

INTERNATIONAL
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POLICY
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INSTITUTE **REPORT**

IFPRI

IFPRI REPORT 1988

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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INTRODUCTION

The International Food Policy Research Institute (IFPRI) conducts research on the world food problem through an integrated approach examining the interrelationships of technological change, agricultural growth, overall economic growth, and social welfare. IFPRI's approach recognizes that the world food problem reflects differing food problems among and within countries. In some countries food problems exist because of slow production growth. In others they are caused by inadequate distribution resulting from poor roads and transportation facilities and other inadequacies of infrastructure. In yet others, food problems exist because the poor, lacking opportunities for employment, also lack purchasing power. Generally the impediments to an increase in production and provision of purchasing power to the poor are closely intertwined. The nature and degree of these problems vary as do technologies, incomes, population size, food habits, and short-term food emergencies.

At present, five areas are of central importance to setting IFPRI's research agenda:

1. development strategy, addressing macroeconomic issues that have a bearing on the pivotal role of food and agriculture in the development process;
2. technology policy, reflecting the essential function of technological change in accelerating agricultural growth;
3. poverty alleviation, emphasizing IFPRI's concern with the food consumption and nutritional status of low-income people and the critical importance of income generation for improving that status;
4. Africa, denoting the urgent, complex, and long-term nature of food problems in this region, the decisive role of food policy in alleviating them, and IFPRI's capacity to bring a global comparative analysis to bear on this issue; and
5. food aid, reflecting IFPRI's concern with the massive flows of food from developed to developing countries, the importance of increased food consumption for the short-run mitigation of hunger, and the crucial wage-goods role of food in infrastructure development and agricultural growth.

Policy formulation requires the analysis of research results from a number of research disciplines. The five areas serve to integrate the results of research projects undertaken within five research programs. The annual report describes the research programs and the individual projects that define their work focus for 1988.

Many of the projects involve the collection of data in the field by IFPRI staff in collaboration with staff from national institutions. Data on food production, consumption, and distribution are collected at the household and farm levels. It is this microeconomic focus that characterizes much of IFPRI's approach to research. By identifying the processes that occur in development, methods to accelerate them can be identified.

The annual report contains the third biannual address of the director of IFPRI to the Consultative Group on International Agricultural Research (CGIAR) during International Centers Week—the formal meeting of the donors to the CGIAR and the CGIAR center directors and board chairmen. The address focuses on the opportunities in the 1990s for abolishing hunger and reducing poverty, while decreasing environmental degradation in the developing world. These opportunities will arise in large part from continued investment in research, education, health care, and other fundamental sources of productivity growth that began in the 1980s.

The results of the work undertaken during 1988 are reported in seven research reports, seven issues of *IFPRI Abstract*, and four issues of the newsletter, *IFPRI Report*. Other publications include four working papers, two papers in the "gray" series, two food policy statements, and reprints of 25 articles by IFPRI staff. Three of the working papers were part of a new series on cassava initiated during 1988. In addition, during the year IFPRI published *Agricultural Price Policy for Developing Countries*, edited by John W. Mellor and Raisuddin Ahmed, and *Food Subsidies in Developing Countries: Costs, Benefits, and Policy Options*, edited by Per Pinstrup-Andersen, the fourth and fifth books in its series with The Johns Hopkins University Press. *Agricultural Price Policy for Developing Countries* was also copublished with Oxford University Press, New Delhi.

IFPRI Policy Briefs, a new publication series, was started in 1988. *Briefs* include summaries of research findings on specific topics of interest to policymakers. The format, which encapsulates the results in a collection of two-page summaries, provides an innovative way to make current information available for quick and easy reference. The first three *Briefs* in the ongoing series were produced and disseminated.

During 1988 IFPRI accepted a request from *Environment* magazine to put together a special issue devoted to sustainable

agriculture in developing countries. This issue highlighted the work of IFPRI and the CGIAR system. In addition, IFPRI took the lead on a special issue of the journal *World Development* that focused on food security.

The Outreach section contains a discussion of IFPRI's collaboration with other centers in the CGIAR and national institutions in developing countries. In 1988 these institutions were located in Argentina, Bangladesh, Botswana, Brazil, Burkina Faso, Chile, People's Republic of China, Colombia, Costa Rica, Côte d'Ivoire, Ethiopia, The Gambia, India, Indonesia, Kenya, Nepal, Nigeria, Pakistan, the Philippines, Rwanda, Senegal, Sierra Leone, Sri Lanka, Sudan, Thailand, Tunisia, Zaire, Zambia, Zimbabwe. A list of collaborating multilateral agencies and institutions in developed countries is also included. As part of IFPRI's increased collaborative activities with national institutions and other centers in the international agricultural research system, IFPRI has outposted nine members of the research staff, four specifically to regional offices of international agricultural research centers.

Also contained in this section is a report on workshops and seminars held in 1988. These included meetings on income and employment effects generated by technological change in agriculture in rural Zambia; the measurement, causes, and alleviation of poverty in developing countries; fertilizer supply and demand policies in Sub-Saharan Africa; and the relationship between income and nutrient consumption. A meeting of Mexican policymakers and researchers and IFPRI board members and senior staff was also held in conjunction with the Board of Trustees meeting in Mexico City in January. The agenda focused on the relationship between macroeconomic and agricultural sector policies in Mexico.

The diversity and training of IFPRI's research staff contributes to the definition of major food policy problems and provides a wide range of research methods and tools to analyze these problems. As the personnel list indicates, more than half of IFPRI's senior research staff come from developing countries. (About three-quarters of the support staff in the research programs are from developing countries.)

To ensure effective communication on the research priorities and management of the Institute, in recent years six standing committees have been established. These committees and their chairpersons are also listed in the personnel section.

AGRICULTURAL DEVELOPMENT: OPPORTUNITIES FOR THE 1990s

BY JOHN W. MELLOR*

It was only two years ago that we were faced with global food surpluses and overflowing stocks, many previously importing developing countries were exporting, and there were pressures from many directions to reduce expenditure on agricultural research and agricultural development generally. At that time, I indicated in IFPRI's annual report the complexity of the policy problems that had to be solved if those plentiful harvests were to be used effectively to foster economic growth of the type that would lift the mass of people out of poverty. Since then, a number of developing countries have reverted to cereal imports, global stocks have been drawn down considerably, and substantial quantities of land in the United States have been returned to agriculture.

In the present context, I would like to remark once again on the central role of food and agriculture in a strategy of development that produces high rates of growth and broad participation in that growth. It is the implementation of steady agricultural development policies (in the face of fluctuating global supply-demand balances) that stimulates, directly or indirectly, rapid growth in effective demand for food on the part of low-income people. Effective pursuit of such policies typically results in demand for food increasing more rapidly than even an excellent record in food production, thereby creating growth in food markets for the surplus-food-producing countries. Thus the slowing of growth in the 1980s has been unfortunate not only for the poor in developing countries, but for developed country exporters as well.

At present, however, I would like to depart from the pessimism of the recent past and instead look ahead to a 1990s of grand opportunity. To do so, I must first be convincing that the 1960s and 1970s provide a clearer picture of what might occur in the 1990s than do the distorted, malfunctioning 1980s.

