

Promethean Science, Pandora's Jug: Conflicts Around Generically Engineered Organisms in India

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Golden Rice and Flounder Genes: The Genetic Engineering Debate

In all the heated debates surrounding genetic engineering and its products -- genetically modified organisms, or GMOs -- I have not once heard reference to insulin. Insulin is produced by a GMO; the now by-passed alternative was the pancreas of pigs, carrying hardly salubrious connotations in several world cultures. No one objects to insulin; it saves lives. Life-saving is likewise deployed globally by multinational firms with profit interests in agricultural biotechnology. Life-saving is specifically organized around miracle seeds and the poor; the poster plant of the biological revolution is "golden rice." Seeds are nutritive as well as generative; the so-called "golden rice" seeds are capable of growing plants that produce beta carotene (the precursor to Vitamin A) in the grains, something that traditional rices cannot do. Millions of lives are lost in Asia each year from Vitamin A deficiency; an estimated 500,000 children go blind. The poster plant of opposition to genetic engineering, the negation of golden rice, is frost-resistant strawberries, containing the gene of a flounder. Plants with fish genes are marshaled as evidence of the hubris of humans playing god -- initiating a presumably unnatural crossing of not only species, but kingdoms. Hyperboles of threat and promise dominate a public debate counterposing the dangerously unnatural ("Frankenfoods") and the solution to world hunger.³

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³ The voluminous literature will be selectively referenced throughout. For an introduction to the dichotomous views on the subject, see McHughen 2000; Swaminathan, 2001; Dawkins 1997; Shiva 2000; Charles 2001.

The global division of positions on these issues does not follow familiar North-South tectonics. Broadly, one can distinguish an American view that has been more supportive of GMOs and a European view that has been skeptical or oppositional. India has been poised between these alternative broad views of the threats and promises of GMOs. What follows will analyze political dynamics that have moved India much closer to the American optimism regarding GMOs than the European caution. I will argue that the nature of the natural constitutes only one of the breaking points in this debate, yet it is the most novel and intractable politically. Much of the overt contest in India has really been about property as a subset of the globalization dispute. These issues are demonstrably subject to conciliation, bargaining and compromise -- familiar terrain for the political economy of interests. Disputes about the nature of the natural take on a different politics, dependent on an esoteric expertise that is asymmetrically distributed both locally -- on the ground within movements -- and globally. These latter questions create a new politics less susceptible of ordinary political solutions, but it is an inescapable politics that the genomics revolution has thrust upon us.

New seeds produced by genetic engineering launched India's entry into the global opposition to GMOs. On the ground, protests were held, test trial crops were burned, courts were moved. The oppositional discourse in India was constructed in terms of threats: threats to national independence, in the form of dominance of agriculture by multinational corporations; threats to farmers, in the form of bondage to monopoly seed corporations; threats to nature, in the form of biological pollution [gene flow]. Threats to human health -- in the form of undiscovered allergens -- figured only secondarily, in contrast to the European opposition, perhaps underlining the reality of some Maslovian hierarchy of needs in a poor country. The recuperative opposites are posed in terms of universal valents: biodiversity over biological reductionism; *swadeshi* [self-reliance] in place of subordination to foreign market forces; safety over uncertainty and risk. Opposition to GMOs in India then centered seeds in their multiplex cultural, economic and ecological moorings and meanings. Vandana Shiva, easily the dominant voice in opposition to GMOs in India, explicitly compared the seed to the spinning wheel of the Independence movement: "The seed has become for us the site and symbol of freedom in the age of manipulation and monopoly ... In the seed, cultural diversity converges with biological diversity. Ecological issues combine with social justice, peace and democracy" (Shiva 1999: 67). Seeds are constructed as carriers of the many virtues of a disappearing peasant society. Seeds so understood are embedded in larger cultural notions and practices of cyclicity

and renewal (Gold 2001).

Direct action against GMO seeds began in 1998 under the banner of resistance to a biocultural abomination: “suicide seeds.” The multinational giant Monsanto, it was said, planned to unleash its “terminator technology” on India. The terminator technology permitted engineering of seeds to produce plants that could not reproduce, forcing farmers to return each season to buy new seeds. The venerable cycle of agriculture would be replaced by dependency and cash nexus. That Monsanto was very large, and American, and possessed property rights for the process of engineering sterile seeds then provided a double symbolic opening. A brilliant verbal jujitsu opposed “seeds of death” to cycles of renewal that signify the essence of seeds. Simultaneously, a rash of suicides by debt-ridden farmers was linked to the “suicide seeds.” This powerful dramaturgy, staged in the name of farmers collectively, ultimately failed to stop the spread of GMO seeds; its political construction of transgenic seeds diverged too fundamentally from the interests of farmers to be sustainable. Whether the short-term interests of farmers are congruent with a public interest in biotechnology remains unresolved.

The Genomics Revolution, Development and the Poor

The genomics revolution is important not only for the profound ethical questions it raises, and its contentious politics, but also for its developmental challenge. Biotechnology is a sector in which low-income countries could conceivably have great comparative advantage. The biodiversity is there, not in the richer countries. Activity in this sector is relatively clean by industrial standards, and labor intensive, the precise opposite the disastrous path of the currently rich polluters of common sinks and resources with capital intensive technologies. Development of biotechnology as a sector potentially valorizes, perhaps remunerates, local knowledge, which is everywhere in danger of extinction [Gupta, 1998; Weiss and Eisner 1998]. Moreover, the use of genomics in probes for and classifications of biodiversity enormously enhances the precision of conservation policy, perhaps to the benefit of current human victims of blind preservationism that sets aside whole landscapes for lack of better information. More instrumentally, proponents of developing biotechnology consistently claim the poor as their constituents. If development means at core reduction of poverty and malnutrition, a strong claim can theoretically be made for biotechnology.

Winning strategies of social mobilization in India do well to speak for the

poor, or at least for the farmer; there is both real and constructed overlap between the categories. Development of a bioengineering sector that would benefit the poor in India assumes that three preconditions are met. First, serious concerns of safety and risk must be settled, implying the creation of international capacity, disaggregated to regional and national levels, to implement the Biosafety Protocol of the Convention on Biological Diversity (CBD). So doing will in turn require human capital with grounded expertise in the social, agricultural, ecological and cultural systems of specific regions. This allocation expensive and there are real opportunity costs. For this safety regime to be effective, there will have to be a double revolution in the legitimacy of science and government in public perception: neither is much trusted in the subcontinent.⁴

Second, there will need to be fundamental reformulations of the property regime. Indeed, in many ways a property regime will have to be created from the ground up. Intellectual property rights intervene between technology and use to determine the distributive and social consequences of technical change. Getting the property system wrong will lower the probability of biotechnology being justifiable in developmental terms – i.e., improving the life chances of the poor.⁵

New technologies enable not only business ventures but also property claims unimaginable a generation ago, raising profound questions of valuation in both the economic and ethical sense.⁶ At present, there is a three-cornered contest for what the international property regime will become. The contesting models are: fee-simple ownership, national ownership as envisioned under the Convention on

⁴ There is no data comparable to the Eurobarometer, but the comparative experience of the United States and Britain demonstrate that such attitudes coincide with the marked difference on acceptance of GMOs as food. Americans consume vast quantities of GMOs every day, and would be hard pressed to avoid doing so; Europeans resist. On the empirics of trust in government and science, see Plotkin, 2000; on European opposition to GMOs, Kettner, 1999.

⁵ For a range of possibilities, see Persley and Lantin, ed., 2000; Swaminathan 2001.

⁶ For example, Reid, Walter V. 1996. "Gene co-ops and the biotrade: translating genetic resource rights into sustainable development." **Journal of Ethno-pharmacology**. (51) pp.75-92; Tanksley, Steven D. and Susan R. McCouch, 1997. "Seed Banks and Molecular Maps: Unlocking Genetic Potential from the Wild" **Science** Vol. 277 (August 22) pp 1063-1066. Simpson, R. David, Roger A. Sedjo and John W. Reid, 1996. "Valuing Biodiversity for Use in Pharmaceutical Research" **Journal of Political Economy** Vol. 104, No. 1, pp163-185 for a skeptical view of the economics of bioprospecting.

Biological Diversity, and the United Nations' model of biota being the "common heritage of mankind" – ie, a common-property regime in which pool resources are publically maintained with open access to all. Elements of all three property systems are at work in the contemporary globalization of biotechnology.⁷ The CBD also mandates benefit sharing with local communities. Given the multiplication of real centers of decentralized decision-making in India under *panchayati raj*, this treaty imperative is a daunting task.⁸ Though celebrating the local has become something of a *mantra* in development studies of late, there are severe normative and practical difficulties in building systems of action and policy around decentralization and devolution [Herring 2000].

Debates around the relative weight of elements of these property regimes revolves around national sovereignty, social justice and incentives for progress. The latter discourse – of incentives as necessary to innovation – poses the most serious sticking point for a biotechnology for the poor. Patents are seen by industry and many economists as necessary to spur investment (as is public investment in basic science, a return on which is difficult to build into profit distributions). Who would invest in research unless ownership of the final product generated a flow of income to the inventor via enforcement of property rights? Yet it is possible that in fields of rapidly changing technology, conventional theory is turned on its head: property rights which are too broad or too strong may stifle innovation by increasing transaction costs. Consider an analogy to literature: it is not clear at what level it is appropriate to allow intellectual property rights. Though it seems reasonable that books are worthy of copyright protection to provide authors a living, it would seem perverse to allow creation of intellectual property rights in the individual words used by a novelist. Are sentences or phrases worthy of protection? What if the sentences are derived from folk proverbs, street slang, remembered conversations -- so tangled over time that it is difficult to tell where

⁷The objections of the United States to the treaty on germ warfare lie in part in fear that property rights of biotech firms will be compromised. As in all international negotiations, the United States takes stronger stance on private property rights than other nations. The American representative to negotiations officially stated that "confidential business information" would be at risk under the treaty [New York Times, July 26, 2001, A7].

