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Biofortified Crops and Biotechnology: A Political Economy Landscape for India

Bharat Ramaswami
Indian Statistical Institute

Micronutrient deficiencies are responsible for major health problems among the poor in India. Biofortification promises to be a cost-effective approach in enhancing the intake of micronutrients. However, it requires government support in terms of resources and regulatory climate. This paper assesses the political receptivity to biofortification especially when it may involve genetic engineering. The paper draws on an understanding of political economy of pro-poor policies as well as the political responses to Bt cotton—the only GM crop that has received regulatory approval. The paper argues that mainstream political parties are unlikely to take strong positions on biofortified crops—whether in favor or in opposition—unless it affords an opportunity to politically mobilize farmers. If it involves genetic modification, biofortified crops will certainly be opposed by NGOs opposed to biotechnology. The extent of support from the scientific community will depend on whether the health and nutrition community is involved.

Key words: biofortified crops, GM foods, political economy, India.

Introduction

Goiter due to iodine deficiency, blindness due to Vitamin A deficiency, and anaemia due to iron and folate deficiency remain major public health problems in India. Nutritionists ascribe these problems to the low intake of fruits and vegetables, poor bioavailability of iron, and lack of universal use of iodized salt. Surveys in India show that the diet of women in poor households is particularly deficient in milk, yogurt, and fruits (Ramachandran, 2006). While a diversified diet can ensure adequate intake of micronutrients, the poor tend to rely on the cheapest calorie sources that are principally staples such as rice and wheat. As income rises, the percentage of food expenditure devoted to fruits and vegetables, milk, poultry, and meat increases and the problems of micronutrient deficiency diminish. But what can be done in the interim to thwart the health problems stemming from micronutrient deficiencies?

The traditional approaches have relied on fortification of commonly consumed foods, such as flour, milk, oils, and salt, and the distribution of supplements, such as iron-folate and vitamin A tablets. A more recent idea is to breed new varieties of food crops so that they contain enhanced amounts of these micronutrients. Biofortification, as this approach is called, holds the promise of being cost-effective because it involves only a one-time investment in plant breeding. Depending on the crop and the nutrient that is targeted, biofortified crops can be developed by either conventional plant breeding techniques or through genetic engineering.

Whether this approach will be pursued and the promise realized will depend on a number of factors. Important among them would be the extent of R&D resources that are allocated to this effort. Biofortification will necessarily have to be driven by public funding. Private investment in developing new varieties can earn returns only on hybrids or if there is some form of intellectual property rights that restricts farmers from saving and selling seed from their crops. This is not the appropriate model for biofortification that targets staple crops and the widest dissemination. Government support is also necessary for a stable regulatory climate, especially for biofortified crops that are genetically engineered. But will government support be forthcoming?

This paper examines how biofortification is likely to be politically received in India. The paper draws on an understanding of political economy of pro-poor policies as well as the political responses to Bt cotton—the only GM crop that has received regulatory approval.

Political Economy

Political economy models (of the median voter type) typically predict that a country with high inequality and representative governments would pursue policies aimed at redistribution rather than economic growth. As a result, such countries would grow slowly and the political environment would be pro-poor rather than pro-business (if not actively hostile to it). This could explain

why socialist ideologies promising restraint on capitalist market systems have been prominent in political rhetoric and have inspired dozens of legislations.

Such models are, however, too simple. Firstly, they presume that pro-poor policies are necessarily inimical to growth. This is hardly the case with investments in primary health care or elementary education. Second, they abstract severely from the political process. While the median-voter-driven model no doubt produces pressure for pro-poor political rhetoric, it does not explain why, despite electoral politics, India's record in health care, education, or even in providing modest safety nets to the poor has been lamentable. As has been pointed out by economist Amartya Sen and others, India's political system has responded to avert potentially disastrous outcomes such as famines (unlike pre-reform China) or high inflation (unlike the Latin American economies) in a country where the poor have unindexed incomes. On the other hand, the Indian state has not been comparably active with respect to chronic malnutrition or infant mortality. The median-voter model works to a point; beyond that, the State has other priorities dictated by organized political constituencies, whether from business or powerful community and caste groups.