THE 1980s AS AN ABERRATION

The interacting effects of the second oil shock, the rapid growth in Third World debt, high real interest rates, unusually depressed primary commodity prices, increasingly distorted prices within many developing countries, and grossly unbalanced public budgets characterized the early to mid-1980s. The consequent essential major restructuring of policies and economies was bound to temporarily slow growth in both developed and developing countries.

Slower growth in developed countries further reduced trade potentials for developing countries, with a consequent reduction in developing-country growth overall, much less progress in poverty reduction, and diminished growth in the demand for food. These circumstances, of course, provided an illusion of food self-sufficiency in many developing countries and added to surplus production capacity in developed countries. The consequences were most severe in Africa, where a poorly developed capacity for policy analysis and ill-considered foreign assistance policies compounded the underlying problems, and in Latin America, where the debt crisis took on particularly enormous proportions.

Current pessimism arises from two sources: observations of the distorted 1980s and a view that growth in developing countries is driven by import demand of the developed countries whose own

*Adapted from a speech presented at International Centers Week, Washington, D.C., November 4, 1988. The author would like to thank Frank Z. Riely for assistance in preparing the text.

growth is now permanently slowed by maturity. A different view arises if growth is seen as largely the product of technological development that raises factor productivity, which in turn is the product of growth of human capital and the institutions that mobilize that human capital for productive purposes. In this latter case, demand is driven much more by domestic forces than by foreign imports. Throughout the distorted 1980s, as in prior decades, human capital has been growing rapidly, even in Africa, and institutional structures have also been improving. Thus the underlying basis for growth is more developed as we enter the 1990s than it was in the late 1960s and 1970s. However, for that growth to be driven by domestic demand and for capital resources to be spread thinly over a large, growing labor force, requires, far more than in the past, a technologically advancing, cost-reducing development of the agricultural sector.

The prospect of growth offers extraordinary opportunities for reducing hunger and poverty and reversing the current onslaught on the environment. Success in those efforts will depend heavily on the availability of cost-reducing technological change for agriculture. It will also require open-trading regimes and direct action to confront the problem of increasing instability in global agriculture. If we are to meet the opportunities presented us in the 1990s, each of these issues must be confronted directly.

T ABOLISHING HUNGER

he 1990s can be a decade in which major strides are made in abolishing hunger, strides that may clearly indicate its approaching end. For that to occur, a few key points must be central in our minds.

Hunger is a massive problem. We will enter the 1990s with at least 700 million hungry people by even the most minimal definition of food adequacy. A more humane definition would include a full one billion people.

Moreover, the poor are heavily concentrated in the rural areas of very-low-income countries, and many are in rural areas where the potential for response to improved agricultural technology is high. Two-thirds of the poor are in Africa and South Asia; three-quarters are in low-income developing countries, and only one-quarter are in the middle-income countries.

Because the problem of poverty is so massive and the poor are concentrated in the rural areas of low-income countries, it is difficult to envision eliminating the bulk of hunger through redistribution. Such redistribution would have to be substantially international and would have to grow enormously over time as the number of poor in the very poor, slow-growth countries continued to increase rapidly, as has been the case in the past. The reasons for this are twofold: poor countries have difficulty finding the resources to reduce poverty, and the proportion of their population that is poor is very large.

While radically reducing the numbers of poor purely through unending international redistribution seems unlikely, reducing their numbers through growth can be highly effective. Note that in the middle-income developing countries the absolute number of poor

dropped nearly in half from 1970 to 1980, while in the low-income countries the numbers increased by more than half. In regional terms, it is the countries of Africa and South Asia in which poverty increased greatly in absolute numbers.

The reduction of poverty in the middle-income developing countries, such as in Latin America and East Asia, has been achieved largely in rural areas that are highly responsive to production-increasing agricultural technology, for which the employment multipliers are substantial both within agriculture and in the rural nonagricultural sector. In contrast, there are still some 250 million poor in the high-potential areas of low-income countries. Agricultural growth in those areas may be particularly effective in bringing about substantial reductions in poverty and hunger in low-income countries.

The technology for such growth is dynamic, requiring continuous effort; it is location-specific, requiring a large, dispersed effort; and it is complex, requiring effort on a wide front, from research to input supply. The quarter of a billion hungry people in high-potential areas still lack adequate research and technology support suited to their specific conditions and circumstances. That research gap is notable in the Gangetic and Brahmaputra Plains in Asia and in the higher-potential areas throughout Africa. The lack of appropriate, area-specific technology stalls poverty alleviation efforts throughout developing countries. Not only are food and employment growth in agriculture lost, but the large multipliers on the rest of the economy, derived from agricultural success, are lost as well.

To emphasize the areas with high agricultural potential is not to ignore the large numbers of poor in low-potential areas and cities. It is, however, to note that we now know what to do to rapidly eliminate hunger in the high-potential areas; that reducing hunger, and thereby the pressures of poverty, in urban areas—where more than a quarter of the poor reside—depends on vigorous growth in high-potential rural areas; and that the historical answer to problems of low-potential areas has always contained a major element of migration, which, in turn, depends on good performance in the high-potential areas and their urban enclaves. Of course, it is also desirable to do research focused on breakthroughs that will raise the productivity of low-potential areas. Such research will give relatively more emphasis to low-input innovation. However, because these are long-term, relatively high-risk investments, it is appropriate that foreign aid and international programs pay for a disproportionate share.

Improved rural infrastructure that allows technology to spread to all farmers and permits employment multipliers to make adequate jobs for the poor is another crucial element in poverty reduction. An IFPRI study in Bangladesh, for example, found that areas with good infrastructure used 4 percent more labor per hectare than areas with poor infrastructure and 92 percent more fertilizer. The multiplier effects of that growth produced a level of nonagricultural employment that was 30 percent higher than in the poor infrastructure areas and wage rates that were 12 percent higher.

Infrastructure investment also provides a vital link between the long-term, self-reliant removal of poverty, and short-term amelioration. Rural public works schemes to build infrastructure

create immediate increases in employment and are clearly the most proven means of targeting food and income to the poor. Improved infrastructure, in conjunction with improved agricultural technology, can provide the employment multipliers that sustain income increases and access to food over the long term. The same study referred to above showed that good infrastructure is associated with a 40 percent decline in the number of people in absolute poverty. However, such efforts sustain development only if they are not so driven by immediate employment objectives that they fail to provide the larger permanent employment multipliers of which they are capable. For example, roads constructed on these projects must be all-weather roads, involving considerable nonlabor expense, if they are to fulfill long-term development objectives. The budgets of these projects should not be so dominated by the food component for labor that resources are not available for materials to build permanent establishments.

T PRESERVING THE ENVIRONMENT

he solutions to hunger and poverty are very much at the core of the solution to the environmental assault occurring in developing countries. Of course, environmental degradation occurs in both developing and developed countries. But a broad distinction can be made. In developed countries, environmental destruction is primarily a product of wealth, while that in very poor countries is primarily a product of poverty. The most serious environmental destruction in developing countries occurs as population pressure expands against a limited land resource base and pushes cultivation out onto more fragile resources, thereby rapidly destroying forests and grasslands.