⁸For some grounded examples of how it might work, see e.g, Anil Gupta, 1998. "Rewarding Local Communities for Conserving Biodiversity: The Case of the Honey Bee." **Protection of Global Biodiversity: Converging Strategies**. Lakshman D. Guruswamy and Jeffrey A. McNeely, ed. Durham: Duke University Press, pp.180-189.

innovation starts and heritage stops? Genomics enables a more radical possibility: the patenting of words, perhaps letters of the alphabet, or sequences of letters. Had Shakespeare been allowed to patent the individual words in his corpus, creative work in literature would have been strangled.

Third, social direction of research in the public interest will have to recover ground lost to privatization. Current research has produced little of benefit to the poor specifically. Indeed, consumers generally have not benefitted from the dominant developments in GMO agriculture, where efforts have been concentrated on selling more chemicals and lowering farmer costs per unit of production. The needs of commercial farmers have been paramount, as this is where the profits are. This is not in dispute; many of the attacks on GMOs in India are really attacks on capitalism and its handmaiden globalization. Yet the history of plant breeding is as much a history of non-proprietary systems, pool resources in germplasm banks and public-sector research as it is one of distributed proprietary rights in seeds.

Research priorities will not automatically incorporate the needs of the poor. For example, poor farmers need research on drought-resistant varieties as the political economy of water often pushes them to the margins of water access; poor consumers need nutrient supplements because their poverty prevents adequate nutrition in the market place, just as their lack of access to land prevents them from growing sufficiently nutritious diets themselves. These priorities can be addressed only if there is good knowledge of the distribution of poverty over time and space, across seasons and economic cycles, across social differentiations of gender and class. Existing aggregate measures of poverty are grossly inadequate. Knowledge of nutritional practices and preferences needs both more precise specification and disaggregation. The yawning gap between what is known and must be known indicates the existing lack of commitment to poverty reduction. A genuine mobilization for the poor would have to begin with these priorities; there is at present in India little evidence of a political force willing and able to take on that battle. One reason is that the putatively pro-poor forces have been mobilized against genetic engineering in agriculture, not for changing its direction.

“Cremate Monsanto”: The KRRS and Farmer Opposition to GMOs

The high ground of aiding the poor has been claimed in the GMO debate by multinationals selling seeds. Their neo-Malthusian logic has been endorsed by mainstream international development organizations and most prominently by the

Rockefeller Foundation. The argument is that increases in yields gained by the “green revolution” are leveling off as population continues to rise.⁹ Worse, the ecological effects of energy-intensive yield increases are destructive, threatening ecological health and future production. The green revolution path is not sustainable. Future yield gains will depend on re-engineering plants. Moreover, the question is not entirely one of yields; the poor face nutritional deficiencies that result directly from the poverty that restricts dietary choices. Re-engineering plants through traditional breeding techniques is both time-intensive and inefficient, as many traits are transferred in each breeding cycle, not just those desirable for the task at hand; there is a certain amount of genetic roulette in traditional breeding. In the global discourse on GMOs, the poor have been deployed by proponents of the technology as legitimation for new property rules and freedom to operate.

It was the extra-national vector of introducing GMOs into India that provided a handle for mobilization of farmer opposition. The core of organized opposition came from the Karnataka Rajya Raitha Sangha (Karnataka State Farmers’ Organization). Founded in 1980, the organization’s original mission conformed to the issues around which farmers historically have mobilized – debts, taxes, prices. Like most farmer organizations in India, it was led by richer farmers. Opposition to multinationals predated the GMO initiative. In 1992, activists occupied and ransacked the offices of the seed giant Cargill in Bangalore and Bellary.¹⁰ In 1995, they raided a Kentucky Fried Chicken restaurant in Bangalore. Critique of globalization in general and of multinational firms in particular connected a state-level farmers’ organization to national public intellectuals contesting globalization.

The American multinational firm Monsanto then provided a charged political target and a redirection of the KRRS campaign. In 1996, India’s largest seed firm, the Maharashtra Hybrid Seeds Company [Mahyco], obtained permission

⁹ Lipton, op cit.; Conway, 1997. For a tenor of the pro-GMO position, see Dennis T. Avery, “Biotech Foods ... Safe, Tested and Ready for the World.” Center for Global Food Issues 1999. The article’s leadin states: “The real risk is starvation in poor countries, not genetically engineered food.”

¹⁰ Darryl D’Monte, “Gandhi’s Disputed Heritage,” Unesco Courier, 2000, pp 1-4.

to import and test genetically altered cotton seeds obtained from Monsanto.¹¹ The seed that spawned operations was Monsanto's Bollgard, a variety of cotton engineered to produce its own pesticide. Bt cotton is the generic name for seeds that have been injected with a gene from a soil bacterium – *Bacillus thuringiensis*, hence the name Bt – that enables the plant to produce a toxin that kills insects boring into its tissues. Bt cotton occupies an important place in the GMO and development debate [cf Varma 2001]. Use of Bt cotton in China, South Africa and other countries, including the United States, has enabled farmers to reduce pesticide usage dramatically.¹² Cotton is a crop especially vulnerable to pests, and among the most sprayed crops in the world. In India, between 40 and 80 percent of all pesticides consumed are used on cotton [estimates vary, but cluster around the greater than 50% range]. Pesticides may account for half the total cost of production on cotton farms. As farmers in India have now encountered the pesticide treadmill, on which more and more poisons are required for less and less effect, the Bt plant was potentially attractive. Popatbhai Ramjibhai Patel, a farmer in Gujarat, claims that costs have doubled in the last five years; many farmers were thinking of abandoning cotton. “This new seed may be a good alternative for us. We have run out of options” [Bunsha 2001]. There is also an enormous social externality of pesticide use: contamination of farm workers, soil and water as well as destruction of non-target insects as well as birds and aquatic life.

Mahyco obtained the seeds from Monsanto, made back-crosses with local cotton varieties, then applied for permission to conduct field trials necessary before approval for commercial release could be obtained. These tests, authorized by the Genetic Engineering Approval Committee of the Ministry of Environment and Forests, were taking place throughout the country, on five agricultural crops, but it was Bt cotton that sparked protests. Crops were burned on two small test plots of Bt cotton in Raichur and Bellary districts of Karnataka state in 1998. The KRRS was explicit: it was resisting foreign domination of the seeds of farmers, and thus of India; it was resisting as well the thoroughly unnatural nature of Monsanto's

¹¹ It was widely reported in India, and asserted by the NGOs mobilizing opposition, that Monsanto had taken over Mahyco, India's largest seed company. Actually, Monsanto's share was only 26 percent, but the symbol worked.

¹² **AScribe Newswire**, Nov. 28, 2001; Ismael, Bennett and Morse, 2001.

“terminator technology,” incorporated into “suicide seeds.”¹³ This characterization of the movement was important in its globalization. The assault on India and on nature was combined in Bt cotton. Manifesting the suddenly global character of a regional farmers’ movement, the actual burning was accomplished when the leader of the KRRS, Professor Nanjundaswamy, came to the fields with activists from Spain and Germany.¹⁴

A third trial plot, in Haveri, was not burned. The reasons proved to be diagnostic of the weakness of the movement. The farmer who owned the plot, Shankrikoppa, reportedly was willing to cooperate until the state-level Bharatiya Kisan Sangh (a BJP-affiliated farmers’ organization) asked him not to. He then asked for and received police protection for his crops. Once a member of the KRRS, Shankrikoppa turned against the movement. His desertion proved to be politically significant. More important, Shankrikoppa saved Bt seeds from his trial plot and germinated them; the “terminator technology-suicide seed” rhetoric of the movement was turned on its head as the seedlings grew well. Moreover, the foliage did not harm insects other than the bollworm, nor mammals. Shankrikoppa called arguments of professor Nanjundaswamy, who spoke for the KRRS, about the danger of the seeds “a cheap publicity stunt” and said other farmers in his area were eager to get the new seeds [Birasal 1998].

Burning of plots and protests in the neighboring state of Andhra Pradesh convinced the state government there to stop and ban the trials in its domain,

¹³ The terminator technology was not developed by Monsanto, but rather by a firm Monsanto bought -- Delta and Pine Land -- for \$1.76 billion in 1996. This technology, despite its dominance of discourse, was not commercialized, due in large part to the vigorous intervention of the President of the Rockefeller Foundation, Gordon Conway. [Conway, personal communication] Nevertheless, the opposition continued to use the terminator technology’s very un-naturalness as a means of combating both Monsanto and GMO seeds. Monsanto’s representative in India responded to charges about suicide seeds in the field trials: “Since the so-called terminator gene does not exist today in any plant in any country in the world, the question of its involvement in the field trials currently on in India does not arise.” Dow Jones **Agnnet** November 20, 1998. Mahyco-Monsanto Seeds chairman BR Barwale emphasized that the seeds being tested had been approved by the Department of Biotechnology for trials and “has nothing to do with the so-called terminator genes.” Sharad Mistry, 1998.

¹⁴ The account of the farmer – Shankrikoppa – is covered in Birasal 1998; also, D’Monte, op cit, p 2

despite the pro-technology profile of Chief Minister Chandrababu Naidu [Mistry 1998]. This was the high point of KRRS movement power within India. The movement seems to have stalled in 1998 in sporadic attacks on “terminator seeds” on a few plots, though the KRRS was heavily represented in the Inter-Continental Caravan that toured Europe protesting globalization and GMOs in 1999. Indeed, the KRRS may have been more publicized outside India than within. The international impact of the cremate Monsanto movement was, however, extraordinary, driven by international groups opposed to genetic engineering of seeds and globalization.

