, farmers' varieties can perform well under conditions of less manure availability, less fertilizer availability, and less water availability.

[4] While scientists and seed companies may know how to get Bt genes into the cotton genome, they can't predict the exact location where these transgenes will lodge. Through trial and error, foreign genes are gunned into many plant saplings until scientists hit upon a suitable niche of the cotton genome where the bacterial genes can stimulate the cotton plant into producing proteins which act like insecticides. Genes are thus used to create events. Independent scientists say that creating events is the primary concern for seed developers. "There are a limited arsenal of genes available. It's creating viable events that is the bread and butter of seed developers," said K.K. Narayanan, managing director of Metahelix Life Sciences Ltd. an Indian private seed company that develops events (Koshy, 2012).

million hectares in 2012 (James, 2012). In 2012, a record 17.3 million farmers (compared with 16.7 million in 2011) grew transgenic crops—and over 90%, or over 15 million were small resource-poor farmers in developing countries (*ibid.*). The adoption rate of transgenic crops trumps those of all agricultural technologies that have been introduced so far.

In 2012, 28 countries planted biotech crops, and of these 20 were developing and eight were industrial (*ibid.*). For the first time since 1996, developing countries grew more, 52% of the global biotech crops in 2012 than the industrial countries at 48%. The growth rate for transgenic crops in 2012 was at least three times as fast and five terms as large in developing countries as compared with industrial countries. Of the individual developing countries, the four biggest players when it came to transgenic crops were Brazil (commercialized transgenic crops: Bt cotton, Herbicide Tolerant or HT soybean, Bt/HT maize), Argentina (commercialized biotech crops: Bt/HT/Bt-HT cotton, HT soybean, Bt/HT/Bt-HT maize), China (commercialized transgenic crops: Bt cotton, Bt poplar, PRSV papaya, VR sweet pepper, DR tomato, VR tomato) and India (only one commercialized transgenic crop: Bt cotton).

If pro-biotech groups focus on the fast adoption of transgenic crops by farmers in developing countries, anti-biotech groups focus on the increasing market concentration in the global seed industry. According to the activist Hope Shand (2012, page 10), the world's six largest seed/agrochemical/ biotech firms (BASF, Bayer, Dow Agrosciences, DuPont, Monsanto, Syngenta) have a "dangerous chokehold" on the global agricultural research agenda.

In the perception of many activists, these Big Six corporations constitute what may be termed as an informal 'GMO cartel.' Whether or not the 'GMO cartel' has been intentionally formed by the six corporations, the fact is that the Big Six corporations have agreed to cross-license proprietary germplasm and technologies, consolidate R&D efforts and terminate costly patent litigation battles. For example, Monsanto has cross-licensing agreements with all other Big Five companies, Dow has cross-licensing agreements with four of the other Big Five companies, DuPont and Syngenta have entered agreements with three of the other companies (Fuglie *et al*, 2011, quoted in Shand, 2012).

According to Shand (2012), market concentration in the seed industry has been growing over the years: in 1995 (before the commercial release of transgenic seeds), the world's top 10 seed companies controlled 37% of the world's commercial seed sales. In 2009, the top ten companies accounted for 73% of the commercial seed market. The three largest seed firms (Monsanto, DuPont, and Syngenta) accounted for 53% of the proprietary seed market globally in 2009. The same three corporations accounted for nearly three quarters of all US patents issued for crop cultivars between 1982 and 2007.

The vast majority of farmers in developing countries are self-provisioning in seed and they represent the seed industry's biggest competition (*ibid*.). In 2006, seeds from the public sector accounted for 11% of the global seed market value, while farmer-saved seeds accounted for 21% and proprietary seeds accounted for 68%. In 2007, Monsanto's GE biotech traits accounted for about 85% of all area (trait-acres) devoted to commercial GE crops in 13 countries where GE crops were planted. Just five firms (Monsanto, DuPont, Syngenta, Bayer and Dow) accounted for 98% of all biotech trait-acres[5].

For the anti-biotech activists and scholars, the 'GMO cartel' needs to be stopped in its tracks for reasons that have to do with concerns regarding biosafety and control of the food system of a country (or community) by transnational corporations (TNCs) and neoliberal governments who create regulatory structures to make it possible for TNCs to capture seed markets.

For many pro-biotech activists and scholars, the 'GMO cartel' is a fact of life that cannot be altered and must be welcomed or at least lived with. Pro-GMO activists argue that exhaustive biosafety studies have been done by the GM crop developers, and biotech crops go through a stringent regulatory system whether it is in India or the United States. The pro-GMO group argues that transgenic crops currently on the market fulfill all bio-safety requirements. Further, it costs upward of US $130 million to develop a crop with a single genetically engineered trait[6], and such large sums of money are generally not available to public institutions, hence biotech crops cannot be made available to agriculturists through public institutions (especially in developing countries).

The scenario I have described thus far raises many interesting questions for scholars of agri-food systems. In this paper, however, I will focus on only one set of issues: an evaluation of how far the Indian state has met with success in the endeavor of creating a genetic democracy, why this is the case, and what can be done to remedy the situation. By 'genetic democracy,' I mean an ideal-type of a society and polity where (i) all citizens (as individuals and as members of civil society groups) participate fully and democratically in the shaping of the nation's biotech agenda and policies; agriculturists, consumers, and scientists converse with each other and co-design transgenic crops that will benefit agriculturists and consumers, (ii) the state has complete regulatory control over transgenic crops and other GMOs, and (iii) the public sector plays a decisive role in researching, developing and commercializing transgenic crops and other GMOs.

[5] The only entity outside of the Big Six companies with notable transgenic seed acreage in 2007 was the Chinese Academy of Agricultural Sciences, a public institution, with an estimated 2% of global trait acreage.
[6] But it takes much less (about US $1 million) to develop an inbred line through conventional breeding techniques.

In developing my concept of a 'genetic democracy' for India, I make the following five assumptions: (i) even though India currently produces enough food to meet the requirements of all of her citizens, it is necessary to develop industrial agriculture as well as to develop and commercialize transgenic crops in order to meet the food needs of Indian citizens in the coming decades. It is necessary to make every community and/or agro-ecological zone of India (whether rural or urban) food sovereign if possible, and transgenic crops can help in that effort. For a vast country such as India, transportation of food from one agro-ecological zone to another can be done as a last resort to avert food scarcity problems[7]; (ii) Indian public institutions can find ways to develop less costly transgenic seeds that can be saved and re-used by agriculturists; (iii) transgenic crops can be designed to be bio-safe: (iv) India is still following the mixed economy model; in addition to the public institutions which will commercialize transgenic seeds, there is a role for private seed companies; (v) when it comes to agri-food systems, there can be no one-size-fits-all model for all Indian states and agro-ecological zones: some states and agro-ecological zones will opt for the industrial agriculture-transgenic crop model, while others will choose the organic farming model (which eschews transgenic seeds). Those following the model of industrial agriculture and transgenic crops may be the more densely populated and/or more urbanized regions of India.