Increased production on fragile land reduces agricultural productivity. In Nepal, for example, farmers are forced, by population pressure and lack of yield-increasing technology, to clear and crop the hillsides, exacerbating problems of soil erosion and causing flooding in lowland areas. In less than a decade, the destruction of forest resources in areas of Nepal has added 1.13 hours per day to the time required for women to collect firewood and forage. Deforestation also contributes to a decline in the nutritional status of children through the reduced time of women in the preparation of food and use of smaller quantities of higher-priced fuel.

There are two solutions to these environmental problems. First, increase the agricultural capacity of the less fragile land to help relieve the pressure in the more fragile areas. This will produce a synergism between environmental preservation and a major attack on poverty in the more responsive areas. Second, conduct research and provide infrastructure in the more fragile areas. The former to help find less destructive systems of farming, and the latter to relieve the environmental stress from hunger in years of poor production and lack of nonfarm jobs. Again, there is a synergism between hunger abatement through growth and environmental protection.

W TRADE

With few exceptions, development cannot be led by export growth because the bulk of the demand for increased output from a developing country will not come from abroad. Development must be largely driven by growth in the domestic demand of developing countries, growth that is achieved through cost-decreasing technological change in agriculture. Nevertheless, trade is extremely important to the development process. Most obviously we know that once countries accelerate their growth substantially, even their best efforts in their agricultural sector cannot keep up with the domestic growth in demand for food. Thus trade is needed to facilitate the imports of basic food staples, including cereals and vegetable oils, into developing countries.

Equally important, if developing countries are to grow rapidly, they must spread their own capital resources across a high proportion of their labor force. This means they cannot concentrate on capital-intensive industries like steel, petrochemicals, and fertilizer. They must import those capital-intensive goods and services.

Agriculture itself can play an important role in meeting export needs. The opportunities are particularly great in labor-intensive agricultural commodities like fruit, vegetables, and certain types of livestock commodities. The message for research is clear. While we are striving for new breakthroughs in the basic food staples, new efforts must be added in the labor-intensive agricultural commodities for which demand is still growing, even in developing countries.

Four lessons from the past can guide us in dealing with these important trade issues of the 1990s. First, developing countries are already increasing their share of the international market for labor-intensive agricultural commodities and command between a third and half of that market already. That potential needs to be developed further in a favorable trading environment. Second, even as countries move into middle-income status, agriculture dominates their trade, hence continued growth in exports requires growth in agricultural exports. Third, developing countries do best in labor-intensive agricultural exports when their own markets for those commodities are growing rapidly. Thus broad-based internal markets that derive from successful rural development strengthen agricultural trade performance. Fourth, a strong research effort is needed both in production to reduce costs and in marketing if new export markets are to develop.

W STABILITY

World agricultural markets have experienced rapidly increasing production instability in recent years, accompanied by greater price instability. The biggest losers from instability in food supplies and prices are, of course, the poor. A given reduction in food supplies will result in a decrease in consumption by the bottom 20 percent of the income distribution in developing countries that is more than 10 times greater than that of the top 5 percent.

Dealing with instability by building stocks sufficient for a single poor year is a common practice by cultivators in low-income countries. However, the cost of providing for two bad years in a row through stocking policy is exorbitant and, hence, is rarely paid. A second successive bad crop year is most effectively dealt with through international trade. Often, however, poor countries face special financing problems that can limit imports in response to domestic shortages. This problem can effectively be dealt with through the IMF cereal facility. That facility should be strengthened, rather than gradually weakened as it is at present.

It is also important that the developed countries, as they try to restrain excessive growth in their production, keep in mind the growing need for food in developing countries during this intermediate period when agricultural growth is accelerating with technological change, but demand for food is growing even more rapidly. They should consider at least a minimal-level stocking policy in order to stabilize their own prices and consumption and to provide some basis for stability in international markets. Most important, they need to return idle land to production when stocks decline below generally agreed-upon levels.

H CONCLUSION

How quickly these development processes proceed will depend very much on the dynamic policymaking capacity in developing countries and the foreign assistance programs of developed countries. And that policymaking capacity in turn depends on a synergistic relation between policy research, policy analysis, and policy implementation. IFPRI's principal thrust in its current five-year plan is collaboration with developing-country institutions to develop those synergistic relations and to do so in a "learning-by-doing" context. The Institute is in the process of a near doubling of its special project funds by the early 1990s, with that increment occurring in collaborative arrangements.

The dynamic forces expected in the 1990s have brought several major emphases to IFPRI's research program as reported in these pages. If the benefits of an agriculture-led, high-employment development strategy are to be reaped, we need to understand far more than we do now the roles of infrastructure development and rural education. These are the strategic elements of development that demand the most resources, thus calling for major reallocations of developing-country resources and foreign aid. Major shifts toward greater political and administrative decentralization are required. And we need more knowledge about how agricultural growth contributes to the transformation of the economy away from agriculture.

If all goes well in the 1990s, macro and trade policies will generally swing away from distortionary, growth-retarding effects and towards more expansionary emphases. As the demands on government resources grow tremendously from the increased need for and capacity to deliver infrastructure and human capital, the dynamics of growth—with rapid diversification at the national level and specialization at the individual level—will require complex analyses of the dynamics of trade relations.

Rising incomes will bring more capacity to deal with environmental problems and an ever greater urgency as well. IFPRI is increasingly emphasizing the interaction between environmental issues, poverty, and agricultural technology. The need to see this interaction occur is growing, especially in the context of continued population growth and diverging regional capabilities to raise incomes and preserve the environment. Developing countries are unusually shorthanded in their capacity to analyze these ill-understood problems and, hence, international organizations are particularly responsible for assisting them.

Poverty in the 1990s will become more differentiated and, as it declines in extent, even more intractable. The relations between human capital, health, and nutrition in areas of low agricultural potential will loom larger as an area of deficient knowledge and great need.

The massive potential for greater use of food to sustain rural infrastructure and rural educational development will raise difficult issues in allocation of both domestic and foreign assistance resources. Developing countries have been distorting their economies away from labor mobilization and food consumption. As those distortions are corrected, the scope will increase for effective use of food aid. That will require new dimensions and increased levels of analytical effort.

Finally, monitoring the dynamic processes in the food sector will increase in importance with accelerated growth. International organizations should play a large role in responding to that need.

The challenges of the 1990s are as much with policy research as with policy action—and the potential for visible impact is immense.

FOOD DATA EVALUATION PROGRAM

Research in the Food Data Evaluation Program largely involves the analysis of trends in food production, consumption, and trade, and based on these the projections of food output and consumption in the Third World. This work builds on the agricultural and economic data provided by other international organizations, primarily the Food and Agriculture Organization of the United Nations (FAO) and the U.S. Department of Agriculture. The program also conducts research on the gathering, evaluation, and use of data in Third World countries with weak statistical systems. The program also assembles statistical indicators on production, consumption, and trade of major food crops and livestock products. Special focus is given to national and provincial data on food production and inputs to agriculture in the People's Republic of China.

During 1988 the trends analysis was expanded to include data for recent years and for the developed countries and the world as a whole. Ongoing work on trends in cassava production and consumption was published in three working papers focused on India, the Philippines, and Indonesia. As part of the work on staple food-crop production in China, a research effort was initiated on the poorest regions. Research using national-source statistics was completed for Brazil and Nigeria, and was continued for Indonesia.

