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Sociopolitical Effects of New Biotechnologies in Developing Countries

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Assuring food security for the next 25 years requires meeting a number of political, social, economic, and technical challenges. One of these is the successful use of new biotechnologies in agriculture. Research in recombinant genetics and biotechnology aims to develop plant varieties that provide reliable high yields at the same or lower costs by breeding in qualities such as resistance to disease, pests, and stress factors such as aridity. Realization of these goals could lead to tremendous gains in food production. However, biotechnology is now evoking the same objections that have been raised against the Green Revolution--that its benefits are distributed inequitably in favor of the large, rich farmers and that it is potentially environmentally destructive.

The sociopolitical ramifications of new agricultural biotechnologies in developing countries are extremely complex. Not only do they vary by country and by sector within each country, but they also vary for different segments of a country's population. Sound domestic policies and international cooperation can go a long way toward reducing the sociopolitical risks of these new technologies.

The Need for Biotechnology

Over the last three decades, food output in developing countries, with the help of Green Revolution technologies, has increased at a faster rate overall than population growth. This success, however, should not engender complacency about the food situation in coming decades. Growth rates in yields have been decreasing in several parts of the world recently, and this declining trend is expected to continue. At current rates of growth, the world's food supply will not be sufficient to feed the increasing population over the next 25 years, even if current per capita levels of consumption do not rise. In many countries, especially in Africa, food self-sufficiency is on the decline (Table 1).

Table 1--Food security in selected developing countries

	Average Annual Growth Rate		Degree of Self-Sufficiency	
	Population, 1991-2000	Food Production Per Capita 1979-91	1971	1990
		(percent)	(1979-81 = 100)	
Low-income countries				
+ Bangladesh	1.9	-0.6	97	87
+ Ethiopia	2.7	-1.4	99	87
+ Malawi	3.1	-2.7	101	94
+ Mozambique	2.9	-3.1	89	54
+ Niger	3.5	-3.4	108	93
Middle-income countries				
+ Dominican Republic	1.6	-2.6	64	35
+ Jordan	4.0	-1.2	48	9
+ Philippines	1.9	-1.9	94	83
+ Syria	3.4	-2.9	76	69

Source: World Bank, *World development report 1993: Investment in health* (Washington, D.C.: World Bank, 1993); Food and Agriculture Organization of the United Nations, *Agriculture Towards 2010*, 27th Session, November 6-25, 1993, Rome.

Also, although the share of the world's population affected by hunger has decreased over the last three decades, the extent of undernutrition is still unacceptably large, and several regions are suffering from worse poverty and malnutrition than 30 years ago. Although the problems of hunger and malnutrition are complex and production increases alone cannot solve them, it is one of the necessary interventions. The Food and Agriculture Organization of the United Nations (FAO) estimates that for malnourishment to be eradicated by 2010, food output will have to more than double.

In light of these conditions, an international conference of experts convened by the World Bank, the United Nations Development Programme (UNDP), and FAO in 1992 concluded that a solution to the problem of securing world food supplies while preserving the environment is virtually inconceivable without recombinant genetics and biotechnology.

The Sociopolitical Ramifications of Biotechnology

The risks from any technology must be divided into those inherent to the technology and those that transcend it. Technology-inherent risks of agricultural biotechnology, such as undesirable mutations, must be dealt with appropriately by the biological sciences. The transcendent risks are outside of the biotechnology; they are the social, economic, and cultural factors that may distort or obstruct its benefits.

Three main sociopolitical concerns exist. First, biotechnology may aggravate the prosperity gap between the North and South by replacing tropical agricultural exports with genetically engineered products produced in the North. Genetically produced vanilla flavoring--to take the most quoted example--could displace 70,000 small farmers in Madagascar. Genetically improved cocoa varieties could displace thousands of smallholder farmers in West Africa in favor of plantation farmers in the newly industrialized economies of Asia. Genetic production of sweeteners could displace the total sugarcane exports of Cuba and Mauritius.

The process of consumer substitution of new biotech products for current tropical exports cannot be forestalled, even by sizable (and undesirable) government intervention. The solution must therefore lie in a concerted international endeavor to diversify the production structure in vulnerable economies. Better governance--that is, more appropriate domestic policies--as well as more efficient allocation of funds from the international development community to support such diversification efforts, is required.