This paper is divided into six sections. Following the introductory section, I discuss the concepts of the Indian democratic developmental state and the neoliberal food regime. I discuss the divisions in the Indian food/seed sovereignty movement regarding transgenic crops. In the following sections, I argue that the Indian state has failed to create what I term as a 'genetic democracy' and I discuss three major cases of state failure (with reference to transgenic crops) to illustrate how the Indian state has mismanaged the tasks of development, commercialization and regulation of Bt crops. Coupled with the resistance of anti-biotech activists, these state failures have not allowed a genetic democracy to flourish in India. In the concluding section, I reflect on the current impasse in India over transgenic crops, and offer suggestions as to how the Indian state and the food/seed sovereignty movement can develop trust in biotechnology among Indian citizens and co-create a genuine genetic democracy.

India: Democratic Developmental State Caught in a Neoliberal Food Regime

Many colonized nations became formally independent just after World War II. India was one of them. These newly sovereign postcolonial countries faced an important question: can a developing country afford to simultaneously pursue the goals of development (often simplified to 'economic growth') and democracy? Unlike South Korea (which chose the route of 'authoritarian developmentalism'), the Indian state chose to simultaneously pursue the goals of

[7] For example, in recent times, Punjab agriculturists (located in the northern part of India) have shipped food to food-scarce regions of Odisha (an eastern state of India).

development and democracy since January 26, 1950 (the day that Indians gave themselves a Constitution). The Indian state chose to construct a democratic civil society while simultaneously pursuing state-led industrialization. I will emphasize here that unlike the global North where civil society grew independently of and simultaneously with the state and the market, the postcolonial Indian state has taken upon itself the responsibility of nurturing both the national economy (through economic planning[8] and the creation of a mixed economy) and the Indian civil society.

In simplified terms, drawing upon Kumar (2008), it may be argued that the postcolonial Indian state has journeyed through three phases of 'democratic developmentalism' between 1947 and the present: Nehruvian/socialist (1947-1964), Indira Gandhi/populist (1967-1984), and various prime ministers/neoliberal reforms era (1985 onwards). While there is more or less scholarly consensus that the capacity of the democratic developmental state was strong during the Nehruvian socialist era and was fairly strong during Indira Gandhi's populist era, it is a matter of debate as to whether or not the Indian state continues to adhere to the ideology of democratic developmentalism in the post-1985 phase. Has the post-1985 Indian state turned into a neoliberal minimalist state that regulates the market so as to favor TNCs? In order to answer this question, I would argue that we need to examine the Indian economy in sectoral terms in order to understand the extent of liberalization, privatization and globalization, and the role of the Indian state in these processes. Since this paper is concerned with the agri-food sector, I will restrict my comments to that sector.

Based on my reading of extant literature and my fieldwork in India, I will submit that Indian agro-food system (or the agriculture sector) has been only partially liberalized so far, especially when compared with other emerging markets such as China or Brazil. However, the effect of this partial liberalization has resulted in a severe agrarian crisis since the 1990s, one symptom of which is the suicides by thousands of Indian farmers.

Economists have sought to explain the welfare declines of Indian farmers (especially small farmers) in polarized terms. One group (e.g. Gulati and Narayanan, 2003) has termed the pace of agricultural liberalization as 'slow' and held this slow pace responsible for the severe agrarian crisis that the country is currently facing. They have advocated an increased role for markets. The other group (e.g. Vakulabharanam and Motiram, 2011) has sought to lay the blame for the

[8] The Indian state adopted the mechanism of planning in order to integrate the best features of two very different models of economic growth: the capitalist model of the United States, and the socialist model of the Union of Soviet Socialist Republics (USSR). Five Year Plans became a hallmark of Indian planning. Prime Minister Jawaharlal Nehru presented the first Five Year Plan to the Indian Parliament in December 1951. Despite the neoliberal turn, India has not given up planning for economic development. The Planning Commission still exists and plays an important role in directing the country's economy. The Tenth Five Year Plan was completed in March 2007 and the Eleventh Plan is currently under way.

agrarian crisis on the state's withdrawal from its support for agriculture and also on the integration of Indian agriculture with global markets. The solution lies in an increased role for the state in agriculture, according to this group.

Many actors (including some state actors, farmers' groups, economists, policymakers, and TNCs active in India) are actively seeking to further liberalize the Indian agriculture sector, including the sub-sector of seeds, while others are seeking to rollback neoliberal economic reforms in agriculture. All this is happening in the era of what Philip McMichael (2005) has termed as the 'third food regime' or 'corporate food regime' and which Gerardo Otero (2012) has reformulated as the "neoliberal food regime.' The third food regime is part of a global political project and its central tension, according to McMichael (2005), is between the globalization of corporate agriculture and counter-movements informed by food-sovereignty principles. This perspective does acknowledge the role of the state, especially in advanced capitalist countries in maintaining subsidies for their agricultures, but there tends to be an overemphasis on the main beneficiaries of the food regime, corporations, and the global South's dependency (Otero, 2012). McMichael's formulation is clear that corporate markets are politically constructed, via states as members of the World Trade Organization (WTO). This means also that states are therefore subject to resistance from counter-movements, which are part of the food regime dialectic and transformation. However, McMichael's analysis remains at the level of the world economy and misses the role of the national state (*ibid.)*. While there is no doubt that TNCs have become the dominant economic agents, especially after the neoliberal turn of the 1980s, we must continue to take full and explicit account of the role of the national state (*ibid.*)[9].

The central components of the neoliberal food regime are as follows: the state, which promotes regulation that impose the neoliberal agenda; large transnational corporations that seek to patent life forms, advance transgenic technology and develop commercial seed markets; and biotechnology, the current driver behind the modern agriculture model (*ibid.*). Biotechnology has become the central technological form in agriculture since the neoliberal reformation of capitalism in the 1980s (*ibid.*). As Pechlaner and Otero (2010) have asserted, the neoliberal food regime and biotechnology do not go uncontested by civil society actors: the neoliberal food regime is a political project that elicits tremendous struggles in particular national projects.

Following McMichael (2005) and Otero (2012), I argue that the neoliberal food regime currently exists in India and other parts of the world. TNCs are the chief actors in the neoliberal food

[9] As Otero (2012) argues, even though the *Via Campesina* is the most important grassroots transnational organization, the struggles of the constituent organizations of *Via Campesina* are firmly rooted at the national level (Desmarais 2007, 2008). Further, the national state and its involvement in local-level legislation and international regulations (promoted and enacted by suprastate organizations) are the objects of the struggle of the constituent organizations of the *Via Campesina.*

regime, and biotechnologies are the chief technological form in this particular food regime. However, state actors can play a very important role in contesting the power of TNCs[10]. In its interactions with biotech-promoting TNCs and the Indian civil society (which it has played a role in nurturing), has the Indian democratic developmental state succeeded or failed in creating a genuine genetic democracy? But before we answer that question, it is useful to discuss the schisms in the food/seed sovereignty[11] movement over transgenic crops.