A watershed year for economic policies was 1991 when the central government announced a number of economic reforms that attempted to dismantle the state-driven model in favor of a private-sector-led model of industrial growth. This was supported by reforms in taxation, tariffs, exchange rate policies, and the capital market. The macro economy has responded well to these reforms: GDP growth has averaged more than 6% annually, exports have grown impressively, and the trade as a proportion of GDP has doubled.

How have the poor fared in the period of economic reforms? This has been the subject of intense scholarly, and often politicized, debates in India. Because of some changes in data collection procedures, statistical evidence has not been impeccable, adding much fuel to the debate. Overall, the evidence is that poverty has fallen during this period, but it also seems that the rate of decline has not been as rapid as it was in the 1980s. Many believe that this is due to the marked slowdown in agricultural growth in the 1990s. Although agriculture now constitutes less than a quarter of GDP, more than 50% of the labor force works in this sector and, therefore, its relevance to poverty is far more than its contribution to economic growth. In terms of politics, therefore, and despite the success of market reforms in speeding up economic growth, socialist themes retain their wide resonance and indeed the electoral verdict of 2004 which saw the return of a Congress led coalition to power in the central government was widely seen as a rebuff to the losing coalition which widely advertised a prosperous "shining" India on the basis of GDP growth alone.

Economic Reforms and the Political Landscape

A prominent political scientist has speculated that the economic reforms (including 1991 but also predating it) were the result of a growing coalition between the governing groups and business working to move India closer to the East Asian model (Kohli, 2006). If true, it is not clear what realignment of political forces allowed such a coalition to happen. Perhaps the State always possessed such autonomy or perhaps the creeping reforms lulled the opposition until the coalition was strong enough.

Nonetheless, it is clear that today there are several industry groups that underpin the political strength of big business (that were noticeably absent, say, in 1980). The economic liberalization of the 1990s has spawned business groups that have a strong interest in the continuance of economic reforms. Among the front-runners are information technology (IT) and business process outsourcing (BPO) firms that have benefited from India's integration into the world economy. Although a small part of India's GDP, they have been hugely important in stabilizing external sectors and the country's balance of payments. They also do not carry the stench of the old style family businesses that flourished in the pre-reform period by managing political contacts and rent-seeking on licenses and quotas.

The emergence of strong business groups from the ranks of first generation entrepreneurs (IT, BPO, telecom, pharma, biotechnology, and now increasingly engineering) have not only overturned longstanding hierarchies but also been a powerful source of inspiration to India's middle classes who have seen it as their biggest guarantee of success because they ensure rising premiums to professional skills. Overseas firms such as GE, IBM, Motorola, and Microsoft have played a large role in this story and in dissipating the traditional fears of foreign businesses that hung over from the colonial experience.

Evidence is now accumulating that parts of India's manufacturing sector (widely considered as laggards relative to China) have also responded well to the challenges of economic openness and have been successful in capturing international markets. As the growth story

becomes more broad-based, the political strength of business groups also becomes wider and deeper. Old style capitalism has not vanished, though—it is still important in the allocation of land for industrial and urban housing and also in sectors where regulators have the power to decide entry and pricing (e.g., electricity distribution, aviation, telecom).

Economic reforms have empowered state governments, and India is more federal than before. The so-called second- and third-generation reforms depend more and more on state governments and nowhere is this more clear than in the agricultural sector. States vary in their political economy, especially in the commitment of the political class to substantive anti-poverty policies. The central government, which is unlikely to be governed by anything other than a coalition, is therefore likely to feel political pressures on its economic policies depending on where (i.e., which states) it draws its support.