TRENDS OF WORLD FOOD PRODUCTION, CONSUMPTION, AND TRADE

In 1986 IFPRI published *Food in the Third World: Past Trends and Projections to 2000*, Research Report 52, which presented trends in the production, consumption, and trade of basic food staples (major food crops) in developing countries. During 1988 an update of the production trends to 1985 and consumption trends to 1983 was completed. Trends in cereal trade were updated to 1987. The study was expanded to include the categories of developed countries and the world. In all cases, comparisons between periods in the early 1980s and 1960s were made.

PRODUCTION

1981-85 Scenario. World production of major food crops averaged 1.86 billion metric tons a year during 1981-85. Total output consisted of 88 percent cereals and 12 percent noncereals (roots and tubers, pulses, groundnuts, and bananas and plantains). Coarse grains represented 40 percent, and maize alone accounted for nearly one-fourth of the total major food crop production. Wheat accounted for 26 percent and rice for 19 percent. Although more than one-half of total production during the period came from developing countries, developed countries provided 52 percent of the cereal output. Almost three-fourths of noncereal production was from the Third World.

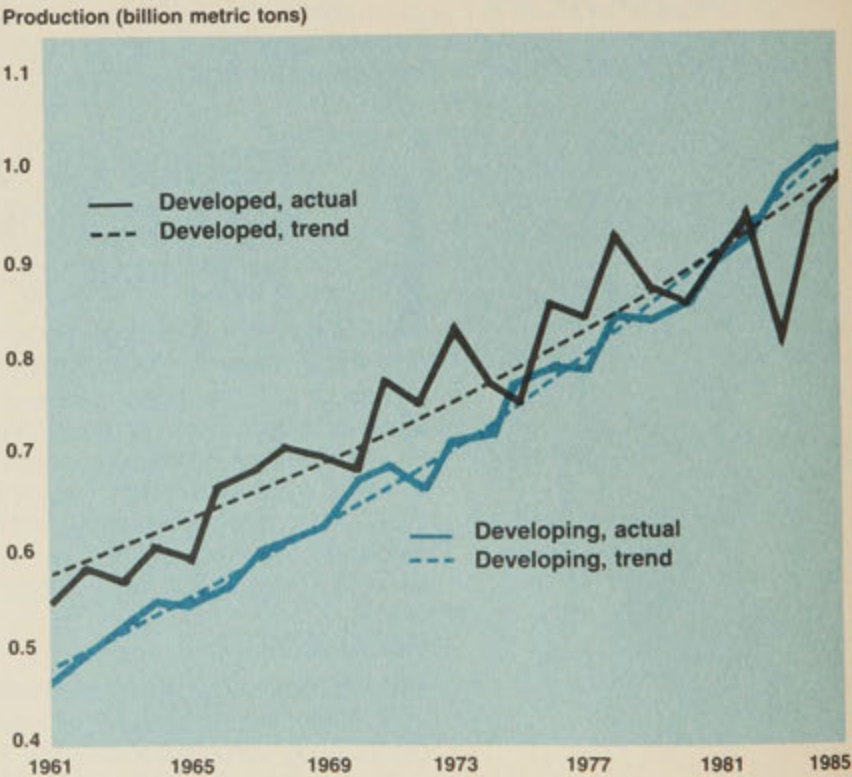
Changes in Production, 1961-65 to 1981-85. Between the early 1960s and early 1980s the world's average yearly output of major food crops increased by more than 750 million tons—71 percent above the average level in 1961-65—representing an annual growth rate of 2.7 percent. Cereals accounted for 95 percent of the increase, and raised the relative share of grains in major food

crops output by 4 percentage points. Noncereals as a group grew at a rate of just 1.0 percent a year.

The developing countries contributed almost 60 percent of the increment in total production, which accounted for 54 percent of the increase in cereals and all of the increment in noncereals. The annual growth rate of food output expanded by 3.1 percent in developing countries compared with 2.3 percent in the developed economies.

Until 1980, production in the developed economies had always exceeded that in developing countries except in 1975. With the faster growth of food output in the Third World, their differences narrowed and the two production trend lines crossed by 1981 (see Figure 1).

Figure 1
Production of major food crops in developed and developing countries, 1961-85



Source: Basic data from Food and Agriculture Organization of the United Nations, "Production Yearbook Tape, 1986," FAO, Rome.

CONSUMPTION

1979-83 Scenario. The world's total annual consumption, or domestic utilization, of major food crops during 1979-83 was about 1.74 billion metric tons. Forty-four percent of this was consumed as food, 41 percent as animal feed, and the rest went to seeds, nonfood use, and waste allowance (see Figure 2). The world's consumption of the basic food staples was about 88 percent ce-

reals and 12 percent noncereals. More than one-half of total consumption during this period was in the Third World, with 47 percent accounted for by the developed countries.

Of the cereals consumed during the period, 41 percent was consumed as food and 44 percent was consumed as feed. For noncereals, the relative distribution was 61 percent for food, 19 percent for feed, and 20 percent for other uses.

Changes in Consumption, 1961-65 to 1979-83. Between these two periods, world domestic utilization of basic food staples rose by 60 percent, an increase equivalent to an average annual growth rate of 2.6 percent (population growth was 1.9 percent). Examination of the actual and trend estimates of the annual total consumption of major food crops between the two periods indicates that annual consumption in developed economies was consistently above that in developing countries before 1974 and then consistently below it thereafter. Data also suggest that the domestic utilization of major food crops has been levelling off in developed countries but continues to increase rapidly in developing countries.

Use in animal feed accounted for nearly one-half of the increment in the world consumption of basic food staples between the early 1960s and 1979-83, whereas direct food utilization accounted for 40 percent. Between the two periods use of food staples as animal feed grew at a rapid rate of 5.2 percent. Sixty percent of the increase in Third World countries was used for food and 30 percent was for feed. However, the bulk—83 percent—of the consumption increment in the developed countries was for animal feed and only 5 percent went to direct food use.