As in historic farmers’ movements in India, Professor Nanjundaswamy explicitly linked his mobilization to Gandhian ideals, primarily organized around the concept of *swadeshi* [self-reliance]. Multinationals were explicitly cast in imperial terms, as “invaders” who would dominate India and Indian farmers. To the argument that destroying offices and crops is violent, and thus contrary to Gandhian ideology, Nanjundaswamy replied: “During the Quit India movement against the British, Gandhi was asked whether burning cargo trains constituted violence and he said it didn’t, unlike passenger trains.”¹⁵ Nanjundaswamy’s notion of *swadeshi* largely applied to the relation of India to the international system, but was congruent with contemporary analysis stressing *swaraj* (self-rule) internally, with a clear link to self-reliance externally. For example, the movement *Lok Swaraj* [People’s Self-rule] seeks “to assert people’s sovereignty over decisions and resources that affect their lives and livelihood — food, seed, land, water and the commons and to save the country being hijacked by a new form of colonialism.” *Bija swaraj*, or seed self-rule, then resonates both with a broader ideology asserting people’s sovereignty in the face of threats of globalization, but also with the movement for Independence from the British.¹⁶

The KRRS was the epicenter of on-the-ground protests against GMO seeds, but there were other venues and tactics. In Delhi in September 2000, a *Bija Panchayat* [seed tribunal] met to hear testimony on the crisis of farmers and urge a moratorium on GM seeds. Public intellectuals seem to have dominated. Justice

¹⁵ D’Monte, op cit, p 3

¹⁶ This movement for *Lok Swaraj*, or people’s sovereignty, has subdivision of *anna swaraj* (for food), *bhu swaraj* (land), *jal swaraj* (water), *van swaraj* (literally forest, but connoting commons in general). *Navdanya* [“Nine Seeds”] (see below) seems to be the major organizer.

V.R. Krishna Iyer spoke to a group including foreign NGOs and Indian farmers on the unfortunate plight of farmers caught up in dependency relations. The *panchayat* also heard testimonies of farmers from Punjab, Andhra Pradesh and Karnataka. In the press report, the testimony asserted that many farmers “were forced to commit suicides and sell their kidneys to repay loans and protect their family honor.”¹⁷ The composition of this *Bija Panchayat* was to be the model of the anti-GMO coalition: public intellectuals from India, international NGOs and their Indian partners and sporadic involvement of some farmers. The press report mentions “more than 100” participants; 25 farmers’ organizations reportedly participated in organizing.

Farmers’ movements inevitably raise the question of who speaks for the farmer. The dissent of one formerly KRRS farmer who refused to have his crop burned, and instead asked the police to protect his crop from his former organization, illustrates one historic problem of mobilization: cultural and practical distance of elites from shock troops. Leaders of the movement were decrying “suicide seeds” even as the dissident farmer Shankrikoppa was multiplying said seeds for future use. The KRRS was especially suspect on this dimension of cultural distance and dubious representation, as it was led by a professor of law. Professor Nanjundaswamy claimed a membership of ten million members for KRRS. Yet, when the professor stood for an assembly seat in Karnataka, he polled only 3,000 votes and lost his deposit. The KRRS, which claimed to speak for its 10 million members, did not secure any seats when it transformed itself into a political party.¹⁸

Though KRRS received much attention as a grass-roots organization, it was not notably effective in stopping tests of Bt cotton. Here its erstwhile partner Vandana Shiva and her Research Foundation for Science, Technology, and Ecology proved to be more effective. The movement and the public intellectual had

¹⁷ **Times of India**, “Farmer Suicides Lead to GM Moratorium Call,” September 26, 2000. Interestingly, the mention of farmer suicides often contains reference to high costs of production and bogus petrochemicals, such as pesticides, that bankrupt farmers. The Bt seeds being protested reduced farmer expenditure on such items and proved more effective as well. For more on the suicides, see Srinand Jha, a Delhi based journalist (Jha 2001).

¹⁸ Stig Toft Madsen, 2001, “Post Festum: The Lotus and the Mud in an Indo-Global Context,” draft ms, cited with permission of author.

united during the KRRS movement against globalization. The KRRS had grass-roots legitimacy unavailable to a global public intellectual, whereas the movement lacked the global connections that enabled 400 Indian farmers to tour Europe as part of the Inter-Continental Caravan protesting globalization. Vandana Shiva secured a temporary victory for the anti-GMO forces when she moved the Supreme Court in 1999 to stay approval of new tests of Bt cotton. The Court ruled that trials should be suspended until concerns of biodiversity and safety were adequately addressed.¹⁹ This ban did not last long, but was one of the few victories of the movement against GM seeds.

The rhetorical strategy of linking farmer suicides to “suicide seeds” was brilliant, but deeply flawed empirically. It was reports of farmer suicides on a large scale in 1998 that initially prompted mobilization around opposition to foreign seeds and Monsanto. Farmers were portrayed as victims of liberalization of farm imports -- hence globalization -- and crushing cost-price scissors that led to bankruptcy. The leap from globalization to financial distress to Monsanto’s power in India to suicide seeds was seamless but logically flawed. The Bt cotton seed trials that provided the site of mobilization did not incorporate Monsanto’s “terminator technology,” which was nowhere commercialized, but this effective rhetorical strategy contributed to mobilization and in particular to international support for the movement. The KRRS, though claiming 10 million members, subsequently fell to internal disputes and factions. Yet its sponsorship of the Inter-Continental Caravan and the Burn Monsanto campaign made it very much a focus of global attention in the controversy over GMOs [Madsen 2001].

Direct action in Andhra and Karnataka – accompanied by agitation in Delhi – did not halt GMO seeds. A single persistent public intellectual – Vandana Shiva – did, but only officially and temporarily. Beneath the regulatory gaze of the state, Bt seeds were multiplying and growing, as the KRRS apostate farmer Shankrikoppa presaged. The failure of the movement itself to spread to other seeds and other venues is fundamentally a function of its divergence from perceived

¹⁹ The petition was granted under Article 32 of the Constitution allowing citizens to move the court on issues of violation of fundamental rights. For details of her argument, Frederick Noronha, “India’s High Court Stops Field Trials of Biotech Cotton” **Environmental News Service** February 23, 1999. Suman Sahai and the Gene Campaign did have successes in altering India’s legislation implementing TRIPS under WTO strictures, but the tests of actual seeds were beyond that mechanism.

interests of its constituency -- Indian farmers. To understand its form, and limitations, one needs to consider both continuity with previous episodes of farmer mobilization as well as elements of a new type of farmer movement.

Farmer Mobilization and the Politics of Expertise: New Movements?

Despite its limited scope and scale, and lack of effectiveness, the mobilization around against GMO seeds in the field trials illustrates both continuities with historical farmers' movements in India and some genuinely new characteristics. The new features can be understood as elements of an emergent politics of expertise, driven by the effects of globalization of knowledge. In the politics of expertise, interest is mediated by forms of knowledge not easily accessible to participants in the movement.

Continuities

1) *Strategic Metonymy of Protest Targets*: Ranajit Guha recounted the peasant tactic of using a part to stand for the whole in **Elementary Aspects of Peasant Insurgency**. In protest tactics, the most decadent landlord was presented as encapsulating in his person the evils of landlordism as a social system, and was strategically attacked as such [Herring 1987]. Since not all landlords could be attacked, nor could landlordism – as system of power – be frontally assaulted by rational activists, or always comprehended *qua* abstract system by peasants, instantiation of the evils of a system in the person was politically critical. “Operation Cremate Monsanto” in Karnataka and Andhra stood for opposition to globalization, and thus to dominance of weak farmers by powerful and grasping multinational firms. Monsanto was presented (falsely) as the originator of “Terminator Technology,” spread through the Bt cotton seeds undergoing trials as required by law in India. A discourse around “seeds of death” or “suicide seeds” – that grotesque perversion of the cultural significance of seeds -- was made to stand for genetic engineering in general, which in turn stood for biotechnology in general.

2) *Defensive Nationalism*: Gandhian notions of *swadeshi* were opposed to neoclassical arguments for openness of economy. MNCs were not just foreign, but invasive – like weeds. It was the bioheritage **of India** that was threatened by biological pollution -- a brilliant rhetorical turn on the common phenomenon of gene flow through ecosystems. Seeds became a site for contesting globalization via

their symbolization of foreign threat, in competition with seeds as representative of indigenous knowledge and culture. Vandana Shiva spoke of “technological totalitarianism.” The new seeds were dubbed one of “capitalist patriarchy’s life threatening projects” and part of “Monsanto’s totalitarian empire.”²⁰ Whereas “empire” conjures subordination, “life threatening projects” link threat to Monsanto – the seat of empire.

3) *Moral Outrage*: Successful peasant mobilization against landlordism and foreign rule historically evoked moral outrage at injustice. MNC property claims were held to be destructive of the United Nations’ norm of seeds being the “common property of mankind.” Theft in the form of “biopiracy” was seen as the objective of global firms involved in India’s biology.²¹ The suicides of farmers were linked to the outrages of globalization, symbolized by “suicide seeds.”

4) *Markets as Dominance*: Charles Lindblom wrote of “The Market as Prison.” The worldview of opposition to GMOs treats the market as prison just as its neoliberal apologists treat it as a realm of freedom. Farmers are portrayed as being forced to grow new seeds, to become bonded to seed firms. There is a cultural component as well. **The Indian Farmers Petition**, a resolution of the Forum of Farmers Organizations on Globalization and Agriculture, decried “the spread of capital intensive agriculture in which innocent Indian farmers are being trapped in the lust for high profits and being driven to indebtedness...”²² Farmers here

²⁰ Vandana Shiva, 1998, “Monocultures, Monopolies, Myths and Masculinization of Agriculture,” a paper prepared for the **International Conference on Women and Agriculture**, “sponsored by Monsanto” but organized by the Government of Canada. Her panel, which she did not attend, was entitled “Women’s Knowledge, Biotechnology and International Trade – Fostering a New Dialogue into the Next Millennium.” Obviously the fostering of a new dialogue failed.

²¹ Ironically, despite the vigorous condemnation of “bioprospecting” in the region as “biopiracy,” the most egregious case of contemporary biopiracy was not South to North, but North to North. The national park system – and people – of the United States were the victims. See Varley and Scott, 1998; Svarstad and Dhillon, 2000.

²² The Forum was held 30 May, 1998, in New Delhi. It included farmers’ organizations across the political spectrum, from communist to BJP. Organizational impetus came from *Navdanya*, a seed-preserving pro-biodiversity NGO linked to the Research Foundation for Science, Technology and Ecology in New Delhi. *Navdanya* [lit. “nine seeds”] has become famous as part of the international lecture tour of Francis Moore Lappe, like Grameen Bank a

manifest the innocence of colonial understandings of peasants, and lack the inner strength and autonomy to resist “lust for ... profits.” It is an argument from moral economy. Markets are held to be inherently illegitimate; the marketplace is a place of dominance, in competition with an arena of freedom. The farmer leader from Uttar Pradesh, Mahendra Singh Tikait, observed:

“When we told European farmers that they should not export their products to India, they simply laughed at us. They told us that we should not buy their products if we did not want them. We are nothing compared to them.”²³

In the **Charter of Farmers’ Rights to Safe Seeds** issued by a coalition of farmers’ organizations convened by *Navdanya*, a right is asserted to “safe seeds and freedom from risks.”²⁴ The normative conceptual framework of capitalism – reward for risk – is contravened by appeal to an alternative moral economy.