The advocates of the 'food sovereignty' model appear to be divided on the issue of whether transgenic crops should be developed by the public sector or private sector, adopted by farmers and eaten by consumers. For some advocates of food sovereignty and seed sovereignty (e.g. the Indian anti-globalization activist and ecofeminist Vandana Shiva), transgenic crops represent a great unknown: they are unsafe for human and animal health, they are unsafe for the environment, and they will only further consolidate the hold of transnational corporations over all classes of the peasantry in developing countries (Shiva 2013).

Unlike Vandana Shiva who is against both TNCs and biotechnology, the geneticist and activist Suman Sahai has argued against Monsanto's role in India but not against biotechnology as such. Sahai (2002) has pointed out that Monsanto and biotechnology are being equated and that is wrong—biotechnology has the potential to provide more and better food. However, technologies must be relevant to the needs of small farmers and should be introduced only after educating them. India, which has significant technical skills in the field of agriculture, must develop self-reliance in technology. There is no reason for the Indian establishment to function as the purveyors of TNC technologies especially with their incumbent baggage of patents (*ibid.*).

In the following three sections, I discuss three cases of state failure with reference to transgenic crops: first, the introduction of Bt cotton through unauthorized seeds resulted in a regulatory nightmare for the Indian state; second, the failure of the Indian public sector to commercialize Bt cotton successfully undermined the developmental efforts of the Indian state; and third, the attempts to introduce Bt brinjal through a public-private partnership have led to a peculiar situation where the Genetic Engineering Approval Committee (GEAC), which is the apex governmental body for clearance of transgenic crops, recommended the commercialization of Bt brinjal in 2009, but later, bowing down to civil society pressure, the Indian state backed out and imposed an indefinite moratorium on Bt brinjal in February 2010. These three major cases of state failure have undermined trust in biotechnology among Indian citizens and contributed

[10] For example, even a relatively small state like Guatemala can keep TNCs and their transgenic technologies at bay if they face sufficient pressure from organized social movements (Klepek, 2012).

[11] 'Seed sovereignty' is an integral part of the 'food sovereignty' paradigm and movement because food items are either seeds or owe their existence to seeds. Hence a community or country's ownership of and control over seeds is of central importance to whether it can achieve food sovereignty or not.

to creating an impasse over the development and commercialization of transgenic crops in India.

Introduction of Bt Cotton in India: Unauthorized Seeds and Regulatory Nightmare

Some insights into the importance of cotton for India may be useful before we discuss the case of the introduction of transgenic cotton in India. Cotton is widely regarded as the king of textile fibers or the leading plant fiber crop in the world and it may be considered as the most influential plant on earth. Indian agriculturists have cultivated cotton landraces since thousands of years and Indian weavers have produced textiles since millennia. The Indus Valley Civilization is the earliest to have spun and woven cotton. The development of the world cotton industry began with the appreciation for the muslin and calico fabrics produced by the Hindu people (May & Lege, 1999). India was the center of the world cotton industry from the inception of organized cloth manufacture ca. 1500 B.C. until development of the cotton industry in the Western Hemisphere (United States Department of Agriculture [USDA], 1941). As I have noted elsewhere, foreign states (and later, corporations) have been a factor in the growth and spread of the cotton culture in India—both in ancient times and modern (Roy, 2006). Alexander the Great invaded India in 326 B.C. and opened the trade routes from India to Europe, including trade in cotton textiles. In 1497, Vasco da Gama opened the sea route to India (around the tip of Africa) from Europe. The subsequent establishment of Portuguese colonies in different parts of India marked the beginning of European colonialism in India and facilitated the development of a maritime industry in cotton, where cotton was exported from India to Europe. Finally, the British East India company was established in 1624, and from a trading company, it became instrumental in establishing British colonial rule over large parts of India.

During the Industrial Revolution phase, Britain became the factory of the world, and cotton grown in India and the United States was chiefly exported to Britain. There was a world cotton shortage caused by the American Civil War, and the British turned their attention to their colony, India. Indian cotton lint was exported to the British factories, and the British colonial officials made efforts to improve cotton production in India. The East India Company made efforts to introduce American cottons in India towards the end of the eighteenth century and with that begins the attempt at scientific agricultural research and experimentation in crop breeding (May & Lege, 1999). Serious efforts toward cotton breeding were started with the setting up of Departments of Agriculture in the Provinces and States in the early twentieth century. The wide range of soil and climatic conditions in the country, as also in its various cotton regions, calls for breeding of a large number of varieties suitable to different agro-typical zones as well as complicates the maintenance of the purity of the varieties. In India, records suggest that organized cotton breeding did not begin until the early 1900s (*ibid.*). Till then, Indians had mostly grown two kinds of cotton: *Gossypium arboreum* and *Gossypium*

herbaceum. To improve the fiber quality of Indian cotton, *G. barbadense* was introduced during the British colonial era.

By1833, tariffs against Indian cloth were protecting Lancashire industrialists, who sent cloth virtually free of tariff to British India, driving countless Indian weavers into destitution (Ludden, 2005). By the 1840s, the British Parliament was directly engaged with the national business interest in empire. For instance, a commission considered ways and means to increase cotton supplies to Lancashire, so as to reduce England's dependence on the American South. Bombay Presidency (then consisting of Gujarat and Maharashtra) attracted special attention, along with Egypt. Resulting efforts to boost cotton exports from India and Egypt accomplished their goal, and when the US Civil War broke out in 1860, Egypt and the Bombay Presidency could fill the void in cotton supplies created by the Union blockade of Confederate ports (*ibid.*).

A development regime emerged in South Asia by 1880, and it fed the first, unprecedented burst of globalization that spanned the following five decades (*ibid.*). By 1880, four basic modern development ideas were well established. First was the idea that the state would lead in the development process in the public interest. Second, major state investments in infrastructure (such as irrigation infrastructure) would boost private investment, expand and integrate markets, accelerate economic growth, enrich the state, and benefit the public at large. Third, economic progress would benefit 'the poor,' who for example were to be protected from famine by large irrigation works. Fourth, advances in science and technology would be instruments of human progress in all nations, led by imperial regimes.

In the 1920s, a national development regime emerged inside British India (*ibid.*). In 1920, the Indian government obtained financial autonomy from Britain. Nationalist forces focused their critique of government sharply on economic issues. The national development regime had its precursor in the *Swadeshi* Movement of 1905, which was a successful economic strategy to remove the British Empire from power and improve economic conditions in India through following principles of *Swadeshi* ('indigeneity'). Strategies of the Swadeshi Movement involved boycotting British products and the revival of domestic-made products and production techniques. *Swadeshi*, as a strategy, was a key focus of Mahatma Gandhi, who described it as the soul of *Swaraj* ('self-rule').