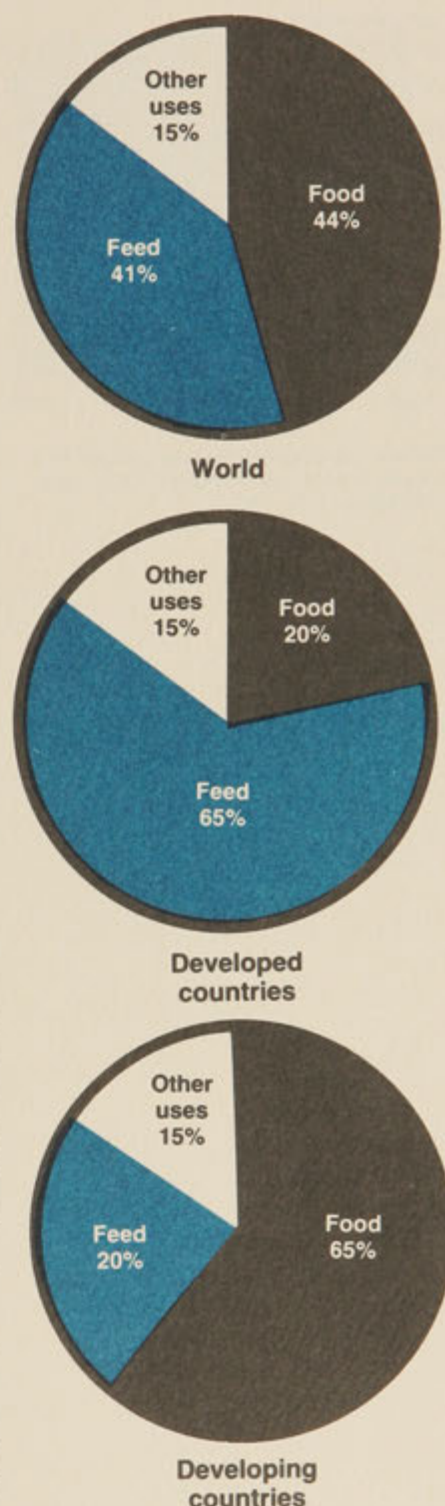
CEREAL TRADE

1983-87 Scenario. During the 1983-87 period cereal exports averaged 202 million tons annually and represented about one-eighth of total cereal production. One-half of the traded cereals was coarse grains, 44 percent was wheat, and 6 percent was rice. The developed economies accounted for 83 percent of total grain exports. These countries accounted for more than 90 percent of wheat and 82 percent of the coarse grain exports, whereas almost 70 percent of rice exports was from the developing countries. The volume of imports was about equally split between the two groups, with Third World countries accounting for about 60 percent of wheat, 80 percent of rice, and 35 percent of coarse grain imports.

Changes from 1961-65 to 1983-87. Between these two periods, world cereal trade more than doubled. Based on export data, trade in all grains rose 2.2 times with increases of nearly 80 percent in wheat, about 60 percent in rice, and more than 200 percent in coarse grains. These increases represented annual growth rates of 3.7 percent for all cereals and 2.6 percent for wheat, 4.0 percent for rice, and 5.3 percent for coarse grains.

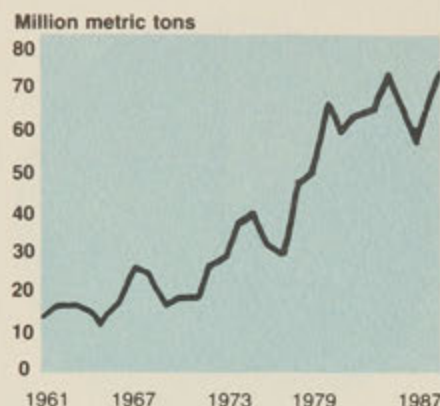
The relative composition of world cereal trade also has changed significantly. Between the early 1960s and the mid-1980s wheat's share in the world cereal trade dropped by 11 percent, whereas the share of maize increased by the same amount. Net cereal imports of Third World countries expanded from 15 million tons annually to 67 million tons, a growth rate of 7.0 percent a

Figure 2
Total domestic utilization of major food crops, 1979-83 averages



Source: Basic data from Food and Agriculture Organization of the United Nations, "Agricultural Supply Utilization Tape, 1984," FAO, Rome.

Figure 3
Net cereal imports of developing countries, 1961-87



Source: U.S. Department of Agriculture, "Production, Supply, and Distribution Tape, 1988," Washington, D.C., USDA.

year (see Figure 3). Although developing countries were net exporters of rice and coarse grains in the early 1960s, they had become net importers of all grain items by the later period. For coarse grains in particular, their imports rose to almost twice the level of exports.

These results show the increased reliance of developing countries on international trade in meeting the rising domestic demand for grains. Although wheat still dominates grain imports to fill the needs for direct food use in the Third World, the rapidly expanding imports of coarse grains also suggest a likely rapid livestock and poultry development in these countries in response to their changing patterns of food consumption.

TRENDS IN CASSAVA PRODUCTION AND CONSUMPTION

Despite the many advantages of cassava as a food and cash crop, it has an uncertain future. Concern comes from the decline in demand for cassava as incomes rise and the changes in the agricultural trade policies of the European Community, which has been importing large quantities of cassava as a feed component for livestock from Southeast Asia, especially Thailand. In collaboration with the International Institute of Tropical Agriculture (IITA) and the Centro Internacional de Agricultura Tropical (CIAT), IFPRI examined past trends in the production and use of cassava and the potential for increasing output and future demand.

The priority given to cassava production development in marginal, cassava-growing areas of Asia and Latin America is justified for reasons of equity. In some locations, its net returns are higher than those for other crops. If demand can be increased through the development of alternative uses, improved yields could increase net returns further. In areas of Sub-Saharan Africa where cassava does not have a comparative advantage due to higher labor costs, research on improving production and processing techniques could help meet the region's food security needs. The yield potential of cassava is high: application of fertilizer alone can increase yields by 5 metric tons per hectare without irrigation.

In 1988 IFPRI published three working papers on cassava as part of a series examining national policies for the crop.

INDIA

Cassava in India is grown in a few states in the south, especially Kerala and Tamil Nadu, which share 93 percent of national production. About 30 percent of the 5.8 million metric tons of cassava produced in 1983/84 was used for starch, 55 percent for human consumption, and only about 15 percent for other purposes, such as cattle feed. Sharp increases in the demand for meat, milk, and eggs could change this picture by the end of the century.

According to projections in a study done in collaboration with the Center for Development Studies in India, *Trends and Prospects for Cassava in India*, Working Paper No. 1, by P. S. George, cassava production in India may reach 8.8 million tons by the year 2000, but demand could reach 10.1 million tons—3.9 million tons

each for human consumption and livestock feed, 1.9 million tons for starch, and the rest for export. The key factor in realizing the projected demand is domestic market expansion through use of cassava in cattle feed.

To close the projected cassava deficit of 1.3 million tons, the country will require yield-increasing technology, farmer incentives, suitable processing facilities, and appropriate organizations and mechanisms for integrating farmers and feed manufacturers.

PHILIPPINES

Although cassava's present contribution is only 4 percent of Philippine agricultural output and its per capita consumption as a food in the country is declining by 2.3 percent a year, its future prospects are favorable, according to Liborio S. Cabanilla in *Trends and Prospects for Cassava in the Philippines*, Working Paper No. 2, a study done in collaboration with the University of the Philippines at Los Baños.

Using the rule of thumb that cassava is competitive with corn for animal feed when a mix of four parts of cassava and one part of soybean meal (for nutritional balance) is cheaper than four parts of corn, cassava use was favorable only in 1981 and 1985, largely because of the tariff on soybean imports. The study projects that the use of cassava as an ingredient in livestock feed may rise sharply by 2000. This increase is expected to arise from two developments in the domestic economy: the rapid growth in demand for livestock products and a ban on imports of corn.

Total demand for cassava in 2000 could reach between 3.3 and 4.3 million tons, with the amount projected for food at 545,000 tons and that for manufacturing at 841,000 tons. The amount projected for feed use varies depending on the assumptions on substitutability with corn. With no land available for area expansion, the bulk of the increased output will have to come from yield increase. These increases can occur by applying fertilizer and planting high-yielding varieties, provided the declining trend in the fertilizer-cassava price ratio continues.