Pro-Poor Agenda

India has a strong tradition of Left politics. Typically, communist parties have controlled 10-15% of seats in Parliament. Sympathy for traditional socialist positions has also existed in centrist national parties, most notably the Congress. The primary constituency of the Left is the organized working class—in industry and in government, especially the public sector. With respect to the rural sector, the Left's principal position has been to emphasize land reforms that would redistribute land to the landless agricultural workers even though the average land holding is small and is getting progressively smaller due to population pressure. Other than this, the Left's interest has been to see that the food subsidy regime is not reformed, despite evidence that this would not be useful to the poor in most parts of the country. On agricultural technology, the Left does not oppose it but is generally suspicious of "technocratic" fixes. It would be even more skeptical of new plant varieties when they are sold by the private sector and multinationals.

Parties other than the Left are distinguished by a lack of a coherent pro-poor agenda. The mobilization of political constituencies along community groups (religious and caste)—referred to popularly as identity politics—has left little space in traditional politics for serious engagement with pro-poor agendas. Policies are populist (writing off farmers' debt, free or highly subsidized pricing of electricity, allowing slum dwellers to squat on public land) and meant to be symbolic.

The most active opponents of agricultural research are the new social movements that have gained force since the Bhopal gas disaster of 1984. Modern technology and science is regarded as an ideological cloak for hegemony by national and western elites. Traditional knowledge—about plants, animals, forests, medicines, rivers, and so on—is seen to have served people well. The more thoughtful of these critiques does not romanticize traditional knowledge but contrasts it favorably with technocratic interventions that endanger the environment and the livelihoods of the poor.

The strength of these social movements has varied from case to case. In some instances, but not all, they have enjoyed some popular grass-roots support. Their ability to influence policy is not just determined by the degree of popular support. As Varshney (1999) points out, there is both mass politics and elite politics. The latter, which is played out in committees, commissions and courts, is important whenever an issue does not receive popular mobilization as has been the case with most economic policies.

Although these social movements generally accuse the government of anti-poor policies, the welfare of the poor is somewhat incidental to their primary purpose of resisting the hegemony of western knowledge systems. An important exception is the movement that is built around the right to food, employment, and information. Here the agenda is expressly framed in terms of the poor and it has the most articulate pro-poor agenda.

Within the government, public sector agricultural research and extension continues to be neglected despite the accumulated evidence about the favorable impact of agricultural productivity growth on rural poverty. The problem is partly resources, the proportion of agricultural GDP spent on research is declining, but not entirely so. The agricultural research system is organized for bureaucratic accountability in terms of targets for funds spent, workshops organized, and person-hours utilized. However, in terms of output, the system's performance has declined. Despite many reviews, reforms have not been implemented. Because of the preoccupations of the Left parties with land reforms and food subsidies and the non-Left parties with identity politics and populist policies, there is no political constituency for effective agricultural research.

The Politics of Bt Cotton

Hybrid varieties of Bt cotton were first approved for commercial release in 2002. Prior to that, these varieties spent five years in the regulatory process. The applica-

tion was repeatedly challenged by various NGOs, including through the courts as well as by direct political action. According to newspaper accounts, the regulators delayed approval by at least one year beyond what was necessary. More Bt cotton hybrids were approved in subsequent years. By 2007, regulators had approved 137 varieties of Bt cotton hybrids, incorporating within them four events supplied by three different companies.

By 2006, the approved Bt hybrids had rapidly diffused to occupy more than 9 million acres out of total cotton acreage of 22 million acres. Statistics for one of the leading cotton-growing states, Gujarat, suggest steadily increasing productivity since 2002. India had the lowest cotton yields among the major cotton growing countries. In 2006, India was expected to export record quantities of cotton. Although adoption of Bt cotton has been biased towards larger growers, there is not a substantial difference in the rates of adoption between large and small growers. The success of Bt cotton has significantly boosted grower incomes. Yet, Bt cotton has not been pushed on a pro-poor agenda. Its success is owed to different factors.

Despite the political mobilization sought by NGO groups against biotechnology and Bt cotton in particular, that never happened. No political party took an active interest either *for* or *against* the technology. The issue was then contested through elite politics—in the courts, in government ministries, and in the regulator's office. Within the government, three departments—biotechnology, environment, and agriculture—are actively involved and they have their interests.[1] The regulatory process has had to deal with turf disputes between scientists and bureaucrats and between scientists commanding different types of expertise (i.e., biotech lab experience, agricultural field experience).

