

BIOTECHNOLOGY IN THE SOUTH: THE GREAT NEW HOPE?

NOTE: The following excerpts are from chapter 13, "Green Revolution II," in Altered Harvest: Agriculture, Genetics, and the Fate of the World's Food Supply, by Jack Doyle (published in 1985 by Viking Penguin, Inc. New York City), except for the final passage which first appeared in the February 28, 1986, issue of Multinational Monitor (reprinted with permission).

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Some Third World scientists and governments see biotechnology as a way out of the fertilizer and pesticide dependencies that came with the first Green Revolution. According to former Indian agricultural official Dr. M.S. Swaminathan, now director of IRRI [the International Rice Research Institute in the Philippines], "nearly every developing country has plans or programs for harnessing the tools of biotechnology for national development."

In the Philippines, for example, the National Institute of Biotechnology and Applied Microbiology has set a high research priority for nitrogen fixation and microbial insecticides. In India the National Biotechnology Board has targeted genetic engineering, photosynthesis, and tissue-culture work among its priority research areas. But these countries are competing with wealthy multinational corporations and governments of developed nations looking to sell their genetic products or reap international prestige from the new Green Revolution. And in that race, developing countries face tremendous odds in determining their own fate.

In September 1983, the United Nations Industrial Development Organization (UNIDO) advanced a proposal for an International Center for Genetic Engineering and Biotechnology aimed specifically at the research and training needs of Third World nations. However, that idea has run into opposition from some advanced countries, including the United States, France, Great Britain, and West Germany. ...

Developed nations, which supply millions of dollars worth of agricultural commodities to the less developed countries, have a considerable vested interest in maintaining such trading patterns. And while biotechnology could radically alter global agricultural trading relationships, experts say, it will most likely do so in ways that will benefit developed nations.

"Trade in agriculture," says a 1982 paper... by the Organization for Economic Cooperation and Development (OECD), which represents industrialized nations, "is particularly susceptible to changes initiated by biotechnology." Traditional agricultural trading patterns between the indus-

trialized and developing countries, says the OECD paper, "may become progressively dislocated when industrialized trading partners suddenly become self-sufficient in "colonial crops." For example, the need for a crop such as sugar cane could be made obsolete as a result of adopting cheaper biotechnology processes which make sugar substitutes... (pp. 271-2)

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As the debate over the effectiveness of the Green Revolution continues, biotechnology and genetic engineering are now being touted for their agricultural potential in developing countries. And once again, the conventional wisdom among officials in international agencies, such as the United States Agency for International Development (AID), is that what is good for American farmers and industrialized nations will be even better for the farmers of developing countries. Says former IRRI director Nyle Brady, now a senior administrator in science and technology for AID: "In the long run, techniques such as recombinant DNA technology, protoplast fusion and the...development of truly pest-resistant plants, drought-and salt-tolerant varieties, and the energy-efficient nitrogen-fixing bacteria may be achieved." And although such developments will be of "revolutionary value" to American farmers, says Brady, they "will be even more helpful to the resource-poor farmers of the developing countries."

Brady sees the genetically improved seed becoming "the nucleus of technological packages that the Third World farmer will accept," as illustrated by "the ready acceptance in the 1960s of new high-yielding wheat and rice varieties, along with the chemical packages that made them productive." (pp. 270-271)

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American-based agricultural genetics firms, some backed and financed by multinational corporations, are now gearing up to move into the developing world. In 1982, the International Plant Research Institute (IPRI)[in California], supported by Eli Lilly and ARCO, entered two joint ventures with the Malaysian Sime Darby

Group aimed at the agricultural market in South-east Asia. Sime Darby, the largest and most profitable corporation in Malaysia with annual revenues of more than \$1.1 billion, is a major plantation owner and major agricultural influence throughout Southeast Asia.

According to IPRI's Executive Vice President Robert Abrams, one of [these] joint ventures... known as the Asean Biotechnology Corporation... "will represent one of the first efforts to apply genetic engineering and recombinant DNA technology to a broad range of tropical agricultural crops in a practical way." The second of the two joint ventures, called the ASEAN Agri-Industrial Corporation, will essentially sell agricultural biotechnology services to other companies and governments in Southeast Asia.

Norman Goldfarb, chief executive officer and chairman of Calgene [also California-based], a company now working with a Nestle subsidiary and Finland's largest chemical company, Kemira Oy, to develop genetically engineered herbicide-resistant crop strains, believes that biotechnology will help the world's unsophisticated farmers. "In Africa," he says, "there are a lot of unsophisticated farmers....you can't even expect (farmers) to drive a tractor straight; you might ask them to put the seed on the field evenly." The new products of biotechnology, in Goldfarb's view, will bring "built-in farm management" to such farmers [because they will work only in precisely instructed ways, with precisely regulated complementary inputs], and products such as herbicide-resistant crop varieties "will be good for the Third World." (pp. 272-3)

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Despite the emerging pressures from corporations and industrialized nations to push the new ingredients of biotechnology into the agricultural systems of less developed lands, there are signs that some of these countries' governments want to turn away from the high costs and treadmill nature of "modern" agriculture. In the Philippines, for example, a seed-collecting and -banking program has been initiated.... to find traditional varieties of rice, corn, and vegetables that have become scarce because of the Green Revolution. Green Revolution rice varieties now cover 6.4 million Philippine acres, 75 percent of the country's rice land. As a result, Philippine farmers now spend about forty-two dollars on chemicals for every acre planted to such newer varieties, and many have gone into debt to keep up with their costs.