INDONESIA

In *Trends and Prospects for Cassava in Indonesia*, Working Paper No. 3, a study undertaken in collaboration with the Center for Agro Economic Research in Indonesia, Faisal Kasryno shows that production of cassava has grown by only 1.6 percent during 1969-84 largely because government incentives have favored rice, maize, and soybeans. Despite the introduction of new technology cassava area has declined and yields have grown only modestly. Nevertheless, cassava is an important food in rural areas: 65 percent of production is used for food. About 25 percent of cassava output is sold to starch factories and 10 percent is exported.

The study projects that the area under cassava will continue to decline between 1986 and 2000 due to competition with other crops. Cassava yields are expected to increase 3.0-3.5 percent per year, reaching about 12.6 tons of fresh cassava roots per hectare in 1990 and 16.9 tons in 2000. But research shows that yield expansion could be much greater if farmers used chemical fertilizers and improved postharvest storage and processing techniques.

The study indicates that expanding production of livestock products, especially poultry meat and eggs, will be a high government priority in coming years, which will increase the use of commercial feed mixes. Whether cassava will be an ingredient of these feeds depends, however, on the price of cassava relative to such crops as maize and soybeans.

A FOOD PRODUCTION IN CHINA

As part of continuing research on wheat, rice, potato, and root crop development throughout China an effort was initiated in 1988 to study the poorest regions of the country with regard to their production of staple food crops.

Because of Chinese restrictions on migration and labor markets, and better social support programs available to qualified urban residents, most of China's poor are in rural areas. Most of the 78 million rural residents earning less than Rmb 200 per capita during 1986 (this poverty line corresponded to US\$55 at official exchange rates) lived in regional poverty pockets encompassing one-third of China's counties. In each of these poverty pockets more than 30 percent of the rural population are considered impoverished (see Figure 4).

Among the country's 750-800 poor counties, more than 600, including all counties averaging less than 150 Rmb of annual income per capita, are located in remote mountainous regions of central and western China. Successful economic development plans for such regions cannot be limited to a narrow focus on local food crop self-sufficiency. But the identity of dominant staple crops and their potential for productivity development through technical change in these regions remains an important consideration for coordinating welfare improvements on a sustainable basis.

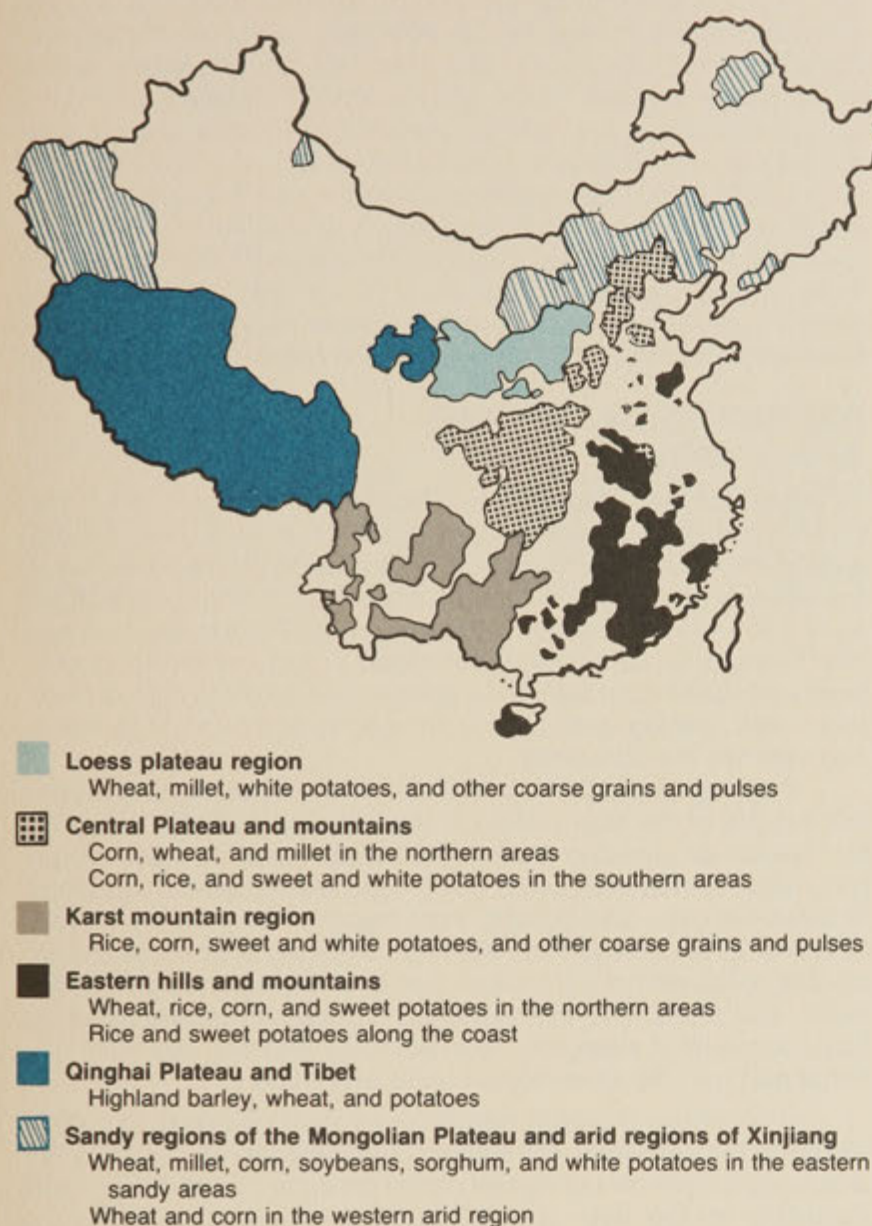
Rice and wheat occupy a surprisingly large proportion of total food-crop area in impoverished regions. In 1985, rice was cultivated on at least 30 percent of the food-crop-sown area in one-third of China's poorest counties. Among these, the largest concentration of especially poor rice cultivators is in the karst mountain region. Wheat is similarly important in more than one-quarter of impoverished counties nationwide. Wheat is an important food crop in almost every poor county on the loess plateau, accounting for as much as 70 percent of food-crop-sown area in some of them.

Corn is a major food crop in 20-30 percent of China's poorest counties. Sweet or white potatoes are very prominent in 20-25 percent. Millet dominates food-crop production in around 40 poor counties in the southern parts of the loess plateau and the northern areas of the Central Plateau.

AGRICULTURAL STATISTICS BRAZIL AND NIGERIA

FPRI's food gap studies have primarily used data from FAO to present trends and projections in terms of aggregates for groups of commodities and of developing countries. *Analysis of Trends and Projections of Food Production and Consumption in Brazil*

Figure 4
Poor areas and their dominant food crops, China



Source: Jiang Dehua, "Research on the Classification and Development of the Poor Areas of China," a paper prepared for IFPRI, November 1988.

and Nigeria by Leonardo A. Paulino and J. S. Sarma is part of IFPRI's ongoing effort at improving methodology for these studies. The use of both FAO and national data in this study is an attempt to enable analysis of changes among geographical areas of a country, compare the two data sources, and identify data needs. The Nigerian analysis was undertaken in collaboration with the University of Ibadan.