As might be expected, the department of biotechnology is generally supportive, while opponents of biotechnology besiege the environment ministry. The agriculture ministry's role has been primarily defensive. Its research system has been slow in devising a research agenda for biotechnology and its primary concern has been that it should not be upstaged by the other government departments or by the private sector. As a result, it has pushed for a regulatory process where it acquires greater say in the decisions. Outside the government, biotechnology has been pushed by mostly multinational firms with some domestic participation as well, while it has been vigorously opposed by many NGOs. The fault lines that appear internationally have been evident here. While the NGOs receive support from similar groups in Europe, the United States has used its diplomatic pressure to lobby the government.

With no compelling political pressures (in terms of mass politics) for or against Bt cotton, the approval process was dominated by lobbying in ministries and hostilities in the media. The bureaucracy, as might be expected, played it safe by asking for multiple tests and getting the Indian Council of Agricultural Research, the apex public sector research body, to organize independent field trials. With the tests not throwing up anything untoward, the supporters of Bt cotton prevailed and were able to influence the decision in their favor.

The approval for the 2002 season was preceded by the discovery in Gujarat of a Bt cotton hybrid growing in farmers' fields. This hybrid, NB151, was registered with the Gujarat government as a conventional hybrid and sold by a medium-sized seed company, Navbharat Seeds. The company claimed that they were unaware that their variety was genetically modified. In fact, NB151 used the same Bt gene, *Cry1Ac*, as was employed by Mahyco-Monsanto in the legally approved varieties. Although the gene belonged to Monsanto, it was not patented in India (such laws came into force only in 2005). NB151 was illegal because the variety had not received a biosafety clearance.

Navbharat Seeds was prosecuted for the offence and the company was prohibited from selling cotton seeds. Yet illegal seeds have diffused, especially in Gujarat, and still account for the bulk of Bt cotton plantings in India. The state government used a loophole in seed laws to choose not to enforce the biosafety regulation framed by central government authorities. Its decision is understandable. The illegal varieties posed no new dangers to biosafety, as they contained the same gene as did the approved varieties. They were also well adapted, and, in many cases, performing better than the approved varieties. Gujarat is a center of hybrid cotton seed production in India and has many seed companies and skilled growers capable of producing and distributing the illegal hybrids. With no technology fees to share with Mahyco-Monsanto, the illegal seeds business has generated large rents that could be shared with many entities including those in charge of governance.

The illegal seeds movement in Gujarat is the closest to mass politics that has happened involving biotechnology. Neither the NGO movement nor the commercial and diplomatic interests supporting "official" Bt cotton

1. *The involvement of the Ministry of Health has been marginal. This could change with the debate about labeling norms and laws for GM foods.*

Table 1. Average intake of nutrients by rural Indian children (% of recommended daily allowance).

Age (years)	Protein	Energy	Calcium	Iron	Vit A	Vit B_1	Vit B_2	Folic acid	Vit C
1-3	81	57	30	33	13	67	29	61	33
4-6	87	61	45	35	16	67	30	69	38

Note: Figures apply to moderate activity for boys and girls combined. Recommended daily allowances are based on guidelines of the Indian Council of Medical Research.
Source: National Nutrition Monitoring Bureau (2002), Diet and Nutrition Status of Rural Population, as reproduced in Gopaldas (2006).

have been able to counter it. There have been two consequences. First, within the sphere of elite politics, this incident has helped the regulatory authorities to muster strength to streamline the process for faster approvals. The beneficiary for the most part has been Mahyco-Monsanto, as most of the approvals are for Bt cotton hybrids containing genes that have been licensed by them. Second, within the sphere of mass politics, it has encouraged the demand for "cheap" seeds. In 2006, the state government of Andhra Pradesh successfully pushed for price controls on Bt seeds, a move that was aimed at Mahyco-Monsanto but may in fact have hurt its rivals who came out with their Bt products in the same year.