The second phase of India's globalization began in 1991, when the Indian economy was liberalized. It is interesting to note that the four basic modern development ideas that Ludden (2012) identified as emblematic of the first phase of globalization are still in vogue today, even though colonialism is formally a matter of the past. For example, advances in science and technology continue to be viewed as instruments of human progress in all nations. Second, it is widely accepted today that the state has an important role to play in directing the development

of developing countries (this is despite the prevalence of the neoliberal paradigm). The nature of state intervention, however, would change from country to country, depending on the specific constraints and needs of the economy.

In contemporary times, Indian farmers sow three types of cotton seeds: varieties, hybrids, and transgenic seeds. In what is considered a major technological feat, the world's first hybrid cotton seeds were created by Indian public-sector scientists in Gujarat (India) in the early 1970s. Gujarati agriculturists are thus used to growing traditional and modern seeds of cotton since long; the same cultivator often grows both traditional varieties and modern hybrids seeds to suit her or his specific needs.

Now, let us turn to the discussion of how Bt cotton was introduced in India[12]. The first move to introduce Bt cotton dates back to 1990, the year during which Monsanto initiated talks with the Government of India for transferring the Bt gene (Ramanna, 2006). Monsanto's offer was refused in 1993, because according to the Indian government, the technology transfer fees demanded by Monsanto were too high. In response, Monsanto began a process of alliance building with domestic actors. In 1995, the Government of India granted permission for a domestic seed company, MAHYCO (Maharashtra Hybrid Seed Company), to import Bt cotton seeds from Monsanto. Imported Bt seeds were used by MAHYCO for backcrossing into Indian cultivars. In 1996-98, MAHYCO was granted permission by the Indian government to conduct field trials on these Bt cotton hybrids. In 1998, Monsanto acquired a 26% share of MAHYCO. In 2002, a joint venture MAHYCO Monsanto Biotech Limited (MMB) was set up. A long period of testing the Bt technology took place following the approval of MAHYCO to import Bt cotton seeds. Despite elaborate tests, MMB was refused permission by the central government to commercialize Bt cotton in June 2001 and was asked to conduct further tests. Thus, in mid-2001, it was not at all clear as to how long it would take before the Indian government approved the commercialization of Bt cotton. However, all this was to change due to an unforeseen event in the fall of 2001: the discovery of unauthorized Bt cotton growing on hundreds of acres in India.

In fall 2001, there was a severe bollworm pest attack in Gujarat (a state in western India) which devastated all cotton varieties, except for one, which was known as Navbharat 151 (NB 151). Subsequently, it was discovered that NB 151 was an unlicensed Bt cotton hybrid carrying the *cry1Ac* gene[13]. NB 151 was found growing on several hundred acres in Gujarat. Although the NB

[12] At this juncture, it is important to note that the Indian government was one of the first developing countries to formally invest in biotechnology research and development. The central government of India established the Department of Biotechnology (under the Ministry of Science and Technology) in 1986, a first among developing countries.

[13] Monsanto has no patent rights in India over the MON531 event which contains the *cry1Ac* gene (Koshy, 2012).

151 seed contained the same Bt toxin gene as the MMB Bt cotton, it was crossed with a different parent. Agriculture is a state subject (whereas biotechnology is decided at the center); hence the central government's GEAC ordered the state government to burn the illegal plantations. The Gujarat government questioned this policy. Considering that some cotton had already been marketed, the GEAC changed its order and asked for recovery of the unpicked cotton to the extent possible and the destruction of the crop residue (Herring, 2005).

In March-April 2002, the Indian government approved the commercial release of MMB Bt cotton. According to Ramanna (2006), the reasons for the decision moving from *de facto* to *de jure* acceptance of transgenic crops must be understood in terms of a powerful story line of 'transgenic crops as agriculturists' choice,' which emerged following the events in Gujarat and which posed a challenge to the discourse of the anti-biotech NGOs. The anti-biotech NGOs had been more powerful than the pro-biotech groups in the years before fall 2001, but now the tables were turned on them.

News of agriculturists growing Bt cotton in Gujarat and other states prior to the central government's approval led to shift in the way transgenic crops were portrayed in the media and policymaking circles. The rationale was then put forward that if agriculturists want the technology, what right does the central government have to deny them transgenic crops? The anti-biotech NGOs could not rebut this powerful logic. If the anti-biotech NGOs opposed Bt cotton, it made them appear to be indifferent to the real interest of the agriculturists they were supposed to represent. The pro-biotech lobby presented Indian cultivators as decision makers and voters for transgenic technology, which trumped the portrayal of Indian agriculturists as hapless victims of globalization (a picture which had been put forth by the anti-biotech lobby, and which had garnered widespread attention in the late 1990s because of the phenomenon of agriculturists' suicides). The pro-biotech lobby's strategy following the Gujarat incident was not to stress the intellectual property rights violation, but rather to emphasize the issue of agriculturist's choice (*ibid.*). Pro-biotech cultivators' groups demanded the approval of Bt cotton. The discourse on agriculturist's choice essentially blurred the distinction between NB 151 and MMB Bt cotton, when it came to the Bt hybrid's success[11]. Note that the cultivation of NB 151 continues to be illegal in India. Hundreds of Gujarati cultivators have created what might be the largest participatory plant breeding experiment in human history as they have crossed the parent line of NB 151 that contained the transgene with different local cultivars to create many new Bt cotton hybrids. These new underground Bt cotton hybrids—called 'loose seeds' in local parlance (Roy *et al,* 2007)—have led to a situation lauded as vigorous rural anarcho-capitalism while others have decried the regulatory failure of the state when it comes to Bt cotton hybrids.

Navbharat 151 and the other illegal variants that it spawned continued to be popular with Gujarat cultivators (as well as agriculturists in other states, but to a lesser degree) for years[14]. In 2012, it was estimated that illegal seeds accounted for 25-30% of Gujarat's Bt seed market (Bhattacharya, 2012) and a lesser percentage of the seed market of many other states (industry sources). So far, the government of India and the various state governments have not able to control this regulatory failure[15]. If the government of India and various state governments are not yet able to regulate the first transgenic cottons (a non-food crop) introduced in India, then it raises serious questions about its ability to regulate transgenic *food* crops in the country.

India's Search for Seed Sovereignty and the *Desi* Bt Cotton Fiasco

The intentions of the Indian public sector scientists were noble—they wanted to develop and commercialize public sector Bt cotton seeds that would be less expensive and savable (reusable). The Indian public sector released a public sector Bt cotton in May 2009, but something went very wrong along the way and the sale of that public sector Bt cotton seeds was cancelled in December 2009. What had happened was unclear for over three years to the general public as the story of the public sector Bt cotton in India was shrouded in secrecy. Details have started emerging only last year.