Brazil and Nigeria, which are the two most populous countries in Latin America and Africa, both supplemented their production of major food crops in the early 1980s with imports equivalent to

about 10 percent of their consumption of these commodities. The study finds that, based on regional trends during 1961-80 for Brazil and given its potential for expanding cultivated area, that country will likely be able to feed itself in 2000 with even a small improvement in the growth of area harvested. For Nigeria, where, unlike Brazil, there appears to be serious conflict between estimates using international and national sources, FAO data show a slow annual rate of increase in major food crop production since the early 1960s, while data aggregates from the national system reflect absolute declines in output. Regional- and state-level projections, based on national-source data for 1961-83 and 1969-83, respectively, show food gaps in 2000 of up to 6 million metric tons. The reliability of Nigerian data clearly needs to be improved in order to develop effective policies to deal with the country's food problems.

POSTHARVEST GRAIN LOSSES IN INDONESIA

Rice production in Indonesia has increased remarkably since the introduction of high-yielding varieties (HYVs) in the country in 1967, particularly in Java, which accounts for more than 60 percent of the national rice output and where annual production growth averaged 7.2 percent between 1975 and 1985. The varietal shift has also brought about significant changes in techniques not only in paddy production but also in the series of the crop's postproduction processes starting from paddy harvesting up to the time milled rice reaches the consumer.

Ongoing research on grain losses in the different postproduction stages of the rice system in Java during 1975-87 builds on the results of previous studies that were made at each stage, generating annual measures using fitted mathematical equations to available data, and pooling them together on a common base to arrive at an overall loss estimate. With most of those earlier studies conducted in a transition period of rice technology in Indonesia, this study also examines the changes in techniques that have occurred in postproduction activities and the attendant national policies that have helped bring them about.

Preliminary research results show that total postproduction losses in the Javanese rice system during the period 1975 to 1987 averaged 9.9 percent of annual paddy production, with 6.1 percent occurring on the farm and 3.8 percent off the farm (Table 1). On-farm losses for the different activities were estimated at 2.2 percent in harvesting, 2.1 percent in threshing, 0.9 percent in drying, 0.5 percent in transport, and 0.4 percent in storage. The milling loss of 2.2 percent and commercial storage loss of 1.3 percent represent the bulk of off-farm losses, with transport and storage losses accounting for only 0.2 percent and 0.1 percent, respectively. Assuming that traditional postproduction methods would be completely replaced by new techniques, potentially reducible losses would total an estimated 16 percent of postproduction losses or an equivalent of 1.6 percent of paddy production.

The study shows that grain losses in the Javanese rice system greatly depend on the prevailing practices in its postproduction processes. Changes that occur in these processes, like those brought about by the adopted rice technology, would affect the level of losses.

Table 1
**On-farm and off-farm postproduction rice grain losses, Indonesia,
 1975-87 averages**

Postproduction Activity	Losses (Relative to Paddy Production)
	(percent)
On farm	6.06
Harvesting	2.15
Threshing	2.09
Transport	0.48
Drying	0.93
Storage	0.41
Off farm	3.83
Drying	1.36
Paddy Storage	0.05
Milling	2.20
Rice Storage	0.05
Transport	0.17
Total	9.89

Source: Atsurobu Tomomatsu.

FOOD PRODUCTION POLICY PROGRAM

Accelerating the growth of food production in developing countries is the principal concern of research in the Food Production Policy Program. This acceleration of growth must be achieved through price, supply, and employment stability and with equity. Because many developing countries have reached their limits of land and other complementary resources, the research effort is focused on the diffusion and adoption of new technologies. This adoption requires improved infrastructure, institutional development, and increased incentives for production.

During 1988 work in the Production Program focused on the broad areas of generation and diffusion of agricultural technology and accelerating growth with equity. Projects in the first area examined the factors of production, including research and resource allocation, fertilizer use, and irrigation, and the effect of technological diffusion. Projects in the second area focused on food production in Africa and Asia.

A GENERATION AND DIFFUSION OF AGRICULTURAL TECHNOLOGY

A key to the acceleration of agricultural production in the Third World is the spread of new technologies through appropriate policies and strategies related to allocations to research, fertilizer use, investment in irrigation, agricultural prices, and the availability of credit. In addition, research on the process of adoption of technology within specific settings can provide understanding of the causative forces underlying the adoption and use of modern agricultural practices.

ADOPTION AND USE OF MODERN AGRICULTURAL TECHNOLOGY

During 1988 research was undertaken in Bangladesh, the Philippines, Brazil, Zambia, Sierra Leone, and Sri Lanka. In all of these settings the technology adoption process has been different because of varying agroecological conditions, government priorities, and resources.

Bangladesh. Bangladesh is a clear example of the increased need for and diffusion of modern farm technology. Since independence in 1971 it has achieved an annual 3.4 percent growth in foodgrain production, mainly because of the spread of new agricultural technologies. However, population has increased by 50 percent and cultivable area cannot be expanded, conditions that have kept cereal imports at about 10 percent of domestic requirements. The use of modern inputs is still low—only one-third of the land under rice, which is grown on 80 percent of the cropped land, is sown with modern varieties—leaving vast scope for further improvement in productivity through technology diffusion.

In *Nature and Impact of the Green Revolution in Bangladesh*, Research Report 67, Mahabub Hossain examines the characteristics of modern technology in rice production in Bangladesh and investigates its effect on agricultural productivity and rural income distribution. The study is based on two household surveys, one

undertaken by the International Fertilizer Development Center (IFDC) and the Bangladesh Agricultural Research Council in 1979-82 and the other undertaken by IFPRI and the Bangladesh Institute of Development Studies in 1981-83. The report indicates that the rate of adoption of the new technology was almost the same among small, medium, and large farmers, although small farmers allocated larger proportions of their land to the new types of seeds. Production, profits, labor productivity, and employment per unit of land all rose with use of the modern varieties. Small farmers produced the highest yield per acre, but their profits were smaller because they paid higher water charges and wages than large farmers, who control much of the water supply and use hired labor more regularly. The functionally landless, who own less than half an acre, benefited through higher employment and wages. The study found that their 1982 household income was Tk 14,300 in villages that had adopted the new technology, compared with Tk 9,700 in villages that had not.

Diffusion of modern seed varieties and expansion of chemical fertilizer use depend largely on the availability of water, and the study indicates that the capacity of the government to accelerate investment in irrigation, flood control, and drainage would determine success in realizing the potential for increased food production. The report also indicates that additional funds will be needed to strengthen agricultural research and extension as well as credit institutions.