Micronutrient Deficiencies, Supplements, and Fortified Foods

The Ministry of Health runs three national programs aimed at combating deficiencies in iodine, iron, and Vitamin A. These were identified as major issues as far back as 1970 (Gopaldas, 2006). The iron program distributes supplements to women and children in the age groups 1-6. The Vitamin A program relies on massive doses of Vitamin A every 6 months to children up to 3 years of age. Fortification of common salt has been the focus of the iodine program. Despite this, however, deficiencies in intake of vitamins and minerals continue to be large, as shown in Table 1.

Stein (2006) has compared the disease burden of micro-nutrient deficiencies in terms of a common metric—the loss of disease-adjusted life-years (DALYs). His analysis shows that iron deficiency anaemia (IDA) is the biggest problem in India, followed by zinc deficiency (Znd) and then by Vitamin A deficiency (VAD). Although the health outcomes associated with VAD are usually more severe than with IDA, the latter affects many more people. His study highlights the problem of Znd that has not received policy attention.[2]

Nutritionists have argued that the national programs have not done a good enough job in covering the affected populations. For instance, the distribution of iron-folic acid tables or syrup did not cover more than 10% of the children in the target age group in most Indian states (Gopaldas, 2006). Informal estimates put the coverage of the IDA and VAD programs at about 50-60% of the target population. Even here, not everybody receives the recommended dosage of tablets. Similarly, while the consumption of iodized salt has gone up, non-iodized salt is still used by about half the population.

In a more recent intervention, the public distribution system (which delivers subsidized grains to its beneficiaries) in a few districts of states such as Andhra Pradesh, Gujarat, and West Bengal has begun supplying fortified wheat flour (with Vitamin A, iron, and folic acid tablets). This has been done with the collaboration of the NGO Micronutrient Initiative. Traditionally, the bottleneck in supplying the fortified wheat flour through the PDS has been the preference of the state government to distribute wheat rather than wheat flour for administrative convenience. Wheat flour is more perishable and is more easily contaminated under the prevalent handling conditions. In terms of initiatives in the pipeline, the government has funded the development of double-fortified salt (with iodine and iron) and Vitamin-A-fortified edible oil. Given the low consumption of oils among the poor, it is not clear whether the latter will be useful in meeting micronutrient deficiencies among them.

One persistent criticism of supplements and fortification is that these programs are technocratic fixes that do not address the basic causes of deprivation. The force of this criticism can be seen in Table 1, which shows significant deficiencies in terms of protein and energy intake as well. These would be quite severe for the poorer groups. Other criticisms have to do with the inherent difficulties of covering large populations with supplement distribution programs and ensuring their intake.

Neither the micronutrient deficiencies nor the programs to address it have received much political atten-

2. *Diarrhea, pneumonia, stunting, and the mortality due to these are the outcomes associated with Znd (Stein, 2006).*

tion. The iodization of common salt only briefly got entangled with politics. In 2000, the government lifted the ban on non-iodized common salt. This was in response to a campaign that sought to discredit iodized salt as a product that only pushed the profits of corporations ("the big salt manufacturers") under the garb of meeting nutrient deficiencies. The campaign did not have wide political support and lost its clout with the change of government in 2004. The ban was restored in 2006. Nonetheless, with evidence indicating that only 57% of households use iodized salt, it seems that while the ban on non-iodized salt might help, it is not sufficient to achieve universal coverage.

India runs a national program called the Integrated Child Development Services (ICDS) that seeks to provide young children (up to the age of six), pregnant women, and nursing mothers a package of services relating to nutrition, health, and pre-school education. Despite the expansion of this program since 1975, the existing coverage is limited to one-fourth of all eligible children. ICDS provides a natural vehicle for nutritional supplements and fortified foods (Gopaldas, 2006). However, there are sharp contrasts between states with respect to the quality of ICDS implementation because of the variations in political support for the program (Dreze, 2006).

Biofortified Crops

Biofortified crops have been suggested as a cost-effective way to resolve the problems of supplements and fortified foods that have limited their reach (Misra, Sharma, & Nagarajan, 2004). The special advantage of biofortification as opposed to industrial fortification is that as the plants are bred to be rich in micronutrients, the investment is one-time. Once such seeds have been developed, farmers can grow and reproduce the crops every year.