A second sociopolitical concern is the exploitation of indigenous genetic resources without appropriate compensation to indigenous populations. Some people fear that multinational firms or even government research institutes could gain control of genes of plants native to the developing world free of charge and use them to produce superior patented varieties that would then be sold back to developing countries at high prices.

Undeniably, it is urgent to keep open access to the genetic riches of the developing world and at the same time enable the people who have helped to build and preserve this wealth through decades of indigenous selection to benefit equitably from the commercial returns on gene exports. Article 19 of the Rio Convention on Biological Diversity of 1992 established that remuneration is due to developing countries for genetic material.

A step in the direction of satisfying both sides' claims to compensation would be to work out binding national and international regulations. However, the technical details concerning who should receive compensation, in what form, and how, so that the remuneration does not end up in the hands of the politically powerful, are still unclear. One solution would be to funnel compensation into development cooperation or into the Consultative Group on International Agricultural Research (CGIAR) system in order to create agricultural value added for the regions the genes come from.

The third area of sociopolitical concern is the increased inequality in the distribution of income and wealth that biotechnology might create, because the privileged classes derive earlier and greater benefits from the introduction of powerful technologies than do the socially disadvantaged. The use of biotechnology can no doubt provide real incentives to agricultural development, but in a socially and politically defective setting, it is much more likely to favor a small and powerful minority than to improve conditions for the poor. Without social reforms that enable the middle and lower strata of society to share in the gain, such as land reform and special support programs for small farmers, technological innovations can work against the development goal of equity.

The sociopolitical risks of agricultural biotechnology cannot be resolved by blaming, changing, or discarding technology. The only solution lies in addressing the risk- creating sociopolitical distortions through good governance and appropriate policies.

Different Countries, Different Effects

When considering the social and economic effects of new technologies, it is not appropriate to lump together all developing countries, with all their social, economic, and cultural differences. Countries must be differentiated on the basis ofáfactors such as their research capacity, institutional arrangements for stimulating biotech development, share of agriculture in overall exports, whether the country is a net exporter or importer of agricultural products, and the size distribution of farmers in the country. Countries must assess the impact on their economy and society in the context of these factors, and design their technology investment and sociopolitical reform strategies accordingly.

In a 1993 study, P. Commandeur and G. von Roozendaal assessed the impact of biotechnology on different countries and concluded the following:

- High food importers with strong technological potential could benefit the most, since the trends would push their economies toward self-sufficiency.

- High food exporters with strong technological potential could benefit by diversifying their exports.

- Net importers of food with weak technological potential could benefit in the short term from lower world prices. In the long term, domestic food production would suffer.

- Countries that are net exporters of potentially substitutable products and have low technological potential are the most vulnerable. This category includes most of Sub-Saharan Africa and the Caribbean.

Roles Played by the Public and Private Sectors

To prevent a further widening of the productivity, and hence affluence, gap between the North and the South, and to develop the biotechnology needed by developing countries and poorer farmers, public research is urgently needed at both the international and national levels. Most biotech research is currently concentrated in the private sector and in the North. Since private biotechnology companies operate with a profit motive, they will concentrate on solutions to be marketed primarily in rich industrial nations. However, public sector research could save time and resources through cooperation that makes the knowledge generated by the private sector available through donation of technology or favorable licenses to the public sector. Unfortunately, funding for public research at both the international and the country level is falling rather than rising.

Biotechnology offers no silver bullet for food security--there are no silver bullets--but biotechnology is an important instrument in the difficult fight against hunger. The sociopolitical obstacles must be removed not only for the successful implementation of biotechnology, but also for an equitable and sustainable tomorrow for the world.

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"A 2020 Vision for Food, Agriculture, and the Environment" is an initiative of the International Food Policy Research Institute (IFPRI) to develop a shared vision and consensus for action on how to meet future world food needs while reducing poverty and protecting the environment. Through the 2020 Vision initiative, IFPRI is bringing together divergent schools of thought on these issues, generating research, and identifying recommendations. The *2020 Briefs* present information on various aspects of the issues.