Private-sector Bt cotton hybrids have been sold in India since 2002, and the popularity of these hybrids has grown by leaps and bounds over the years. Bt cotton accounted for 93% of cotton grown in India in 2012. Writing in the prestigious journal *Nature*, Jayaraman (2012) states that the vast majority (97%) of the Bt cotton in India is sold or licensed by Monsanto. There are at least two problems with Monsanto's seeds. First, they are expensive for Indian farmers. Further, like other hybrids, Monsanto's seeds lose vigor after one generation, and farmers have to buy new stocks every year. Recognizing these problems, the apex body of the Indian public sector institutions, the Indian Council of Agricultural Research (ICAR), wanted to develop a cheaper Bt cotton variety with seeds that could be reused.

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[14] See Roy (2006) and Roy *et al* (2007) for a discussion of how Navbharat 151 and other illegal Bt cotton hybrids performed better than Mahyco-Monsanto Bt hybrids for many agriculturists in Gujarat during the early years of adoption, 2002-2004. The agronomic reason for the better performance of Illegal Bt cotton hybrids could be that the recipient parental lines (with which the Bt gene containing parent was crossed) were better suited to the micro-environments of the agriculturists' fields in case of the illegal Bt cotton hybrids.

[15] One problem with the lack of regulation is that cultivators are supposed to plant Bt refuges of isogenic lines alongside the Bt crop. If Bt refuges are not planted, this will hasten the development of pest resistance to Bt crops. There is no regulation of whether cultivators are actually planting refuges or not. Another problem with the lack of regulation is that it undermines both cultivators' and non-cultivators' trust in the government and its regulatory bodies. The Gujarat government attempted to punish cultivators who were breeding illegal Bt hybrids and criminalized their actions (Roy, 2006), further depleting their trust in the government. Third, lack of regulation erodes trust that citizens have in each other and diminishes their capacity for concerted action. A democracy, which is built on the agency of individual actors as well as that of associations, cannot function well in the absence of citizens' trust in the government and trust in each other.

In 2000, ICAR's National Research Centre on Plant Biotechnology (NRCPB) in New Delhi provided the University of Agricultural Sciences (UAS) at Dharwad in Karnataka with the 'indigenous' *cry1Ac* gene construct to begin work on its own transgenic cotton. B.M. Khadi of the UAS coordinated the project, and the Central Institute for Cotton Research (CICR) in Nagpur (Maharashtra) was given the task of testing and commercializing the product (*ibid.*).

In 2001, the project's principal investigator, Ishwarappa Katageri of the UAS, announced the successful transformation of the native Bikaneri Narma (BN) variety into a transgenic cotton carrying the *cry1Ac* gene construct (*ibid.*). Khadi became director of the CICR in May 2005, taking with him the Bikaneri Narma Bt (BN Bt) seeds for biosafety studies in preparation for commercial release by the CICR. The GEAC, the apex body which clears transgenic crops, had approved of BN Bt on May 2, 2008. The CICR was ready with 20,000 packets of what was known as the *desi* (indigenous) Bt cotton seeds for distribution to farmers starting in May 2009 (Deshpande, 2009).

BN Bt was a variety and not a hybrid. Till May 2009, Bt cotton hybrids were the only option available to Indian farmers. Unlike a hybrid, a variety enables farmers to replicate seeds for the next sowing. It was reported that BN Bt seeds would be available for Rs 200 per 2 kg bag as against Rs 750 per 450 grams bag of hybrids currently sold by national and multinational companies (*ibid.*). Apart from the significantly lower costs of BN Bt seed, since a variety needs very little fertilizer and pesticide, it was announced that the farmer can save nearly Rs 4,000 per acre in the first year (Rs 1,000 on seeds, Rs 2,000 on pesticides and Rs 1,000 on fertilizers) and about Rs 4,500 per acre every subsequent year since he or she won't have to buy seeds. One seed of the BN Bt can produce up to 200-300 seeds. Farmers hailed the arrival of BN Bt seeds as the technological means to win back seed sovereignty (Hardikar, 2012).

Meanwhile, Keshav Kranthi had become the CICR director, replacing Khadi. CICR Director Kranthi told a reporter in 2009: "This year we are giving it only to Maharashtra, Andhra Pradesh, Madhya Pradesh and Gujarat since Bikaneri Narma is beneficial in drought-tolerant, non-irrigated areas and is also resistant to sucking pests like jassids and aphids… The CICR will supply the bags to state seed companies which will then distribute them to the farmers" (Deshpande, 2009).

In the summer of 2009 and subsequently in January 2010, I interviewed many of those farmers in central Gujarat who had received BN Bt seeds from the state seed company or from their fellow farmers. My interviewees generally reported that BN Bt had performed well in their fields [*see* Roy (2013)], which contradicts other reports (e.g. Jayaraman 2012) that BN Bt was a failure in farmers' fields.

The problem of whether BN Bt was a success or failure in farmers' fields paled in significance when it was realized in 2009 that the much-hyped *desi* technology had turned out to be a misnomer. Shrivastav (2012) reported that the BN Bt variety developed by UAS has been found to contain Monsanto's gene construct MON 531 gene instead of the 'new event' BNLA106 truncated *cry1Ac* gene supplied by Ananda Kumar, director of NRCPB, to UAS.

"We have launched the probe because our tests have shown that the so-called indigenous Bt cotton actually contains Monsanto's gene and the researchers have no explanation how it got there," S. K. Datta, ICAR's deputy director-general, told *Nature* (Jayaraman, 2012). He would not comment on whether he thought it was a case of deliberate scientific fraud, or accidental contamination.

Sahai (2012) commented that Indian public sector scientists at the UAS (Dharwad) and the CICR had simply backcrossed Bikaneri Narma with a Monsanto hybrid and claimed the results to be their novel indigenous variety. She claimed that scientists associated with the regulatory system were aware some time ago of the fraud that had been perpetrated but did not act on it. It was the ICAR that finally acted by withdrawing the so-called 'indigenous' variety and stopping its commercial sale.

C. Kameswara Rao, executive secretary of the civil society organization Foundation for Biotechnology Awareness and Education in Bangalore (Karnataka), told *Nature* that the situation is "a huge embarrassment for ICAR and a blow to the credibility of India's public-sector cotton research" (Jayaraman, 2012). Agriculture scientist and activist G.V. Ramanjaneyulu worried about the future of straight varieties in view of the overwhelming presence of transgenic cotton. He told a reporter: "But CICR should answer the question about contamination of Bt Bikaneri Narma and the way they withdrew it. If Bikaneri Narma was contaminated, any other variety could also be contaminated. What is the use of promoting traditional cottons? These will also get contaminated" (Jishnu, 2012).