Stein (2006) has evaluated, in an ex-ante analysis, the impacts of fortified crops in India. He finds that biofortifying both rice and wheat with iron will reduce the existing disease burden of IDA by 19-58% depending on whether the projections are pessimistic or optimistic. Even in the pessimistic scenario, the biofortification cost of saving one healthy life-year is only around US$5, which is much less than the cost of existing interventions. With zinc biofortification of wheat and rice, the cost of saving one healthy life-year is US$8 in the pessimistic scenario. Finally, Golden Rice, i.e., rice fortified with Vitamin A, will save one healthy life-year at a cost of US$35 in the pessimistic projections.

If the gene pool within the species is rich enough, biofortified crops can be developed by conventional breeding. Otherwise, transgenic approaches would have to be used to employ genes from other species. An instance of the latter is Golden Rice. As there is no paddy cultivar with beta-carotene in its endosperm (the edible part of the grain after milling), conventional breeding cannot be employed.

If the inclusion of new vitamins and minerals changes the appearance or taste of the food crop, then consumer acceptance could be an issue. This is not expected to be the case with crops that are biofortified with iron or zinc, but crops fortified with beta-carotene are likely to exhibit a deep yellow or orange color. Another question is whether farmers would be willing to grow a crop that has no particular agronomic advantage; hence, the suggestion that biofortified crops should involve agronomic improvement as well in order to preserve the incentives for their cultivation. It should be noted, however, that if consumers would actually prefer biofortified staples, then the resulting demand would lead farmers to grow them even when it involves no agronomic advantage for them.

In the field, the sole example of a biofortified crop is the orange-fleshed sweet potato promoted by the Center for International Policy (CIP). This is a conventionally-bred crop and is high in beta-carotene. In India, cuttings of these crops have been distributed in Orissa, eastern Uttar Pradesh, and Bihar. The scale of the program is small. The limitation to using this program is that the sweet potato is not widely consumed in India.

Other examples of biofortified crops are being developed. Golden Rice has been bio-engineered to contain beta-carotene in the grain. In India, the public research system including the Indian Council of Agricultural Research, the Directorate of Rice Research and the Tamil Nadu Agricultural University, Coimbatore, are part of the Golden Rice network involved in adapting the technology to local varieties. However, work on Golden Rice is still in its initial stages with respect to the regulatory process. At a policy level, the government has announced a biofortification program that is modestly funded. Wheat, rice, and maize are the targeted crops. Presumably, the program will include both conventionally bred and genetically engineered approaches.

GM potatoes have moved further along in biosafety regulation. A lysein-methionine rich storage protein gene from Amaranth, *AmA*1, has been introduced into the potato tuber to increase protein value of the crop. The crop has completed field trials and now awaits a

decision from the regulators with respect to approval or the need for further testing. The scientific work has been done by the National Centre for Plant Genome Research (NCPGR) in Delhi. This institute is also using transgenic approaches to remove oxalate toxicity in plants. This technology holds promise of producing toxin-free grass peas (*Lathyrus sativus* or *kesari dal*), of which excessive consumption can cause paralysis (neurolathyris).

There is no other nutritionally enhanced crop in the regulatory process. There are projects in the greenhouse stage that are testing delayed ripening and improved texture for tomatoes. The public sector research system is also working on quality protein maize using conventional breeding but employing marker-assisted selection. This does not seem to be a project that would be relevant for meeting nutrient deficiencies among the poor.

Politics of Biofortified Crops

As it would be extremely difficult to find backing for an unswervingly pro-poor project, biofortified crops must build on support from a coalition of interests if it is to succeed. What is that coalition likely to be and what forces will oppose such a coalition?