5) *India in Command of Bharat -- Elite Leadership*: Farmers movements are often the product of urban intellectuals and political entrepreneurs. Nanjundaswamy is a Professor of Law; Vandana Shiva has a PhD in Philosophy of Science. Conflicts within KRRS developed on lines of the distance of leaders from ordinary farmers, signaled in part by the use of the English language by leaders.

6) *Gandhian Resonance*: The KRRS used Gandhian symbols and legitimation, just as Gandhi evoked *Ram Rajya* as legitimation for the independence struggle. The movement which arose subsequently to mobilize farmers as defenders of GMO seeds did likewise. Sharad Joshi, leader of the *Shetkari Sanghatana* [see below], asked assembled farmers to pledge to stand to the death against the forces of a regulatory state threatening to burn illegal Bt cotton crops in their fields. In asking for a pledge for farmers to be burned with their crops in the fields, Joshi explicitly evoked *satyagraha*. He did so on the banks of the hallowed Narmada, at

site of pilgrimage.

²³ Personal communication from Tikait to Stig Toft Madsen, quoted with permission.

²⁴ Press release, New Delhi, 1 November 2001 from the Research Foundation for Science, Technology and Ecology. The Charter resulted from a meeting of leadership of a broad spectrum of farmers’ peak organizations stationed in Delhi, from BJP groups to the CPI’s All India Kisan Sabha. On the Gandhian point, see D’Monte, op cit.

Nilkantheshwar temple.²⁵ Social movement merges with pilgrimage. The seed project of the KRRS revolved around *swadeshi*, opposition to an overweening regulatory state testing seeds evoked *satyagraha*.

Discontinuities

1) *Global Reach*: In both directions, farmers' movements in India went global in this episode of protest. The highly visible "Inter-Continental Caravan" took Indian farmers to Europe to protest globalization [Tansakul and Burt 1999]. In Europe, their authenticity as farmers was called into question; many were one-step or more removed from actual agricultural operations and they were not poor enough for the Europeans' imagination of Asian peasants. No one poor books international jet flights. Their experiences on the global stage had an impact on the movement at home, contributing to its fragmentation and ineffectiveness [Madsen 2001]. Because of the asymmetric distribution of knowledge globally, the public face of resistance to GMOs frequently came from Indians connected to international NGOs – Greenpeace India, for example, via Michelle Chawla. Reciprocally, the web pages of international opponents of GMOs depend heavily on the output of Vandana Shiva, who came to represent Indian farmers, along with Indian women, Indian indigenous knowledge, indeed India itself if not Bharat.

2) *Contesting Science*: Opponents of globalization in general but particularly protestors against GMOs deploy attacks on "Western science." Supporters of GMOs attack these same opponents for deployment of "junk science." Vandana Shiva speaks of "imperialist science." Science is reified, constructed not as an agnostic method of adjudicating truth claims, which is all it claims or can claim, but as standing in for political strategies and state policy. It is then fused with technology, sometimes to connote threat (Shiva's "totalitarian technology"). The fusion enables a diffuse dialectic of modernity and its critiques as a background condition for opposition to or support of specific instances of change.

²⁵ The temple takes its name from the "blue necked" Shiva, alluding to Shiva's voluntarily taking the poison of demons into his bowl and consuming it, turning his neck blue before it was metabolized into a safe substance. The choice of site may consciously connect to Shiva's taking of poison in the public interest – I am told by Ann Grodzins Gold – and thus perhaps relates to a conscious choice to symbolize toxins. Bt cotton, according to its proponents, will alleviate the threat of poisons to the body public, as did Shiva's taking the poison into his body.

The politics of expertise is embedded in this international contest of constructing “science” under asymmetries of knowledge. Risk becomes central. Yet, risk entails knowable distributions of possible events. Expertise is contested. Because of the gaps in expertise, farmers are more than ever represented by those with specialized knowledge. Because of locational isolation, globalization of protest necessitates farmers’ being represented by metropolitan elites. Both global stage and knowledge asymmetries reinforce the dynamic of representation in farmers’ movements slipping out of the hands of farmers. In constructing these contests dramaturgically, the world becomes one of conjured threat, anxiety, and state attempts to relieve those anxieties -- the conditions under which the late Murray Edelman [1962] posited the greatest power for symbolic politics. But movements generate dialectal responses: the state’s assumption of anxiety surrounding GMOs resulted in the regulatory regime’s assertion that field trials would unambiguously establish the safety of new seeds -- certified by the authority of science. Otherwise, the state would ban distribution of the seeds. That this regime did not meet farmers’ disaggregated objective interests propelled a second, reflexive GMO movement, this time in defense of vigorously growing genetically engineered cotton seeds.

Regulatory State and Scorched Earth Protests: The Suicide Seeds Sprout

Opposition to the field trials of Bt cotton was opposition to Delhi’s regulatory *raj*. Democratic norms were violated in a top-down imposition by a state caving in to global pressures. Opponents to field trials claimed specifically that states (provinces) were by-passed in an opaque process of approving the trials from the Centre. This argument took on additional strength because agriculture is constitutionally a state subject in the federal system of division of powers. Field trials of Bt cotton were approved by the Genetic Engineering Approval Council of the Ministry of Forests and Environment (GEAC) in 1998 under provisions of the Environmental Protection Act . There is as well a Monitoring and Evaluation Committee in the Department of Biotechnology. Because of federalism, there are to be State Biotechnology Coordination Committees, as well as district level committees. This complex regulatory structure is meant to protect India from unsafe or unwise commercialization of new organisms. The theory is decentralized, with many arenas for transparent consideration. The reality is opaque and centralized. The tests approved by GEAC were to determine effects on gene flow, gene stability, animal nutrition, insect resistance and other matters of ecological

effects and safety of the Bt cotton seed.²⁶ The company granted permission for field trials was Mahyco (Maharashtra Hybrid Seed Company Limited).²⁷

Farmers operate beneath the regulatory gaze of the state whenever possible. The state of high modernism claims regulatory surveillance that is beyond its means [for discussion, see Jim Scott's **Seeing Like a State**]. If there is consensus on any aspect of the biological revolution's effect on society, it is that there will be more surveillance and regulation. Field tests of new seeds were to reassure mass publics that the state's final decisions were authorized by science. Early mobilization under the banner of Professor Nanjundaswamy's KRRS had opposed even the testing of Bt cotton, as had Vandana Shiva's petition before the Supreme Court. At the visible level, there was considerable mobilization of public intellectuals and their organizations to oppose GMOs. By mid October of 2001, there were, however, reports of actually existing fields, in the thousands of hectares, of illicit Bt cotton in Gujarat. Farmers had been voting with their plows beneath Delhi's radar screen; unknown quantities of Bt cotton were reported to be growing in states as well.²⁸ The Genetic Engineering Approval Committee in Delhi on October 18 ordered the state-level State Biotechnology Coordination Committee to uproot and burn the GM crop. In this ironic replay of the "cremate Monsanto" campaign, the roles of activists and state were reversed; farmers mobilized to prevent the state from burning their crops. The federal issue emerged

²⁶ Interviews in Delhi, July 2001 and Greenfiles archives of the WWF-India are the basis of this and later discussions of the regulatory structure, supplemented by press accounts.

²⁷ **Business Line**, The Hindu Group, March 24, 2001, "GMO Debate." Anti-GMO activists falsely claimed that Mahyco was a fully owned subsidiary of Monsanto, which does hold a 26% share.

²⁸ Personal communications with agricultural scientists in India and scattered press reports indicate possible plantings in Maharashtra, Andhra Pradesh, Rajasthan, Karnataka, Punjab and Haryana. The Union Minister of Agriculture has likewise mentioned Bt cotton in these states. The extent and spread of the transgene crop is virtually impossible to assess at this point. There is no way to distinguish the Bt cotton by sight, except that in areas of bollworm infestation some fields proved to be healthy. But the fields were quickly harvested. The only reliable means of distinguishing the Bt cotton is by testing genetically for the Cry 1 A(C) gene. The variety was locally known as the 151 *Navbharat biyaran* (seeds) in Gujarat, but sold under names such as *Jay*, *Vijay*, and *Digvijay* in Andhra Pradesh, evidently without wide-spread knowledge of its transgenic character. Indeed, the Navbharat company later disavowed knowledge of the presence of a transgene in the hybrid it had been using for breeding.

immediately; the state of Gujarat expected Delhi to compensate its farmers if need be, but in the first instance questioned the need for a scorched earth policy.²⁹ By October 31, the GEAC had modified its order to bend to reality: because the variety flowers early, most had already gone to market: there was no cotton to burn and fiber could in no way be distinguished in the market. The GEAC then ordered recovery of cotton from the market to the extent possible, procurement of unpicked cotton at the support price, destruction of seeds and storage of lint, and uprooting and complete destruction of crop residue [Menon 2001]. Here residues of the license-permit-quota *raj* so excoriated by liberal economists came in handy: licenses of seed dealers who had spread the illegal variety were cancelled.

Why were farmers taking to a technology that anti-GMO farmers' movements had said would bankrupt and endanger them? The clearest answer is that there are significant profits in using Bt seeds. According to Department of Biotechnology data, Bt cotton trials showed that average yield went up by 297 kilograms per hectare. Savings to the farmer from reduction of pesticide purchase alone were Rs 1,856 per hectare. With a market price of Rs 22/kg, the farmer gained Rs 6,534 per hectare from using Bt cotton, even though the GM seeds were more expensive.³⁰ Union agriculture minister Ajit Singh estimates from field trials

²⁹ See Vinod Mathew, "India's GM Cotton Story Gets Bigger - 'Uproot & Destroy' Begins on Gujarat Farms," **Hindu - Business Line**, Oct. 20, 2001; Darshan Desai and Sonu Jain, "Government Gets Cotton Farmers To Pay For Its Incompetence." **Indian Express**, October 21, 2001; Dionne Bunsha, "A Can of Bollworms," **Frontline** Vol 18, Issue 24 November 24-Dec 7, 2001. Gujarat had previously undertaken a major initiative in biotechnology as a new sector for development.