ICAR director-general S. Ayyappan took office about three weeks after a meeting of the ICAR top brass decided on December 10, 2009, to suspend production and sale of BN Bt. But his decision to set up a five-member panel (headed by S.K. Sopory, vice-chancellor of Jawaharlal Nehru University in Delhi and a plant molecular biologist of international repute) to investigate the matter came only after unseemly details about the cotton project were made public in December 2011 after scientists Mansoor and Surendra filed Right to Information (RTI) petitions (Deshpande and Tiwari, 2011; Jishnu, 2012).

The BN Bt cotton fiasco did not cause any huge financial loss to the farmers apart from dashing their hopes for cheaper and renewable seeds, but it's a huge embarrassment for the ICAR and a

blow to the credibility of India's public-sector cotton research (Hardikar, 2012). Besides, the BN Bt project, on which the ICAR had spent Rs 20 million, had pushed all other public-sector research on cotton to the backburner.

In a severe indictment of the way some Bt cotton varieties were developed and commercialized in the country, the Sopory Committee found that the BN Bt cotton variety was contaminated by a gene patented by Monsanto (Venkateshwarlu, 2012). Having found lapses in the BNLA106 event, the committee has held as 'invalid' the data obtained from biosafety studies and field trials with BN Bt as these were conducted with material that contained Monsanto's MON531 event. The committee's finding raises disconcerting questions over the claims made by developers, the role of regulatory body, the public sector research institutions and their ethical standards. "The purified BN Bt, as far as its bio-safety and evaluation studies are concerned, is a new event that must now go through the regulatory process as a fresh application, if ICAR intends to commercialize it," the committee observed (*ibid.*). The panel felt the project was 'poorly planned' and implemented with inappropriate distribution of work elements. It listed several institutional and ethical failings, lapses on regulatory front and found conflict of interest with developers sitting in the GEAC meeting as regulators and approving their own product (*ibid.*).

Reacting to the report, the civil society organization Coalition for a GM-Free India, congratulated the Sopory Committee for its thorough investigation and exposing "one of the worst cases of scientific fraud within the ICAR institutions" (*ibid.*). The Coalition expressed dismay at the way the ICAR was "shielding the errant officials" by delaying the report. The report was submitted to the Union Ministry of Agriculture in August 2012 but was made public only in December 2012. The Coalition for a GM-Free India felt that "apparently the establishment waited for the retirement of a senior official while another senior technocrat was protected as he does not figure in the enquiry or the report, though he was the coordinator of this project" (*ibid.*).

According to activist Kavitha Kuruganti (2013), the Sopory Committee Report also points to serious shortcomings with transgenics' regulation in the country. It reinforces the observations of the Technical Expert Committee (TEC) set up by the Supreme Court in a public interest litigation (PIL) related to GMOs. The TEC has pointed out flaws with regard to examination of biosafety data by our regulators, for instance. The fact that this Monsanto event-contaminated-*desi* Bt cotton passed through regulatory evaluation even without a presentation to the apex regulatory body is an illustration. TEC pointed out the need for removing conflicts of interest. The Sopory Committee Report shows that crop developers in the case of Bikaneri Bt cotton were sitting in the regulatory body approving their own products. The committee says that

information about contamination appeared to be known to scientists involved but was not revealed in the regulatory process (*ibid.*).

For Kuruganti (2013), the Sopory Committee Report is an indictment of how public sector transgenic research in this case has happened (claiming capabilities that do not exist for such research for instance, posing ethical and accountability questions given that precious taxpayers' funds are being spent), and also of general research standards and quality in the country (how proposals are written, how even normal breeding guidelines are not followed, how project management takes place, etc.). She commented that the National Agricultural Research System (NARS) has itself to blame if the citizens today are demanding accountability and rigor. If they do not set the house right now, the public sector scientists would be writing their own epitaph through reports like the Sopory Committee's (*ibid.*).

For the veteran journalist Latha Jishnu (2013), three years after the country's first attempt to commercialize a GM crop ended disastrously, there is no satisfactory conclusion to the tale of scientific deception, regulatory carelessness and official indifference that has characterized the development of BN Bt cotton. The Sopory Committee, which was tasked with finding out if the public research institutions involved in developing the *desi* cotton did, indeed, do so or whether it was just the MON531 event of Monsanto with which it was claimed to have been 'contaminated,' has stitched together a detailed report that exposes the many flaws and omissions in this prestigious project of the ICAR. While the regulatory oversight is not mentioned in the inquiry conducted by Sopory and his team, it does highlight the weaknesses in the ICAR system. In its rush to develop an indigenous variety of Bt cotton, the institutions and scientists that were involved in the project appear to have thrown due processes and ethics out of the window (*ibid.*).

Was the BNLA106 a truly independent event? Ananda Kumar, principal scientist of NRCPB who later became its director, played a central role in developing the *desi* GM cotton. NRCPB provided the gene construct for genetic transformation, conducted gene integration studies apart from the technical and financial support to UAS (Dharwad) for genetic transformation of the material into the indigenous cotton variety (*ibid.*). The Delhi-based institution also provided details of the gene construct and molecular analysis to the central governmental bodies Review Committee on Genetic Manipulation (RCGM) and GEAC for approval. It is here the committee found the most unethical aspect of the project (*ibid.*). The *cry1Ac* gene used in BN Bt was developed by Illimar Altosaar of the University of Ottawa in Canada, who is an expert on plant biology and GMOs. This *cry1Ac* gene was obtained by R P Sharma, former director of NRCPB, by signing a material transfer agreement (MTA) with the University of Ottawa. In 2006, Ananda Kumar tried to negotiate a freedom to operate agreement with Altosaar but did not meet with success. Hence, the ICAR decided at a meeting in October 2006 that Sharma had signed the

MTA in his 'personal capacity,' and a freedom to operate agreement was not necessary. Using this spurious logic, it was decided to call the gene a 'NRCPB construct' (*ibid.*).

The concern here is whether the regulatory authorities are at all aware of this since the information has been kept hidden for three-and-a-half years after the GEAC approved BN Bt. According to ICAR sources, NRCPB has provided the same disputed construct for the genetic transformation of a number of crops, including pigeonpea, chickpea, tomato, castor and groundnut. It is not known as to whether such research has been halted (*ibid*).

Bt Brinjal and the 2010 Indefinite Moratorium

India is not the center of origin of brinjal (also known as eggplant or aubergine; botanical name: *Solanum melongena*), but it is the center of diversity for brinjal: India has over 2,500 varieties of brinjal. Brinjal is widely consumed in India. When it comes to brinjal, Indian farmers cultivate both hybrids and open pollinated varieties (OPVs). Hybrids and varieties cover about 40% and 60% of the brinjal crop area, respectively.

