

Prospects for Agricultural Production in the Third World

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Third World agricultural production needs help. During the last two decades, countries in Asia and Latin America have had a "green revolution" through which they have made remarkable progress in increasing their agricultural output. Even so, food production in those regions is just barely staying ahead of population increases. The poorest people are still often hungry and many of them suffer from malnutrition.

The Agricultural Situation in Africa

Agricultural problems. The situation in Africa is most critical. That continent is just emerging from its worst drought in 50 years. To compound the problem, it suffers from a series of deficiencies and policy defects that limit its capacity to produce food. Rainfall is low and unpredictable, and soil quality is poor and fragile. Traditional farming systems are inadequate to meet the needs of rapidly growing populations and, when strained to do so, are degrading the natural resource base. The continent harbors plant and animal diseases and insect pests that are unheard of elsewhere.

During the last 25 years, pressing current problems and financial constraints have prevented African governments from focusing on and dedicating resources to long-range agricultural planning. They have thus failed to build the efficient institutions and the cadre of human resources necessary for major agricultural development. In addition, trade and exchange policies and agricultural policies have held back growth in the agricultural sector by failing to provide incentives for increased production.

Solutions. Innovative solutions to Africa's serious agricultural problems are needed. Among the requisites for improved agricultural production programs are science-based improved technologies such as seeds and inoculants, readily available food production inputs such as fertilizer, water, and credit, and government policies that do not discriminate against agriculture and do make it profitable for farmers to use the new technologies and the necessary food-producing inputs.

What is being done. Although Africa's extensive agricultural problems will require many years of intensive remediation, some innovative, appropriate solutions are beginning to emerge. Plant scientists at U.S. universities and at the international agricultural research centers in Africa are developing superior cultivars of sorghum, millet, cassava, dry beans, potatoes, sweet potatoes, and lentils. These improved crop plants are higher yielding than traditionally grown cultivars, are more drought tolerant, and have better resistance to insect pests and diseases.

Research efforts to develop improved crop cultivars are complemented by similar efforts to improve crop-management systems. Alley cropping, an agroforestry technique, is one such practice that is receiving considerable research attention. In an alley-cropped system, annual food crops are planted between rows of perennial, leguminous trees and scrubs. The larger plants provide some ground cover to reduce soil erosion, recover nutrients from soil levels well below the crop plant roots, and are a convenient source of leaf and stem material that can be cut and placed on the alley-cropped rows to reduce evaporation from the soil surface and to act as a green manure.

Researchers working to overcome animal diseases are also

making progress. Considerable scientific attention is being focused on animal trypanosomiasis (sleeping sickness), a disease that prevents production of livestock in large areas of central Africa. Although researchers have not yet been able to develop a vaccine against this dreaded and scientifically elusive disease, they have identified native (N'dama) cattle that have a degree of natural immunity and are identifying, isolating, and crossbreeding that tolerance into disease-susceptible native cattle.

Smaller animals, ruminants such as goats and sheep, often survive better in the less hospitable conditions that prevail in much of Africa. For this reason, the Small Ruminant-Collaborative Research Support Project (SR-CRSP) sponsored by the Agency for International Development (AID) carries out research on a number of management, immunization, diagnostic, nutritional, and reproductive technologies that have high potential for improving sheep and goat production in Africa and worldwide. Better management practices are already bringing one goat disease, caprine arthritis-encephalitis, under control; and a rapid diagnostic test and new vaccine for another, contagious caprine pleuropneumonia, also promises to improve goat production.

A prolific breed of sheep has been identified by the SR-CRSP in Morocco. With proper management and disease control, the ewes of this breed could produce more than triple the number of lambs produced by other breeds.

Improvement of rural financial systems is another area that is receiving research attention. Through a cooperative agreement with AID, Ohio State University's Agricultural Finance Department has explored experimental approaches to rural finance. The research revealed the underlying problems inherent in many rural financial systems and pointed the way to correct approaches to rural finance in developing countries.