³⁰ Sonu Jain (2001). C S Prakash estimates the seed cost differential as Rs 50/kg for Bt seeds, Rs 6-8 for traditional seeds. Purvi Mehta reports a somewhat higher differential, but still high profits among the Gujarati farmers with whom she works (personal communication December 15, 2001). See also Prakash's letter to the editor, **Indian Express**, Nov 5, 2001. Karamsibhai Ladabhai Patel reported a ratio of Navbharat seeds to his usual hybrid seed of Rs550/bag to Rs 300/bag [Bunsha 2001]. Shankrikoppa, the KRRS dissident, reported a 25% increase in yields with savings of Rs 10,000 per acre on pesticides. The figure seems high, but Karamsibhai Ladabhai Patel in Gujarat reported a savings of Rs 5000 per acre on pesticides with the Navbharat variety [Bunsha 2001]. A related issue is the effectiveness of pesticides; there is much fraud in selling farmers expensive chemicals that do not work. These faulty products were implicated in the wave of farmer suicides of such importance to the anti-GMO movement in 1998.

that the productivity increases are on the order of 30-35 percent.³¹ These gains are consistent with experience in China and South Africa.³² Moreover, Navbharat 151 flowered early, giving farmers more time to prepare the ground for a subsequent crop. But most important, the Bt fields stood healthy when other varieties were devastated by bollworms, even after expensive application of pesticides.

Delhi's threat to uproot and burn the crop quite naturally triggered farmer protests. Sharad Joshi, president of the farmers' organization *Shetkari Sanghathana*, said at a rally October 30, 2001: "They will have to walk over our corpses to destroy this crop. This is our *satyagraha*. This is a question of the farmer's freedom to select his seed and access technology." A crowd of farmers estimated to number in the thousands pledged that they would not allow the Government to touch their crop. This pledge was taken at the Nilkantheshwar temple on the banks of the Narmada river. In an appropriate bowing to the motif of the times, Joshi concluded: "By depriving the farmers their freedom to choose the seed, the governments in Gandhinagar [capital of Gujarat] and New Delhi are indulging in terrorism" [Shaik 2001]. In a rally about two weeks later, a crowd estimated at between 12,000 and 13,000 cotton farmers protested in Wardha near Nagpur. This large protest was not in Gujarat, but in neighboring Maharashtra state; either the seeds had surreptitiously spread to Maharashtra or the farmers there anticipated growing them. This protest too was under the leadership of the *Shetkari Sanghatana*. A "rail roko" agitation at Wardha and Sewagram railway stations was meant to interrupt traffic on the Central Railway's Mumbai-Howrah route.³³ According the press report, the protest took place at a time when the government was promising that the crop would be burned only after purchase from the farmers: i.e., there was to be no financial loss to agriculturalists. Sharad Joshi posed the question as one of farmers' freedom and, implicitly, urban bias: "Development should not be locked up in the cities. The marvel of technology

³¹ **Financial Express** (India), October 5, 2001.

³² Gilbert and Lee, 2001, report on a study by un-named university scientists indicating significant income effects for small farmers. They quote a small farmer, T.J. Buthelezi: "But even if they [Monsanto] weren't good to us, Bt cotton has proved to be the best thing to put money in our pockets. I wouldn't care if it were from the devil himself." The paper in question may well be Ismael, Bennett and Morse, 2001., which reaches the same conclusions.

³³ "Bt Cotton Farmers Take to the Streets," **Indian Express**, November 13, 2001.

should reach the villages."³⁴

It is not clear how far the GM cotton has spread in India. There are reports of farmer protests in favor of Bt cotton in other states: Andhra, Punjab, Haryana.³⁵ It is certainly being grown in Karnataka, evidently in Maharashtra. The position of the state is classically regulatory *raj*. In Gujarat, the principal Secretary, Forests and Environment, P K Ghosh, after visiting the Bt cotton fields said: "We will have to destroy the crop though I am not commenting on whether the Navbharat 151 seed is good or bad. It was supplied without the necessary permission. Now, we have to fix the compensation"[Desai and Jain 2001]. The threat to burn the fields of Bt cotton had migrated from the anti-globalization movement to the state and Union governments; the farmers were now on the other side of the fence.

Despite the elaborate regulatory structure of the state, and the belligerent vigilance of the NGOs who saw GMOs as dangerous, the discovery of the Bt cotton growing was a function of business rivalry. The variety growing in Gujarat was supplied by Navbharat Seed Limited, which had registered the seed as a hybrid, but claimed no knowledge of its transgenic nature. Mahyco, which has reportedly spent about US\$8 million preparing the Bt cotton seeds for commercialization in India and originally received permission from Delhi for field trials, reported Navbharat to the GEAC for selling illegal seeds. Mahyco might not have discovered this fact had the bollworm infestation not hit Gujarat in 2001. The infestation in Gujarat was so bad that the few healthy fields stood out starkly. Farmer movement leader Sharad Joshi wrote:

“Through a lucky stroke a nondescript seed company managed to play Robin Hood and smuggle into Gujarat one line of anti-bollworm gene. For three years nobody noticed the difference and then came the massive bollworm rampage of 2001. Gujarat saw all its traditional hybrid cotton crop standing devastated, side-by-side the Bt-gene crops standing resplendent in their glorious bounty. The Government

³⁴ Sajid Shaikh, “Farmers Hold Rally, Vow to Defend Bt Gene Crops,” **The Times of India**, 10-31-01.

³⁵ Dr. Gurusurti Natarajan (personal communications).

was upset and ordered destruction and burning of the bountiful crop.”³⁶

Where did the seeds originate? The speculation is that Navbharat got the seeds from the US, where they are readily available, brought them back to India and crossed them with indigenous varieties. Their defense is that they did not know the cross source was genetically engineered [Jayaraman 2001]. This is possible, as a genetic probe would be necessary to tell the difference, but unlikely. Unless the seeds had special characteristics, there would be no reason to create new crosses from them. Navbharat claims in response that they were breeding for early flowering -- a desirable trait in itself -- and chose for breeding stock plants that seemed to resist the bollworm. The final irony of course is that for all the furor over “terminator technology” and “suicide seeds,” Navbharat was using off-spring of Monsanto’s patented seeds to breed a new line in great quantity, evidently much to the profit of farmers.³⁷

The farmers in whose name protagonists in the seed war speak are divided.³⁸ This outcome is to be expected; there is on the ground a continuous process of differentiation of economic interests but in the arena of GM crops a multifaceted ideational divide as well. Contrary to organicist conceptualizations of rural society, there is no coherent interest of “rural India” or of “farmers.” Farmers growing rice may have no interest at all in GM cotton, or in any cotton. Fears of biological

³⁶ I personally heard the same account from two people who toured the fields in Gujarat as part of their jobs. Purvi Mehta-Bhatt and Deviprasad Mishra, personal communications. There is no other way to tell the cotton apart, absent a genetic probe.

³⁷ It is remotely possible that Monsanto’s variety is nowhere in the picture, however, as there are indigenously developed Chinese varieties of Bt cotton much cheaper than the Monsanto version. The December 26, 2001 issue of **The Economic Times** reports an agreement between Nath Seeds and the Biocentury Transgene (China) Company, to introduce transgenic technology in cotton crop in India. Biocentury’s patents are for Bt and Bt+ genes developed by the Biotechnology Research Institute (BRI) of the Chinese Academy of Agricultural Sciences. It has also been argued that gene flow from trials of the Mahyco-Monsanto variety produced new varieties accidentally that became raw material for Navbharat crosses.

³⁸ A full accounting of the farmers’ organizations in play is not possible; many have no reason to take a position at this point. It is clear that the Gujarat stealth sowing has altered the political logic around GMOs. *Bhartiya Kisan Sangh* [Indian Peasant Association] president Bhupendra Singh Mann has said: “Give us these seeds and we will sow it in our fields in Punjab. The cotton crop that we have seen here [Gujarat] is fantastic.” Shaikh, 2001.

pollution via gene flow may be undetected by specialists and not comprehensible to farmers at all. The crucial mediating role has been through educational and agitational campaigns of NGOs such as Gene Campaign, RFSTE, Greepeace-India, KRRS. But these efforts periodically must resonate with enough of the world as experienced by farmers to generate support. The commercial and biological success of Bt cotton was too much for the more indirect, distant and hypothetical arguments about foreign control and dangerous genes. Gujarat *Khedut Samaj* president Vipinbhai Desai said at the *Shetkari Sanghatana* rally on the Narmada: "We have tested the seeds. This is the third yield using Bt cotton seed. The government says it is hazardous. If that is so, why are they not proving it scientifically" [Shaikh, 2001].

In this microcosm of seeds and seed choices we have another refutation of the puzzle Ashutosh Varshney [1995] poses for Indologists: if material interests drive mobilization, why hasn't rural India formed itself as a political actor? Why is there no political *Bharat*? Surely the GMO controversy is ideally suited to be a war of indigenous *Bharat* against a globalizing India. This was precisely the construction of the KRRS: the metropole represented by Delhi was caving in to globalization pressure which would subordinate and bankrupt the Indian farmer. The KRRS self-destructed along factional lines and failed in its attempt to launch a political party. Indeed, simply that there are factions should provide Varshney a better answer to his own question than he conjures. Varshney's own answer is essentially primordial loyalties: there are cross-cutting social cleavages of caste and community that prevent horizontal solidarity in rural India. Yet the GMO controversy offers yet more evidence, if any were needed, that objective interests are deeply divided in rural India. These divides alone are sufficient to explain the absence of a rural political bloc.³⁹ But in addition to divisions among farmers and other rural classes introduced by objective class structure, the politics of expertise divides new social movements. Ideational divides over GMOs are deeply etched not only because of knowledge asymmetries, but also because of deep normative ambiguities concerning the nature of the unnatural and the legitimacy of collective risk. These factors – interests both material and ideational – provide ample reason for rural divides: no primordial loyalties needed.