The market segmentation between hybrids and varieties facilitated a public-private collaboration, beginning in 2003 (Herring and Shotkoski, 2011). MAHYCO shared its biotechnology (which it had developed in collaboration with Monsanto) with Indian public institutions for development of Bt brinjal. This collaboration was assisted by an international partnership: The Agricultural Biotechnology Support Group II (ABSPII). To create regionally appropriate cultivars of Bt brinjal, ABSPII worked with three public-sector partners in India. These public institutions developed locally popular varieties with the insect resistance (IR) trait donated by MAHYCO, while MAHYCO itself continued to concentrate on Bt hybrids, assuming that many farmers would eventually favor them for their yield advantage. In contrast to Bt cotton, more brinjal OPVs from the public sector than hybrids from the private sector were planned for release. This would give Indian farmers a choice between two types of IR cultivars: the lower-cost and save-able seeds of varieties, and the higher-yielding, more expensive hybrids seeds.

The Indian government's GEAC's Expert Committee concluded in October 2009 that the IR trait in brinjal, for both hybrid and OPVs, was effective in controlling target pests, safe to the environment, non-toxic as determined by toxicity and animal feeding tests, non-allergenic and had the potential to benefit farmers. However, the Minister of Environment and Forests Jairam Ramesh announced that he would not accept the GEAC recommendation for commercial release of Bt brinjal, but would instead open public consultations in a tour of seven Indian cities. After the public consultations, Minister Ramesh placed a moratorium in February 2010 on the commercialization of Bt brinjal for an indefinite period. Critiques from Indian and foreign scientists pressured the minister to reconsider his decision. In 2010, he asked six of India's

leading science academies to assess Bt brinjal. Their report confirmed the original conclusions of the GEAC, but the moratorium still holds[16].

If 2010 was the year that began the opening up of debates regarding Indian agriculture—largely due to Minister Ramesh's public consultations which led to the moratorium on the commercialization of Bt brinjal—then 2012 may go down as the year that marked the decisive return of the democratic developmental state in India, at least as far as the seeds sector is concerned. In August 2012, a 359-page Parliamentary Standing Committee (PSC) Report was issued. The PSC was chaired by Basudeb Acharia, a Member of Parliament representing the Communist Party of India (Marxist), and the PSC had members from other political parties. The PSC report was highly critical of the 2009 GEAC's decision to approve the commercialization of Bt brinjal. Regarding the problems with field trials of biotech crops, the PSC report stated that the committee was " [...] convinced that these developments are not merely slippages due to oversight or human error but indicative of collusion of a worst kind [...] field trials under any garb should be discontinued forthwith" (quoted in Rodrigues, 2013).

In October 2012, the Supreme Court of India-appointed Technical Expert Committee (TEC) issued a 24-page interim report which recommended a ten year moratorium on field trials of all Bt transgenics of food crops. The central government has raised objections to what it calls a 'scientifically flawed' report. However, about a hundred scientists, many of them well-known, have written an open letter to the Supreme Court asking it to comply with the TEC's recommendations. Other scientists have disagreed with this open letter. Thus, the Indian scientific community stood divided on the issue of the TEC's interim report.

According to the activist Aruna Rodrigues (2013), the Supreme Court-appointed TEC's Final Report, released in June-July 2013, is the fourth official report (the first was the 'Jairam Ramesh Report' of February 2010, which imposed an indefinite moratorium on Bt brinjal, overturning the apex regulatory body's approval to commercialize it; the Sopory Committee Report of August 2012 which had to do with BN Bt and which was available to the public only in December 2012; the Parliamentary Standing Committee or PSC Report of August 2012 which critiqued GEAC's decision to approve Bt brinjal commercialization) which exposes the lack of integrity, independence and scientific expertise in assessing the risk of GMOs. Further, the TEC's Final Report is the third official report barring transgenic crops or their field trials singularly or collectively. Rodrigues (2013) finds this consensus is remarkable, given the regulatory oversight and fraud that otherwise prevail in Indian agri-institutions. Further, she

[16] For a comparison of the factors that led to the successful introduction of Bt cotton in India and the stalled introduction of Bt brinjal (same technology, different crop) in the same country, see Roy (forthcoming). Bt brinjal is resistant to the Fruit and Shoot Borer (FSB), which is a major pest of brinjal.

comments that the pervasive conflict of interest embedded in those bodies makes sound and rigorous regulation of transgenic organisms all but impossible.

The TEC recommends that there should be an indefinite stoppage of all open field trials of transgenic crops, conditional on systemic corrections, including comprehensive and rigorous risk assessment protocols (*ibid.*). TEC's Final Report includes a specific focus on Bt food crops. It also calls for a ban on the environmental release of any GMO where India is the center of origin or diversity[17].

Ending the Biotech Impasse and Creating a Genetic Democracy

Let us consider some counter-factual arguments. First, it is possible to speculate that the Indian state would have further delayed the introduction of TNC transgenic crops (perhaps in order to buy time for public sector transgenic cotton) had Bt cotton not entered India unannounced, beneath the radar screen of the state. If Bt cotton had been legally introduced in India (whether it was a public sector variety or a private sector hybrid) instead of making its way into the country illegally, then it is highly unlikely that the state would have faced a regulatory nightmare, and it is highly unlikely that civil society would have lost trust in the government's ability to regulate Bt cotton. Second, if Bikaneri Narma Bt cotton had been constructed by public sector scientists with an independent event (instead of a purloined genetic event), then it would have not have to be withdrawn by ICAR. The success of even one public sector Bt cotton variety would have restored (at least partially) citizens' trust in the government's ability to regulate transgenic crops as well as its commitment to developmental activities. Third, India is the center of diversity for brinjal, and there is a risk that transgenic brinjal could lead to genetic contamination. Brinjal is a popular item of consumption among the rich and the poor classes of India. There is no scarcity of brinjal production in India and brinjal is quite inexpensive. If instead of Bt brinjal, some other transgenic food crop that would have really made a difference to the lives of the poor (and that was not going to lead to genetic contamination of farmers' varieties and wild varieties) had been chosen for introduction, then perhaps we would not have seen the backlash that has accompanied the attempts to introduce the vegetable transgenic crop Bt brinjal. Despite the immense popularity of private sector and illegal Bt cotton hybrids, the Indian state is hesitating to give the green signal to Bt brinjal, possibly because of the health, environmental and political-economic ramifications of Bt brinjal.

Many advocates of transgenic crops tend to adopt a 'There is No Alternative (TINA)' approach to industrial agriculture (with its large-scale monocultures and corporate-owned seeds) if we

[17] Note that the Mexican anti-transgenic maize network has received much international media coverage and transnational NGO involvement because it is the first case of 'genetic pollution' in a crop's center of origin (Fitting 2008, 2011).

are to feed the whole of India, but the reality is that India produces enough food currently to feed all citizens, and the major problem is inadequate distribution of food. The poor lack money to buy food from the market. Despite the existence of a public distribution system (PDS) to supply essential food items at subsidized prices to the poor, about 320 million Indians suffer from chronic hunger currently. Every third hungry person in this world is an Indian. In this context, it is debatable whether food transgenic crops (whether from corporate quarters or the public sector) can alone provide a magic bullet solution to the problems of endemic hunger and malnutrition.