"Productivity gains in cereal production," says one Asian Development Bank study on the social and economic impact of the Green Revolution,

"are coming more slowly and more expensively than they did during the past decade." But in the Philippines, it has been found that the use of local varieties -- including those of rice and corn -- in place of Green Revolution varieties can cut the high cost of farming by as much as 66 percent, creating a substantial economic impetus for collecting and saving traditional seed. "The seed-retrieval program," says Philippine program director Domingo Panganiban, "seeks to rebuild the national genetic pool of plants geared to small farmers."

In Tanzania, a new national agricultural policy now emphasizes crop rotation, composting, and village-based agriculture over the high-tech practices of the Green Revolution.... These methods, says [President] Nyerere, provide the answer to the peasants' questions about how they can increase their income without becoming dependent upon an unreliable supply of expensive fertilizers and other inputs. "When we talk about self-reliance...this is the kind of thing we should be talking about."

However, countries like Tanzania, the Philippines, and others wishing to free themselves from the dependencies of Green Revolution I or II will still need some help from beyond their borders, and most logically from the United Nations and the International Agricultural Research Centers (IARCs).

Although the IARCs may have fueled some of the problems brought on by the Green Revolution.... today there are many scientists in the IARC system who are sensitive to these problems and whose work and perspective are important as counterpoints to more purely commercial interests. As a publicly-responsive system of research and scientific opinion, the IARCs can be used as a check on the real worth of new agricultural products introduced for use in less developed countries....

Besides their new research in biotechnology and with farm production alternatives, many IARCs have also developed extensive collections of seed and plant materials, some of which are quite rare. These genetic resources will be extremely important in developing appropriate biotechnological options for Third World agriculture, as well as providing options for reinstating some of the more valuable and less technology-dependent features of traditional agricultural systems....

However, the IARCs are beginning to run into funding problems.... The total IARC budget of \$162 million [for 13 centers in 1985] is about \$100 million less than what Du Pont now spends annually on life-sciences research.... (pp.274-7)

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Some countries....are seeking a middle road hoping to combine the promise of biotech with traditional agricultural techniques. In Africa, a continent largely bypassed by the first Green Revolution, a different kind of agricultural research is developing. Recently, researchers at the International Institute of Tropical Agricultural (IITA), one of the youngest of the 13 IARCs headquartered in Ibadan, Nigeria, have had modest success developing new, better-yielding varieties of crops like the plantain, cassava, yam, cowpea, and sorghum. But genetics is only part of the picture. In Nigeria, plantain has been "intercropped" with flemingia, a fast-growing bushy-leaved legume, whose periodically pruned leaves provide a protective mulch and shade for the plantain's fragile root system. What's more, this intercropping duo is economic on 2.5 acres.

IITA's yam researchers have saved farmers money and used common sense in cutting up pieces of yam for "seed potatoes" where only whole ones were used before. A creative "herbicide" strategy of controlling weeds makes use of plastic sheeting affordable for the farmer with 2.5 acres. The yams produced from this acreage can fetch as much as \$13,000 in Nigeria.

In Kenya, researchers at the Nairobi-based Institute for Insect Physiology and Ecology found that by simply advancing the planting date of sorghum by two weeks, the troublesome infestations of the stem borer pest could be greatly diminished. With two weeks' growth, the sorghum plants effectively beat out the shoot fly population, whose damaging larvae were normally deposited as eggs on the sorghum seedlings. IITA's researchers are also conducting experiments with

various predatory insects, such as wasps, mites and beetles to control insect pests such as the cassava mealybug and the green spider mite.

High-yield agriculture doesn't have to come solely through the genes in the plant, the chemicals in the bottle, or the water from expensive irrigation projects -- it can also come through creative biology, human labor, and skilled economic organization.

Nevertheless, advanced countries are plying their agricultural producers with the latest biotechnological advances for wheat, corn, soybeans, rice, and cattle. Many have export subsidies and special credit programs ready in the wings for countries that would buy from them. This technological dominance coupled with subsidies will surely undermine the creative and common sense agricultural efforts now going on in Africa and other places.

Biotechnology is the real wild card now emerging in world agriculture. In one sense, biotechnology is a double edged sword for the Third World. It has the potential to increase the quality and efficiency of agricultural production, offering a long-awaited answer to malnutrition and foreign food aid dependency. But, it also has the potential to disrupt local agriculture and encourage further dependency on expensive agricultural imports and technology.

In many ways, it depends on who controls and dispenses this new technology. If biotechnology is vested primarily in the hands of advanced nations and major businesses, those interests will be in a position to pull the plug on locally significant kinds of agricultural development in the Third World, possibly with dire consequences for national economies and international trading patterns. (Multinational Monitor, 2-28-86, p. 15)

**"We Have to First Ask, 'Where Do We Want to Go?'
Before We Ask, 'How Do We Get There?' "**

Congressman George E. Brown, Jr.

The potential power of the new biotechnologies requires thinking in terms of new farming systems rather than in terms of simply integrating a new technology, like some new type of plow, into our existing system. We should be thinking not just about ways to improve our current crops but also about developing entirely new crops. We should consider how these tools of biotechnology can be applied in developing countries where tremendous gains in production are possible. We should seek to use the unique power of these technologies -- by replacing chemical and mechanical energy with biological energy -- to reduce input costs and increase farm profits.

What discourages consideration of fresh, new ways of thinking about agricultural technology are the short-term nature of corporate research investments, inadequate public research investments, and inadequate public research planning....Corporate investments in biotechnology re-