The pro-GMO stance of Bt cotton farmers is likely to win at the national

³⁹ For an elaborated explanation, see Ronald J. Herring, review of Varshney, **American Political Science Review** Fall 2000.

level. Farmers possess a residual power across regimes in India's populist democracy; if India does not stand for the *kisan*, for what can it stand? Though most early adopters of Bt cotton were substantial farmers, its higher profit margin and freedom from dependence on pesticides would clearly be of great benefit to farmers near the margin -- ie, the poor, in the abstracted name of whom all developmentalist regimes ultimately claim legitimacy. It is almost impossible for political parties to move against the farmers in overt ways. The Government of Gujarat not surprisingly stood with its cotton farmers against the Centre. Moreover, the Union Government that legitimizes itself as the developer of farmers has been slow to move against the illegal plantings. Rule 89 of the Environmental Protection Act would presumably make the farmers culpable in law. Yet farmers seem to be off the hook: everyone agrees that Navbharat should be brought to book, and perhaps Monsanto, but not the farmers actually growing the illegal plants. Environmental activists have also been careful not come out against the farmers, despite their strong attacks on GMO seeds. **The Hindu** in an editorial of October 30, 2001, quoted an "eco-activist" as saying: "In the present situation, it is difficult to be environmentally correct and politically correct at the same time" [Padmanabhan, 2001]. Instead, anti-GMO activists have pressed to bring charges against the corporations. The counter-reaction from Vandana Shiva's *Navdanya* has been to publish a Resolution and Charter of Farmers Rights to Safe Seeds, reverting to the early "moral economy" literature of "safety first" (profits second).⁴⁰

Final resolution of the Bt cotton controversy will await litigation.⁴¹ There are large issues of federalism. Agriculture is a state subject under the Constitution; Delhi's authority is as yet institutionally untested. These are after all novel subjects of regulation. What we can conclude at this stage is that the representation of farmers' interests in blocking genetically engineered seeds is deeply flawed. Farmers seem to be driven more by economic interest than ideology, by immediate benefits rather than hypothetical threats. There lies herein a societal risk: farmers did not worry much about the externalities of pesticide use, but rather did what

⁴⁰ Press release, New Delhi, 1 November 2001 from the Research Foundation for Science, Technology and Ecology. The classic work on "safety first" as the core of peasant moral economy is James Scott, 1976. **The Moral Economy of the Peasant**. New Haven. Yale.

⁴¹ Vandana Shiva, through her Research Foundation for Science, Technology and Ecology has filed a Public Interest Litigation in the Supreme Court against the Department of Biotechnology, alleging large-scale violations of biosafety guidelines during the field trials.

they could to protect their crops. The early KRRS representation of societal threat was pushed aside by a small farmer in South Africa, T.J. Buthelezi, who had experienced both Monsanto and Bt cotton: "But even if they [Monsanto] weren't good to us[and they were], Bt cotton has proved to be the best thing to put money in our pockets. I wouldn't care if it were from the devil himself [Gilbert and Lee 2001]." What is missing from the representation of farmers in the Sharad Joshi defense of the Bt cotton is societal externalities: how safe are the seeds? Is India dealing with "the devil himself"? We now know that Bt cotton seeds are profitable, that farmers with experience want them, and that they do well in Indian conditions. What is the threshold of social risk? Contests in this realm place science at the center of politics.

Promethean Science, Pandora's Jug: Disputes over science produce much of the contentious politics of GMOs. Science as neutral method for adjudicating truth claims is subordinated to science as a target or legitimation in strategic deployment of findings by corporations, government agencies and NGOs. Science becomes less method than political arena. Specifically, applied biological science comes not as mode of inquiry and applied knowledge relevant to basic needs, but as a locus of politics contesting questions of national sovereignty, international power relations, meanings of development, biopiracy, ecological risk and a host of complications surprising to self-identified scientists. "Junk science" is perhaps the most common epithet hurled at Vandana Shiva -- who answers in turn with charges of "imperialist science." "Western science" as derogatory identifies a mode of thought that claims for itself no geography.

In the normal use of the phrase, Promethean science implies that science is itself neutral, like fire, neither a blessing nor a curse. Science can, for the Prometheans, like fire, be used for good or evil.⁴² In Greek mythology, Prometheus was given the task of allocating useful traits to all the animals; when he got to humans, all the good qualities (excellent sight, defensive weapons like claws, etc) had been allotted. Fire was left, and it had the power to subdue the other animals. In granting fire to humans, there was recognition that it would confer great powers and comforts to the species, but also great risks to humans and others. Conservation problematics organized around the ethics of species mastery were

⁴² The phrase in this context comes from Ismail Serageldin and G.J. Persley, 2000. For a broader view of Promethean worldviews concerning science and the environment, with corresponding policy implications, see Dryzek, 1997.

born in fire: only one species can extinguish others, either at will or by accident. Zeus punished Prometheus for his hubris by chaining him to a mountain where a vulture consumed his liver until his rescue by Hercules (at least in the version of Aeschylus). The camp of cautious interest in GMOs in India -- most identified with the distinguished scientist M.S. Swaminathan -- could be considered Promethean: there are risks but great potential for human progress. Swaminathan (2001) for example, discusses transgenes conferring drought resistance as a potential means of coping with global warming, and its salt-water intrusions, in poorer nations such as India. He recognizes “the power of genetic modification to do immense good to agriculture and food security.” At the same time, he argues: “Unless research and development efforts on GM foods are based on principles of bio-ethics, bio-safety, bio-diversity conservation and bio-partnerships, there will be serious public concern about the ultimate nutritional, social, ecological and economic consequences of replacing numerous local varieties with a few GMOs.”

Implacable opponents of GMOs implicitly argue that we are dealing not with Promethean promise and risk but with Pandora’s jug, with correspondingly darker connotations. Pandora was in Greek mythology the first woman on earth, given by Zeus to Epimetheus, brother of Prometheus. Prometheus and Pandora were thus related from the beginning. Pandora came with a sealed jug -- or box in some versions of the tale -- that was not to be opened. When it was, all evils that afflict the human species escaped; only hope was left behind in the jug. Pandora’s very name means “all gifts;” her jug however came to symbolize what Microsoft calls “unexpected errors” -- that is, unanticipated consequences of a normal human trait (curiosity).

The global debate on genetic engineering largely falls into the cleavages introduced by Prometheus and Pandora. A great wall has emerged between camps that believe the biological revolution is more like fire – a source of currently unimaginable human progress which nevertheless is risky if used unwisely – and those who believe it is more like Pandora’s jug, set to unleash unknown, perhaps unthinkable, evils on the species if allowed to escape its confines in laboratories.⁴³

⁴³ Anthrax as bioterror threat in the United States has created a new round of debates on whether or not genetic engineering is the source of new risks represented by bioterrorism. See Vandana Shiva’s comments from **The Hindu**, <<http://www.hinduonnet.com/stories/0519134i.htm>>

Within South Asia, India has made the most systematic efforts to cope with the biological revolution and its globalizing pressures.⁴⁴ Under consideration in Delhi now are domestic measures to implement India's obligations as a signatory to several international treaties. First, the Agreement on Trade-Related Aspects of Intellectual Property Rights of the World Trade Organization requires that India amend its patent law regarding intellectual property. Patents on novel organisms fall under this rubric. Obligations under the Convention on Biological Diversity (CBD) necessitate changes in the national system for dealing with real property as it intersects with biodiversity and habitats; the response is the Biological Diversity Bill. The response to TRIPS is both the Protection of Plant Varieties and Farmers' Rights Bill and the Patents (Second Amendment) Bill.⁴⁵ The political divides on these issues are deep.

India is poised between the European and American views of Promethean science. Though the positions are considerably more sophisticated, one may view this as a contest between the positions of Vandana Shiva and M.S. Swaminathan. The optimistic side of the argument -- more evident in the United States than in Europe -- deploys poverty as a major theme for legitimation. The views of biotechnology as a means of ending poverty, as adopted by both Indian firms such as Mahyco and more globally by the multinationals such as Monsanto, resonate domestically with the Nehruvian faith in modernization and science. In a very organicist fashion via this logic, modernization overwhelms poverty, which is a residue of backwardness. There is an underlying discourse of Malthusian logic: population pressures require a step up to more productive and adaptable technologies if progress on poverty is to be made. The clearest global representation of this argument is the Rockefeller Foundation -- which supports biotechnology along with traditional techniques (green manuring, biological pest control, etc) as a means of feeding the global poor -- who have cyclically emerged and disappeared as an object of policy -- over the next decades. The "doubly green revolution" replaces the seed-fertilizer technologies of the 1960s and is required by continuous

⁴⁴Sri Lanka recently banned GMOs altogether, then under pressure, released the ban.

⁴⁵ For a useful outline of the issues and the implications for property systems, see Phillippe Cullet, "Biodiversity Legislation Reflects India's Obligations," **The Hindu** 22 February 2001. For the official response of the Indian Government to questions of property rights and the WTO, see Shri Shripad Y. Naik, Minister of State in the Ministry of Agriculture, **Rajya Sabha Unstarred Question No. 4565**, April 27, 2001. The Minister views WTO rule-setting as an alternative to the bilateral pressures which have characterized dependency.

expansion of the mouths to be fed.⁴⁶ The 2000 meeting of the Indian Science Council, in similar vein, discussed biotechnology under the conference theme of “Food, Nutrition and Environmental Security,” a set of associations abhorrent to the NGOs that protested the event.⁴⁷

A Biotechnology for the Poor?

Visions of food security and nutritional improvement from genetic engineering resonate with earlier policy debates in Indian agriculture. The "green revolution" as political symbol crystalized this cleavage on both dimensions: Malthusian assumptions and a benign view of science and technology as saviors -- as what is left in Pandora's jug rather than what has escaped. Its critics pointed to class-skewed rates of adoption and inequality of outcomes, whereas scholars such as Michael Lipton looked at aggregate effects and argued that poverty would have worsened in the absence of massive production increases: food prices are always higher under conditions of scarcity than under conditions of plenty.⁴⁸ Poverty was at the core of disputes over technology and strategy. To deal with the poor, political parties adopted either a land-redistributive stance (on the left) or moved to subsidize agriculture with nominal targeting for the poor (the dominant response). Neither worked very well nationally for the simple reason that a coalition for the poor is hard to mobilize; public programs confront local power that can either veto or coopt.