If the goal of a community of farmers (well-informed about the various alternatives available to them and also democratically literate) is to achieve and maintain individual and community autonomy over seeds at any cost, then agro-ecological methods (with its small-scale farming, poly-cropping, and use of landraces or farmers' varieties) may be the correct solution for them (Roy, forthcoming). But in a democratic society, individual farmers and even farmers' groups may freely decide to purchase hybrid seeds and transgenic seeds from the market. In this case, the state, civil society organizations and corporations should make all efforts to educate them about the advantages and disadvantages of adopting hybrids and transgenic crops.

Farmers, either individuals or communities, should not be coerced (directly or indirectly) by those who have power over them into buying this kind of seed/technology or that. After all, the debate over transgenic crops is also a struggle over the nature of development models--authoritarian or democratic (*ibid.*) If the Indian state actors, civil society actors and business actors abide by the principles of democratic developmentalism, then the right of citizens to make informed choices in a democracy is paramount. This necessitates free and fair public debates in the media regarding the merits and demerits of different types of seed technologies, truthful advertising regarding the advantages of transgenic crops, and transparency in the government's regulation of transgenic crops.

So, what is to be done? To create a genetic democracy in India, the key step is to develop trust in biotechnology among the citizens. This will take a while, given the resistance of anti-GM activists and the three major cases of state failure that I have discussed in this paper (regulatory problems with illegal Bt cotton, Bikaneri Narma Bt cotton fiasco and the lack of agreement in civil society over Bt brinjal forcing the Indian government to impose an indefinite moratorium on the commercialization of Bt brinjal) and the resistance of anti-GM activists. Both the Indian state and the food/seed sovereignty movement have to co-operate with each other if the national goal is to develop trust in biotechnology among citizens and create a genetic democracy.

Though one cannot reject the roles of the market (as an efficient allocator of resources), of private enterprise (for competitive efficiency and incentives) and of efficient management of the macro-economy in promoting development, neither can one undermine the role of the state in directing the path of development in non-industrialized countries such as India. In order to develop trust in biotechnology among citizens, the Indian state should take at least three steps. First, the Indian government should commercialize at least one public sector transgenic cotton variety (containing a genuinely indigenous event). This will go a long way in regaining the trust of agriculturists and civil society actors in the Indian government's ability to be a developmental state. Second, the Indian government should end the regulatory nightmare of illegal Bt cotton hybrids. If inexpensive and savable (reusable) public sector transgenic varieties are made available to agriculturists, the acreage devoted to illegal Bt cotton hybrids will automatically decrease. Third, the Indian government and its public sector scientists should seek to develop and commercialize some second-generation transgenic crops that will be truly useful to the citizens, both agriculturists and consumers.

In order to develop trust in biotechnology among citizens, the food/seed sovereignty movement, on its part, should clearly distinguish between transnational corporations' transgenic crops and public sector transgenic crops. Second, since recombinant DNA technology potentially has the capacity to serve the interests of the poor, further sustainable agriculture and solidify social control over seed markets, the food/seed sovereignty movement should take carefully evaluate the merits and demerits of various types of public sector transgenic crops. Third, the food/seed sovereignty movement should join the struggle to restore the centrality of the public sector in agricultural research and development. The public sector should be encouraged to develop suitable transgenic crops for different agro-ecological zones of India, by seeking the co-operation of farmer-breeders. Fourth, the food/seed sovereignty movement should strive to help the public sector open up the transgenic technology development process to more democratic participation by multiple stakeholders including agriculturists.

It is important for all stakeholders to realize that biotechnology is a science which has not yet reached maturity. Open source biology coupled with public sector research and development may yield useful second- or third-generation transgenic crops. Democratization of the research and development process of transgenic crops is necessary in order to reap the fruits of biotechnology. This may require the deliberate slowing down of the entire process of development and commercialization of transgenic crops, especially in a large democratic country like India where millions of stakeholders are likely to take part in decision-making processes[18]. While it is not a silver bullet, biotechnology can help in solving the problems of

[18] Here, it is useful to note what Sateesh Kumar, managing director of Prabhat Agri Biotech Seeds in Hyderabad, (one of the first companies to find that the BN Bt seeds it sourced from CICR were the same as the Monsanto Bt

endemic hunger and malnutrition in a country such as India where millions are still food-insecure. Since India is arguably the developing world's most influential site for both public and policy debates on transgenic crops, if the Indian state and the food/seed sovereignty movement were to pay attention to the suggestions that I have outlined in this paper, this would have beneficial effects for creating genetic democracies in other countries as well.

cotton seeds) had to say about the *desi* Bt fiasco: "Too much pressure on the public sector to deliver quickly is one reason why such things happen" (quoted in Jayaraman, 2012).

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Food Sovereignty: A Critical Dialogue

INTERNATIONAL CONFERENCE
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FOOD SOVEREIGNTY: A CRITICAL DIALOGUE INTERNATIONAL CONFERENCE PAPER SERIES

A fundamentally contested concept, food sovereignty has — as a political project and campaign, an alternative, a social movement, and an analytical framework — barged into global agrarian discourse over the last two decades. Since then, it has inspired and mobilized diverse publics: workers, scholars and public intellectuals, farmers and peasant movements, NGOs and human rights activists in the North and global South. The term has become a challenging subject for social science research, and has been interpreted and reinterpreted in a variety of ways by various groups and individuals. Indeed, it is a concept that is broadly defined as the right of peoples to democratically control or determine the shape of their food system, and to produce sufficient and healthy food in culturally appropriate and ecologically sustainable ways in and near their territory. As such it spans issues such as food politics, agroecology, land reform, biofuels, genetically modified organisms (GMOs), urban gardening, the patenting of life forms, labor migration, the feeding of volatile cities, ecological sustainability, and subsistence rights.

Sponsored by the Program in Agrarian Studies at Yale University and the Journal of Peasant Studies, and co-organized by Food First, Initiatives in Critical Agrarian Studies (ICAS) and the International Institute of Social Studies (ISS) in The Hague, as well as the Amsterdam-based Transnational Institute (TNI), the conference "Food Sovereignty: A Critical Dialogue" will be held at Yale University on September 14–15, 2013. The event will bring together leading scholars and political activists who are advocates of and sympathetic to the idea of food sovereignty, as well as those who are skeptical to the concept of food sovereignty to foster a critical and productive dialogue on the issue. The purpose of the meeting is to examine what food sovereignty might mean, how it might be variously construed, and what policies (e.g. of land use, commodity policy, and food subsidies) it implies. Moreover, such a dialogue aims at exploring whether the subject of food sovereignty has an "intellectual future" in critical agrarian studies and, if so, on what terms.

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