Through ongoing policy dialogues with developing-country leaders, AID encourages modification of policies that do not support development goals. Using current facts and examples, AID officials demonstrate to Third World leaders that improved policies can lead to increased agricultural productivity and other beneficial changes that support economic development.

Thus, we are working in many ways, through many disciplines, and with a great variety of experts to help Africans alleviate their very pressing agricultural problems. The effort has just begun and the potential for further and accelerated improvement is great. Many years of intensive research and adaptation lie ahead if the desired levels of economic development are to be attained in developing countries.

Concerns About the Impact of Foreign Aid on U.S. Agriculture

Despite the obvious need of aid recipients, in recent years some members of the U.S. agricultural community have raised objections to AID's agricultural assistance programs, saying they are hurting U.S. agricultural exports. But this contention is just not supported by the facts.

No one denies that American farmers are in trouble. U.S. agricultural markets have been shrinking since 1982. Australia, Canada, and France have absorbed portions of our wheat markets in India, the United Kingdom, Morocco, the Netherlands, and Pakistan. France has also taken over a large piece of our corn market in Great Britain. West Germany, Italy, and the Netherlands have greatly increased their self-sufficiency in corn. Argentina and Brazil are major competitors for traditional U.S. soybean markets in France, Mexico, and Denmark. Except for Brazil, however,

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none of these competitors has ever received agricultural assistance from the United States.

From the 1950s to the mid-1970s, we helped Brazil improve its agricultural production and its overall economic development. This led to Brazil's becoming a much better customer for U.S. agricultural commodities, especially wheat, corn, and even soybeans. From 1970 to 1981, Brazil's overall agricultural production increased an average of less than 5% per year. But Brazil's imports of U.S. agricultural commodities increased 14.7% per year. In addition, whereas 64% of our agricultural exports to Brazil was food aid in 1970, these exports were commercially purchased by Brazilians at market prices by 1981. Our early help to Brazil has paid off.

There are a number of reasons why U.S. agricultural exports have declined in recent years. The strong American dollar and domestically supported U.S. farm prices are among the most important. According to a recent article in the *New York Times*, our subsidy for wheat is now more than \$70 per metric ton. This encourages U.S. production levels that are unrealistic in world markets and helps keep world wheat prices unrealistically high.

While the comparative prices of U.S. agricultural exports increased, high oil prices and escalating interest rates made it difficult for developing countries, particularly those with large foreign debts, to find the foreign exchange for food imports.

Confidence in the United States as an agricultural supplier was also somewhat shaken by our embargoes—on soybean exports to Japan in 1973 and on soybeans and grains to the U.S.S.R. in 1980. Some of our customers began to seek other sources for their commodity needs. They also increased their own agricultural output to fulfill more of their domestic food needs.

Creating U.S. Agricultural Markets

AID's current economic assistance goes to developing countries that are hardly in a position to compete in traditional U.S. agricultural export markets. They are, however, excellent potential customers for our agricultural commodities.

Their rapidly growing populations are part of that picture. In 1975, the industrial countries of the world were home to just over 1.1 billion people, while the developing countries had a population of almost 3 billion. By the year 2000, the population of the developed countries will have increased slightly to just over 1.3 billion. However, at currently predicted rates of growth, the population of the developing nations will have grown to more than 5 billion by the turn of the century; 79% of the world's population will live in what are now developing countries.

Economic growth is another critical factor in expanding agricultural markets. Most often, as economic conditions in developing countries improve, demand for agricultural products increases more rapidly than agricultural production. This demand is satisfied by importing food and feed grains. This is true even when agricultural development is "leading" overall economic growth, because poor people spend a major portion of increased income on food. They also add more meat to their diets, thus increasing demands for feed grains.

During the last 25 years, the standard of living has reached a zenith in many industrialized countries, and their populations are stable or declining, so they have little need to increase their agricultural imports. The developing countries, however, with their increasing populations and their immense potential for economic improvement, are our growing agricultural markets. For example, while only 17% of U.S. corn exports went to developing countries in fiscal year 1972-1973, those exports had increased to almost 46% by fiscal year 1983-1984. The portion of U.S. wheat exports going to developing countries increased from just over 44% in 1972-1973 to over 59% in 1983-1984. During the same period, the proportion of U.S. corn and wheat sales to both industrial countries and centrally planned economies declined.