In terms of conventional poverty analysis, bioengineering and technology represent a frontier where the usual modes of analysis do not apply smoothly. Yet there is deep resonance with questions of property rights and the role of the state. These traditional questions are complicated by the presence of an international system pressuring the final dismantling of the nationalist economic project of

⁴⁶ The most comprehensive statement is by Rockefeller's President, Gordon Conway, 1997. **The Doubly Green Revolution: Food for All in the 21st Century**. New York: Penguin Books.

⁴⁷ Biotechnology is frequently used as a synonym for genetic engineering, though GE constitutes only a part of the whole. Tissue culture and marker-aided selection are frequently used techniques in biotechnology for plant breeding.

⁴⁸ Lipton, Michael with Longhurst, Richard, 1989. **New Seeds and Poor People**. Baltimore: Johns Hopkins University Press.

Nehru. It is because India has become a party to international agreements that controversial changes in domestic law are required. Linking protests against globalization -- which is held to be self-evidently anti-poor -- to the biology of crops grown and consumed by the poor has been an important political move among NGOs. Nationalism has been deployed alongside themes of environmental risk and cultural challenge: a new call for *swadeshi* in agriculture and Luddism in the fields. The dramaturgy is set for powerful and rich multinationals against rural India.⁴⁹

Yet proponents of biotechnology argue that the poor are **their** constituency. This argument has several elements. First, existing of technologies and dynamics in unequal agrarian systems are hardly pro-poor. Second, the "traditional" seeds romanticized by critics of biotechnology are inadequate in terms of yield and adaptability to existing farm-level constraints; heritage seeds are wonderful if they will feed the family. Third, higher farm net revenues may well result from reduction of purchased inputs such as pesticides and higher yields, as was the case in Bt cotton; in this sense, the new technology may be more scale-neutral than the old. Finally, biotechnology presents the capacity in principle to address the specific needs of the poor (who are often left with access to only marginal land and inadequate water). For example, a plant that is engineered to be drought resistant and to tolerate poor soil may be tailor-made for the poor farmer. M. S. Swaminathan is enthusiastic about engineering for saline resistance. And there is of course the prospect of "golden rice" and a whole class of nutritionally superior grains; as the poor are disproportionately dependent on grains for calories, such advances would disproportionately benefit the poor.

In any event, property rights are still fundamental to real outcomes. The "green revolution" favored those with deep pockets and access to the state, particularly to subsidized, often *de facto* free, farm credit. Property rights condition the effects of technical change on the poor along several dimensions. First, what will biotechnologies cost? Their cost is a function of property rights of developers of new strains. No one thinks Monsanto is in the charity business. On a global scale, the war⁵⁰ between property rights and the needs of the poor escalates with the

⁴⁹Stig Toft Madsen, in "The View from Vevey," *EPW* 9-27-01 (??), underlines the problematic representation of "farmers" in "farmers' movements."

⁵⁰ Not to be melodramatic, the metaphor is Kristin Dawkins' in *Gene Wars*.

incorporation of development costs and profits into the price of seeds – indeed the opportunity cost of capital is deployed by multinationals as a cost. If development costs are legitimate for private capital to recover via sales, poor farmers may well be priced out of the market.

There are three immediate caveats. First, the Bt cotton experience offers a counter case: net profit increases of the magnitude experienced in India make higher expenditures on seeds rational. Even paying black market premia for illegal Navbharat 151 seeds, farmers did very well financially. Second, markets are international. Immediately following the success of Bt cotton came the announcement of an agreement between Nath Seeds and the Biocentury Transgene (China) Company, to introduce transgenic cotton technology in India. Biocentury's patents are for Bt and Bt+ genes developed by the Biotechnology Research Institute (BRI) of the Chinese Academy of Agricultural Sciences and applicable across a range of crops besides cotton [The Economic Times December 26, 2001]. The third caveat is contained in the second: the Chinese Bt and Bt+ genes were developed in the public sector, where profit alone is not the driving mechanism and the cost to users will be lower than Monsanto's.

The easy assumption that globalization is conceptually coherent and monolithic, as assumed in the protest discourse, is increasingly dubious as a proposition. One reason is market segmentation. Partly in response to political pressures opposing GMOs, multinational firms seek profits in countries with rich farmers but provide the technology free or at cost to poor nations. The much disputed "golden rice" falls mainly into this category. Its promises of alleviating some of the Vitamin A deficiency that kills millions yearly, and leaves hundreds of thousands more blinded, would be transparently ridiculous if all development costs and patent rights had to be covered in the cost of the seed: nobody poor could afford it. Second, there is the path-breaking South African AIDS-drug resolution, in which property-rights claims of multinationals were attenuated to compensate for the poverty-level of nations needing the drugs. At a more distal level of operation, as political practice has focused on biopiracy, the global property regime has begun to be specified in terms that have real consequences. Who owns the genetic material that forms the components of biotechnology as process and outcome? The Rio treaty (CBD) says the state owns biota; the poor throughout India, particularly in *adivasi* areas, contest Delhi's claim to ownership of nature and terrain. The Rio treaty enjoins governments to find ways to establish "benefit sharing" so that the poor can profit from the biodiversity which they have

preserved through the absence of "development." What are the politics of moving toward that intriguing possibility? The new *panchayati raj* institutions in India offer both new prospects and a hint of severe problems to come.

There is implied in the above an empirical question and a political question. Empirically, it is not well understood how biotechnologies will affect the poor in India. For example, pesticide-producing crops such as Bt cotton, which have spread rapidly in China, reduce applications of market-purchased pesticides. Such reductions presumably favor poorer farmers, but reduce demand for labor in application, presumably at the expense of wage laborers. Those same laborers then gain some health advantage -- avoiding pesticides -- but lose daily wages. Whoever drinks surface water or shallow well water -- often the poor -- benefit from less poisoning of the water, but may have less work. Second, the yield advantages of GE crops are not to date dramatic; the effect on consumer prices and farmer income may not be large, though it is precisely these effects that are centered in the firms' presentation of their technologies as saviors of the poor. Third, we do not know what mix of private and public ownership of the technology will result, and this question affects costs of production for all farmers. The empirical ambiguities are huge; though both sides in this debate present their case as rooted in clear evidence, the evidence is in fact mostly absent.

This debate itself replicates the venerable question of who speaks for the poor, and on what basis. Yet the issues are different in at least one important way: the poor know very well what variable distributions of land and credit and wages mean for their well-being. There are long-standing struggles on these issues. Biotechnology inhabits a murky area of the politics of expertise: much that needs to be known is either not known or known to very few. For this reason, I expect the politics of poverty around biotechnology to exhibit some novel characteristics. It is not yet clear how political actors will determine what resonates with both the mass public and with the poor on GMO issues. As GMO politics is in its infancy, these questions remain tantalizing but unanswerable. The Bt cotton controversy offers a glimpse of the antinomies of protest. What we can do now is clarify what is at really at stake, beyond the rhetoric of suicide seeds and miracle plants.

Solution Sets and Politics: What is Really at Stake?

Politics about institutions typically has a solution set. In the GMO debate, the politics about institutions distributing property rights is in theory amenable to

compromise, conciliation, reform; there are models on the table and historical precedents. Owning nature is a venerable question, to which biotechnology adds new questions but within familiar normative frames. The politics of expertise, on the other hand, introduces issues on which there is no comparable set of compromises or institutionalized public logic of resolution.

1) *Property and Markets*: Many of the controversies around genetically engineered seeds in India are reducible to property claims. An alternative property system would undercut the protests based on three large issues: biopiracy⁵¹, MNC dominance, and bondage of farmers to seed companies. Poverty is mostly an outcome of property regime, and there is no mystery how to make purposive alterations. Ironically, the international property regime in place before the Rio convention of 1992 was better suited to development of a biotechnology that might be useful to poor farmers, as the international public sector commons was dominant. Under current conditions, the drive for a uniform global property system under the auspices of the WTO admixes genetic engineering with private property in ever smaller bits of nature, making it politically difficult to isolate the policy question of genetically engineered crops *per se*. This piece of contentious politics could go away with a reinvigorated public sector, both nationally and internationally. With appropriate property institutions, most importantly a strengthening of both national and international commons holding germplasm and conducting research, many of the concerns about adverse effects on national sovereignty and poverty would recede. This system worked for many decades. With appropriate property safeguards to prevent biopiracy [e.g. Svarstad and Dhillon 2000], fears of threat and loss of specifically national property would be mitigated. These issues are separate analytically from the core problems raised by the biological revolution itself, ones not so easily resolved through appeals to an obvious public good. These issues concern the nature of the natural, risk and uncertainty.

Farmers' protests in Karnataka and Andhra Pradesh in 1998 were less about the unnatural character of genetic engineering that looms large in the international protest movement than about a new bondage to multinational corporations. The

⁵¹ In **Indian Farmers Petition**, a resolution of the Forum of Farmers Organizations on Globalization and Agriculture, 30 May, 1998, New Delhi, we find an attack on "biopiracy of the rich heritage of knowledge of our farmers and tribals and their resources by the First World nations, their research institutions and their multinationals."

resistance language stressed “invasion” of foreign companies – Monsanto most directly – and *swadeshi* as an alternative strategy, echoing the Gandhian emphasis on national self-reliance. Indeed, the argument from India looks more like a disagreement with the international division of labor, wealth and power than a dispute over genetic engineering. Globalization dominated oppositional discourse and targets. The property system enabled by genetic engineering is indeed one likely to be dominated by Western capital,⁵² but not from any inherent necessity. The first wave of Bt cotton came via Monsanto; the next may well come from China, derived from public sector research there.

It was this view of dominance and subordination that undermined the protest movement, because it is objectively inaccurate, as farmers learned. The opponents of GMO seeds spoke of “terminator technology” of a giant multinational corporation enslaving farmers. The reality was GMO seeds being widely and vigorously propagated and bought even at high prices because they gave farmers better profits. Sharad Joshi called Navbharat Seeds, the agent of seed subversion, “Robin Hood.” Farmers value freedom, in the first instance freedom to choose seeds; when the NGOs and the state interfered with that freedom, farmers took to their own *satyagraha* -- for Bt cotton. Freedom from dependence on the pesticide firms and the debts incurred from expensive but increasingly ineffective pesticide use meant more on the ground than a hypothetical threat of dominance by distant Monsanto. It was not clear on the ground how Monsanto or anyone else could force any Indian farmer to plant anything. Farmers vote with their plows, as the stealth movement for Bt cotton demonstrated.