As noted earlier, populist pro-poor announcements that are highly symbolic are very powerful politically. This is often the content of "socialist" policies. The biofortified crops agenda cannot draw much support from them or even from the more coherent agenda of the Left. However, much like agricultural research in general, biofortified crops will not draw open opposition from these groups either. Biofortified crops will receive their most hostile reception from environmental and social movements that do not accept biotechnology, especially if the crop is genetically engineered. However, their opposition can be lessened by careful selection of projects, collaborators, and traits.

All biofortified crops will be vetted by the Ministry of Health and the nutritionists. They could ensure powerful support or detract fatally from it depending on how their participation is structured in biofortification. The two nutritionally enhanced crops being considered—protein-rich potatoes and Golden Rice—are being developed and tested by biotech and agricultural scientists. Health professionals and nutritional scientists are not yet involved; if this continues to be the case, their role will only be to ask questions. On the other hand, if health and nutritional scientists were involved in agenda and priority setting, they would be powerful allies. Nutritionists have a track record of promoting fortification and supplements because they do not believe that dietary diversification is near at hand. Hence, they would be sympathetic to the rationale of biofortification. The absence of institutional mechanisms that support cross-disciplinary brain storming decreases the receptivity of novel food crops.

Agricultural and biotech scientists would, of course tend to support biofortification. Plant scientists outside the traditional agricultural research establishments tend to be more pro-science (or at least be vocal about it) perhaps simply because they are not subject to the same controls as fellow scientists in agricultural research. There are scientific institutions outside the agricultural research system that are committed to biotechnology and nutritional genomics. Plant scientists in India have been politically unaware, but the prestige of big science still works in their favor in government committees and commissions.

India's new pro-business lobbies would be supportive to a point. For them, the selling points would be the use of frontier technologies and the linkages with the international research community. They would then see this as yet another demonstration of India's technological capabilities and human capital. By contributing to brand India, it would help in drawing more business from the Western world.

The subsistence crops of coarse cereals (pearl millets and sorghum) offer the greatest possibilities of garnering political support and minimizing opposition as these are typical poor farmer crops. They are grown in harsh conditions and they are principally consumed by the poor. So while they are excellent candidates for biofortification, they also avoid the possibility of a boycott induced by affluent groups since such groups do not consume these crops. There is little possibility of overlap. The latter is a possibility with both rice and wheat and therefore these crops that are otherwise so important may not be the right crops for initial release. A biofortified subsistence crop that is supported by nutritionists and the Ministry of Health and that is developed at one of the public research institutes would be hard to resist politically. The other extreme would be a vegetable crop such as carrots or green beans (consumed largely by the non-poor) that is biofortified simply because it is easy to do so and is done so with prominent donations of technology by multinational corporations.

The big conundrum is the reaction from farmers. Despite many organizations claiming to represent farmers, they are not well organized and lack a policy vote when it comes to elite politics. However, once they are

mobilized, they become a factor in mass politics, as was seen in the case of illegal Bt seeds.

References

Dreze, J. (2006). Universalization with quality: ICDS in a rights perspective. *Economic and Political Weekly*, *41*(34), 3706-3515.

Gopaldas, T. (2006). Hidden hunger: The problem and possible interventions. *Economic and Political Weekly*, *41*(34), 3671-3674.

Kohli, A. (2006). Politics of economic growth in India, 1980-2005. *Economic and Political Weekly*, *41*(13), 1251-1370.

Misra, B.K., Sharma, R.K., & Nagarajan, S. (2004). Plant breeding: A component of public health strategy. *Current Science*, *86*(9), 1210-1215.

Ramachandran, P. (2006). The double burden of malnutrition in India. In *The double burden of malnutrition: Case studies from six developing countries* (FAO Food and Nutrition Paper 84). Rome, Italy: Food and Agricultural Organization of the United Nations.

Stein, A.J. (2006). *Micro-nutrient malnutrition and the impact of modern plant breeding on public health in India: How cost-effective is biofortification?* Göttingen, Germany: Cuvillier Verlag.

Varshney, A. (1999). Mass politics or elite politics? India's economic reforms in comparative perspective. In *India in the era of economic reforms*. J.D. Sachs, A. Varshney, & N. Bajpai (Eds.), New Delhi: Oxford University Press.

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