Food aid is sometimes touted as a solution to Third World hunger. But, food donations and concessional sales can only be temporary expedients. They serve a humanitarian purpose and can be accommodated because of large U.S. commodity carryover. But

most of the bill is footed by the American taxpayer, not by the countries that receive the food. These markets can't be sustained beyond the end of U.S. aid unless the countries develop economically. Economic growth in most developing countries has been "led" by growth in the agricultural sector. Thus, when we help developing countries to improve their own agricultural production, their economic resources increase and they become paying customers.

This transition is exemplified by the fact that as Third World nations develop economically, an increasing percentage of their agricultural imports from the United States are through commercial channels; food aid has been a declining share of U.S. agricultural exports to developing countries. In the 1960s, close to 25% of U.S. agricultural exports were in the form of food aid to developing countries. Since the late 1970s, food aid has generally accounted for only 3-5% of U.S. agricultural exports. Humanitarian food aid to alleviate effects of the African drought, combined with overall reductions in our agricultural exports, has resulted in slight increases in the last two years in the proportion of our exports that are food aid. Even so, the great bulk of our exports to developing countries are through commercial channels. They are mostly cash customers.

What Needs to be Done

Clearly, the agricultural assistance we give to developing countries brings economic benefits to the U.S. agricultural sector. It is in our own best interest to continue this assistance.

Also, developing-country farmers need the technical expertise that the United States is in the best position to provide. Rapidly growing Third World populations vastly increase the need for changes in the agricultural technology used by developing-country farmers. The situation in Africa is most critical. Demographers estimate that while the population of the developing world will double in the next 34 years, Africa's population will double in 24 years.

Although there is some potential to expand the land under cultivation in sub-Saharan Africa, most increased food production must come from higher-yielding plants and increased cropping intensities that protect the fragile resource base. This cannot be adequately accomplished with the technology that is now available. Many of sub-Saharan Africa's agricultural problems, particularly those connected with plant diseases and insect pests, are unique and profound. Proven research and management methods can be applied to combat these new problems. But, the specific technologies—seeds, fertilizers, pesticides, farming practices—that have worked so well in the temperate climates and even in many other developing regions, are often useless or even counterproductive in dealing with the problems in Africa. On that continent, soils, organisms, and pathogens tend to differ from those that soil and plant scientists have dealt with before.

The essential role of U.S. plant scientists. This is a real challenge—a challenge that is being met by the unmatched cadre of U.S. plant and other scientists who have helped to create the most productive agricultural system in the world. The very best way we can assist developing-country farmers in Africa and elsewhere is by working with their scientists to improve their crop plants and other production technologies as we have done and continue to do for our crops here at home.

Such assistance must include the creation or strengthening of agricultural institutions and the development of human resources. Also it must not ignore the constraining conditions under which Third World farmers cultivate crops. Economic constraints must be taken into account, new technologies must be designed with the understanding that purchased inputs are often out of financial reach. Improved plant cultivars that require high rates of fertilizer and irrigation or pesticides will frequently be ignored by poor, small-scale farmers. In Africa, in particular, extreme care must be taken not to further degrade or destroy the fragile natural resource base. Pesticides cannot be used as they are in the United States. Agricultural planning must take into account the reality that water is a scarce resource in much of Africa.

How to do what must be done. Traditional scientific techniques will continue to be the mainstay of AID's efforts to breed biologically hardy plants. However, AID does support some potentially high pay-off research programs that use the new biotechnological methods. At the same time, it provides education and training to developing-country scientists in this relatively new field that gives researchers the added ability to attack problems at the molecular level. Thus, AID is working to develop some badly needed technologies while helping Third World scientists to prepare themselves for participation in this new field.

Involvement of U.S. scientists. How can U.S. plant scientists participate in meeting the challenge of improving Third World agricultural production?