2) *Risk and Uncertainty*: The second fundamental divide concerns risk. In the oppositional view -- that humans are “playing god” -- the risk to nature and to the species is grave, though unknown; we simply do not know what is in Pandora’s jug. On the other side, among the Prometheans, the totemization of risk is held to be utterly inappropriate: there is no progress without risk, indeed no life without risk. Academics seem to be especially risk-averse, and academics contributed heavily to the presentation of GMO seeds as bearers of risk. Everyone knows that

⁵² In **Indian Farmers Petition**, a resolution of the Forum of Farmers Organizations on Globalization and Agriculture, 30 May, 1998, New Delhi :“The liberalization and globalization regime have been destroying India’s resilient crop diversity and culture of sustainable agriculture through multifold attacks.... The loot and patenting of our bio-resources have increased under the WTO and trade liberalization regimes.” On corporate global control, Charles 2001; Shiva 2000.

flying on airplanes, driving a car, having a vaccination, breathing air in cities -- all these activities entail risk; most accept these and other risks in everyday life for the benefits obtainable thereby, but some do not. I fly in airplanes regularly; my mother will not fly at all. There is no settling that argument by appeal to any probability distribution.

The problem with genetic engineering to date is that we are dealing with uncertainty, not risk: critical probabilities are not known, perhaps unknowable. Moreover, there is no individual-level choice about environmental risk. In the absence of labeling, even informed choice about risk is difficult to obtain for those who fear ingestion of GMOs.⁵³ Indeed, in the United States, GMOs have so permeated our food system that it is virtually impossible to avoid them. Given how much is unknown, rational calculation of risk and benefit is less possible; politics is dominated by interests, on the one hand, and by fear or hope -- the bottom of Pandora's jug -- on the other. Second, the globalization of genomics manifests a spatial differentiation of expertise that divides the globe on issues at the biological frontier. Who can assess risk? Risk to whom? Who will decide?

3) *The Nature of the Natural*: There are, quite naturally, divergent views of the natural. First, there is the divide between those who see genetic engineering as fundamentally unnatural and those who see it as a continuation of a process of human manipulation of "nature" that has been going on for at least 6,000 years.⁵⁴ In the great natural war between trees and grasses, humans have intervened on the side of the grasses, creating things we now consider quite natural -- wheats, maizes, rices, millets -- and destroying their competitors the trees by giving grasses

⁵³ Recent Eurobarometer data indicate the primacy of choice in European concerns about GMO foods. Interestingly enough, education does not decrease concern about risk, contrary to findings about other risks of this type. "Europeans Want Right to Choose on GMOs," **Agbiotechnet**, <http://www.agbiotechnet.com/news/database/guestnews.asp>

⁵⁴The most provocative recent statement of this process and its impact on societal evolution is Jared Diamond's **Guns, Germs and Steel: The Fates of Human Societies**. New York. Norton.1997. For a view that biotechnology is no more than a more efficient extension of the same process, see Alan McHughen, **Pandora's Picnic Basket: The Potential and Hazards of Genetically Modified Foods**. Oxford. Oxford University Press. 2000.

privileged spaces (fields).⁵⁵ Genetic engineering enables this process of instrumental reconfiguration of plant genomes to proceed more rapidly and more precisely. The human species, if it has been playing god historically, is now potentially a more efficient god. The cultural and political divides on this question are more chasms than *nullas*.

Perhaps the greatest irony in this opening round of conflict over GMOs sprouts from the “terminator technology.” One of the unknowns about agrobiotechnology that worries ecologists is gene flow. As systems evolve over very long time periods, there is no way to ensure that some nasty surprises will not result from gene flow. This problem is aggravated by the transfer of technology from areas of relatively low biodiversity (plants tested in Iowa, for example) to areas of high biodiversity (tropical agriculture, for example). The terminator technology that was centered in the GMO debate in India did not exist in any actual plants, with beneficial consequences for the pirates of the Bt cotton transgenics. Yet a terminator technology is one solution to the gene flow problem. It was the cultural offensiveness of terminator seeds, and their transparent profit-motivated application, that made them targets [albeit hypothetical targets] of anti-GMO agitation.

Whether or not genetic engineering constitutes a fundamental break in manipulation of plant genetics represented by thousands of years of breeding depends in part on a more fundamental cognitive divide between an **organismic** view of nature and a **molecularist** view. From the organismic perspective, putting a fish gene into a tomato -- the most common of examples used by opponents of genetic engineering -- violates some threshold of the unnatural. Some geneticists think crossing kingdom boundaries is more risky than closer crosses, others think not. For the pure molecularist, there are no fish genes or tomato genes, just variable organizations of bases in DNA: all life is composed of the same stuff, just differently arranged. For the organismist, species constitute the natural world; to disturb this order is to assume the thoroughly unnatural role of god.

There are few spheres of globalization that match genetic engineering in terms of the anxiety with which citizens contemplate science. In political contests,

⁵⁵ See Michael Pollan, **The Botany of Desire: A Plant’s Eye View of the World**. New York. Random House. 2001. In Pollan’s view, if plants were instrumental, they could be seen as using human agents for their own evolutionary goals, rather than vice versa.

science has become an object of conflict, rather than an arena for adjudicating truth claims.⁵⁶ These divisions are politicized and stand in the way of breaking information asymmetries. To take the India case: if the Vandana Shiva camp wins out over that of M.S. Swaminathan, India will be a marginal player in a game in which it could be a leader. Western firms will increasingly hold knowledge monopolies that will be reinforced to the extent that Pandora's jug dominates discourse in the South. Scientific knowledge is a classic global public good. Yet access to this public good is in the real world powerfully skewed, filtered by politics and institutions.

The globalizing process induced by rolling implications of a biological revolution is then mediated by property and by views of science. At stake, then, first of all, is the politically contentious issue of owning nature and conceptualizing what is to be owned. Natural systems have historically provided living laboratories, counter-intuitive insights and raw materials for technical innovations. Yet just as advances in biotechnology increase the payoffs of discoveries from wild biota, declining biodiversity threatens depletion. In global policy terms, there is then a pressing question of the appropriate balance of public interest and distributed rights in these resources. At present, the driving mechanism is private profitability of firms with considerable political and economic clout. Convergence of an intellectual property regime at the global level, driven by TRIPS and WIPO, deters the emergence of alternative courses of action. As global property systems converge on a patent regime favored by multinational capital, there are new possibilities for adverse long-term consequences for public welfare, and more critically for the advance of independent scientific inquiry.⁵⁷ A global system of

⁵⁶ The literature is exploding. For a useful framework, see John Dryzek, 1997. **The Politics of the Earth**. New York: Oxford University Press. For an extreme view of risk and danger, see Kristin Dawkins, 1997. **Gene Wars: The Politics Of Biotechnology**. Seven Stories Press (Open Media Pamphlet Series). Specifically on ethical dilemmas, see Leissinger, K.M., 2000, "Ethical Challenges of Agricultural Biotechnology for Developing Countries," in G.J. Persley and M.M. Lantin, eds., **Agricultural Biotechnology and the Poor**. Consultative Group on International Agricultural Research. Washington, D.C.

⁵⁷ See Horsch, Robert B. and Robert T. Fraley, 1998. "Biotechnology Can Help Reduce the Loss of Biodiversity" **Protection of Global Biodiversity: Converging Strategies**. Lakshman D. Guruswamy and Jeffrey A. McNeely, ed. Durham: Duke University Press, pp. 49-65. For the "doubly green revolution" stance, Gordon Conway, 2000, "Crop Biotechnology: Benefits, Risks, and Ownership." Paper delivered to the conference **GM Food Safety: Facts, Uncertainties, and Assessment**. Edinburgh, Scotland. March 28.

property is growing up around us, one that Robert Herdt calls “the closing of the global plant genetics commons.” Understanding that system requires attention to both global processes and local responses. How, for example, could a globalizing property regime treat contributions of the sort the United Nations used to call “the common heritage of mankind” -- a complex web of knowledge stretching backwards in time and across continents in space. In this model of knowledge, it is very difficult to carve out the value-added property rights of liberal theory conceptually. Likewise, given this historical reality and the tendency for ecological systems to ignore administrative conceits of humans, specifically **national** property claims are difficult to sustain. If there are numerous varieties of *basmati* rice, and they are grown in several nations, where does a proprietary claim for India specifically get its normative power?

Local responses to this developing global property and risk regime in India exhibit both continuities and divergences from farmers’ movement politics historically. Deployment of culturally resonant symbolic targets of protest, the dominance of movements by the more articulate and knowledgeable,⁵⁸ the plea for social justice for the weak against the powerful, deployment of Gandhian themes of mobilization and legitimation -- these and other themes represent application of tested forms of mobilization to new situations. Likewise, property is central to agrarian grievances, and rejection of novel forms of property continues a venerable tradition (Herring 2002). What is genuinely new is the politics of science in agrarian movements, and the global entanglements of the struggle. In a curious twist, active farmer involvement in the dispute has turned the *Bharat*-India divide on its head. It is *Bharat* demanding genetically modified seeds in cotton-growing areas; Sharad Joshi says the benefits of technology cannot stay locked up in cities. India is divided between the pro-technology sector and intellectual resistance, both enmeshed in global relations of support.

Finally, the divergent worldviews at conflict in the GMO contest are not reducible to deductive logic; they are to some extent rooted in cosmologies and ethics that area scholars seek to understand, but also in the antinomies of response to risk and promise presaged by the tales of Prometheus and Pandora. There are no

⁵⁸ One participant in the Nanjundasway’s Inter-Continental Caravan complained of the *neta-chamcha* [leader-sycophant] character of relations in the movement. *Chamcha*, literally “spoon” carries a more derogatory connotation than “sycophant,” closer to “brown-nose” in its original meaning.

answers in science to these essentially normative questions; their resolution will be political, but it is through a politics quite different from that we have previously understood in agrarian movements in India.

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