Biologically overcoming plant diseases is a major focus of AID-supported research. Your help is needed, particularly in helping to train developing-country scientists. These researchers must receive training that is relevant to the problems that constrain agricultural production in their countries.

Contact with developing-country scientists is not a one-way street. Graduate students who come to study at U.S. institutions frequently already have many valuable years of practical experience. Interaction with them gives U.S. plant scientists a tremendous opportunity to broaden their knowledge of international agriculture.

Many agriculturally related organizations in the United States have taken leadership roles in encouraging information exchange, working relationships, and collaborative research among their U.S. and developing-country members. For example:

- The American Chemical Society cooperates closely with the International Union of Pure and Applied Chemistry (IUPAC) in an ongoing effort to identify and prioritize chemical research and development that will help poor farmers in developing countries to increase and sustain agricultural production while keeping costs and energy use down and preventing further environmental degradation. In 1982, IUPAC and the International Rice Research Institute cosponsored CHEMRAWN II (Chemical Research Applied to World Needs), a conference that focused on the impact of chemistry on world food supplies. Follow-up seminars were held in Sri Lanka in 1985 and in Argentina earlier this year. Another seminar is scheduled to take place in 1987 at the International Center for Insect Physiology and Ecology in Nairobi, Kenya.
- The American Chemical Society also administers a USIA grant program that arranges for developing-country chemists who are studying at U.S. universities to attend technical meetings in the United States.
- Through its International Agronomy Division, the American Society of Agronomy provides a forum for soil and crop scientists who are concerned about international agricultural development, explores how the society can increase assistance to international members, and assists other countries to develop similar organizations. Both the society and its sister organization, the Soil Science Society of America, annually present International Service awards to members who have made the greatest contributions to international agronomy and soil science.
- With income from its members and outside sources, the Tropical Region Division of the American Society for Horticultural Science is very active internationally. The Division sponsors

workshops on tropical crops, holds its annual meeting in a different country each year, and publishes the research results of its members. I am told that, more than 25 years ago, the Tropical Region Division provided the inspiration for the American Phytopathological Society's Caribbean Division. Today, many scientists are concurrently active in both organizations.

These are just some of the ways in which U.S. agriculturally related organizations have shown that they recognize the importance and value of international activities.

Challenge to The American Phytopathological Society

The control of plant diseases can make major contributions toward increased agricultural productivity, particularly in the harsh farming environments in many developing regions. Poor farmers must have inexpensive technologies that work if they are to feed themselves and begin to generate an economic basis for further development.

The contribution APS members have made to this effort, and can continue to make in the future, cannot be overestimated. The APS has already made an excellent beginning through the support U.S. plant pathologists give to its Caribbean Division. The close working relationships with Central American and Caribbean area scientists have accomplished much in overcoming the problems of plant diseases in that part of the world. Now, scientists and agricultural leaders the world over invite APS to broaden its participation in these efforts.

These are some of the ways professional societies such as the APS can effectively contribute to the professional and technical growth of developing-country scientists and researchers:

- Cooperate with international groups in holding international meetings with the express purpose of sharing information on research results, especially state-of-the-art technologies, and identifying and prioritizing potentially high-impact research needs.
- Invite developing-country scientists to attend professional meetings in the United States while they are here for doctoral and postdoctoral studies and research.
- Waive attendance costs and contribute to the travel and lodging expenses of developing-country scientists who cannot afford to but should attend these conferences.
- Arrange subsidized or reduced-rate professional publication subscriptions for developing-country scientists who would otherwise be unable to receive them.
- Award scholarships and fellowships to developing-country scientists for study and research in the United States.
- Encourage U.S. members to develop collaborative research with scientists in developing countries. (AID's Science Advisor's Office provides small research grants for such joint efforts.)
- Cooperate with other scientific organizations in sponsoring workshops specifically focused on developing-country problems.
- Sponsor awards that recognize achievements in international agricultural research.

In these and other ways, you can become even more active participants as we work to alleviate some of the major constraints to productive agriculture in the developing countries of Africa, Latin America, and Asia.