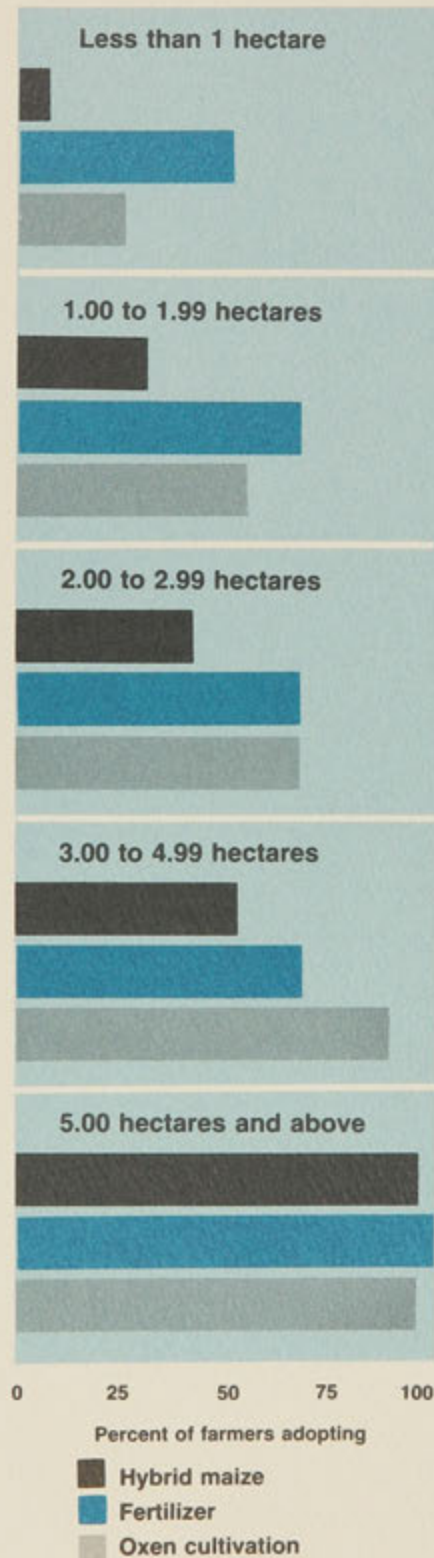
Philippines. Research on the adoption of technology in the Philippines is focusing on the Bicol River Valley. Of specific interest in this work is the time lag that exists between the release date of new rice varieties and their subsequent adoption by farmers. Preliminary estimates indicate that distance to market, household dependency ratios, area under irrigation, type of irrigation (gravity flow or mechanical), and agricultural extension services all affect the swiftness with which farmers adopt recently introduced high-yielding varieties.

Brazil. Research on adoption of technology in Brazil in collaboration with Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA) continued during 1988 with two methodological innovations. The first is the analysis of farms on the basis of concentration of output produced, using cluster analysis. Studying degrees of product cultivation within clusters, for example from 60 percent of farm output in coffee to 90 percent, and shifts across clusters, for example a significant change from corn production to coffee production, will provide important information for future policy decisions. Preliminary results suggest that even in seemingly homogeneous agroeconomic environments there is a significant degree of diversity in levels of farm output specialization. In addition, the differences in the composition of farm output were not fully explained by differences in farmgate prices.

The second methodological innovation is the monitoring of cross-sectional and intertemporal changes in relative input use, and changes in the efficiency with which inputs are used to generate output on farms over time.

Zambia. Analysis of the adoption of hybrid maize, fertilizer, and animal traction on smallholder farms in the plateau and valley regions of Eastern Province, Zambia, continued during 1988. It

Figure 5
Farm size and adoption in the plateau zone, Zambia, 1985/86
Farm size



Source: Dayanatha Jha.

indicates that the differences in agroecological conditions between the two regions are important to technology adoption. Hybrids suitable for valley conditions are not available and the local varieties of food crops grown there are not responsive to fertilizer application. Tsetse fly infestation precludes oxen use in the valley zone.

In the plateau zone, where farm size varies significantly, use of hybrid maize and oxen improved with increased farm size, whereas fertilizer use did not change dramatically from small to large farms except in the largest farm-size category (see Figure 5). In theory, both hybrid seed and fertilizer use are size-neutral, but because of its poor storability hybrid maize is planted primarily as a cash crop. The need to produce enough local maize for domestic consumption is a critical constraint to hybrid adoption on smaller farms. The research also indicates that education and membership in cooperatives positively influenced hybrid maize adoption and that female-headed households and older farmers were less likely to adopt hybrid maize. Use of hybrids and access to oxen were found to be linked to fertilizer use and there was evidence that fertilizer use was higher in locations with relatively better infrastructure (also see the Agricultural Growth Linkages Program and the Food Consumption and Nutrition Policy Program sections).

Sierra Leone/Sri Lanka. Sierra Leone and Sri Lanka are both small, rice-dependent countries with good research systems. In addition, they have both faced serious postcolonial administrative and political problems. In collaboration with the University of Sierra Leone, Njala, research is under way to determine why the research-linked performance of rice farming has been so much better in Sri Lanka. Fieldwork to trace the origins, diffusion, performance, and relationship to the research system of new rice varieties was completed in Sierra Leone. Preliminary data analysis for Mogbuana, a village with about 100 farms averaging 1.8 hectares, indicates a high turnover of rice varieties: 24 of the varieties planted in 1983 were not present in 1987 and 15 of the 39 varieties found in 1987 were new. New farmers accounted for a significantly smaller share of new varieties than of population or rice area. There was little extension, and exchanges among farmers and loans accounted for a significant proportion of rice innovation. The data indicate that farmers are experimental, changing varieties to better cope with flood patterns and nonrice requirements for labor and land. They suggest that farmers' assumptions may be very different from those of rice breeders.

RESEARCH AND RESOURCE ALLOCATION

A main focus of the research effort in this area during 1988 was published in *Prospects for Agricultural Production and Food Deficits in West Asia and North Africa: The Role of High Elevation Areas*, by Peter Oram, a study undertaken for a meeting sponsored by the Turkish Ministry of Agriculture and the International Center for Agricultural Research in the Dry Areas (ICRISAT). The study indicates that agricultural research must play a greater role in the upland areas of West Asia/North Africa, which have a harsh climate but compose almost half of the agricultural land in the region. Despite a rapidly growing demand for food as a result of oil revenues, labor export, and population growth, productivity of wheat, the

region's major staple food, is expanding slowly, if at all. This is due partly to government price and subsidy policies that have encouraged production to the point where wheat is being planted in areas unsuited to it. The fastest-growing demand is for livestock products and other high-value foods in the region, and Oram proposes that governments should instead encourage production of better suited livestock and feedgrains and pasture to support them.

Before a more rational production and land-use pattern can be developed, however, the study suggests that agroclimatic conditions of each major ecological zone and the agricultural strategy best suited to it need to be determined. Research (which the author shows to be greatly underfunded despite the relative affluence of countries in this region) should be expanded to increase yields of wheat and pulses and to develop new varieties of barley and fodder production systems for high plains with cold winters. The results of this research should be tied to greater emphasis on extension efforts to improve farming practices. A regional marketing structure should be developed to encourage intraregional trade.

This research has led to the initiation of a study supported by the World Bank on the potential for diversification of agriculture in the West Asia/North Africa region and to the development of a collaborative project with ICARDA on the future of legumes in that region.

AGRICULTURAL PRICES

Price Policies. In developing countries agricultural prices have enormous human and political implications. The cost of food, of course, is of elemental importance to the poor, but agricultural prices also have profound effects on growth, equity, and stability throughout a developing economy. Too often, governments have intervened with policies that, in striving toward some short-term objective, have grossly distorted prices and created severe backlashes.

Agricultural Price Policy for Developing Countries, edited by John W. Mellor and Raisuddin Ahmed, IFPRI's fourth book in its series with The Johns Hopkins University Press, examines agricultural price policy in the context of technological and institutional changes that lead to systematic, equity-oriented economic growth. The authors address the intensely political nature of price policy; its role in allocating resources for short- and long-run objectives not only within agriculture but also between economic sectors and domestic and foreign production; the limited ability of governments to maintain artificial prices without influencing the long-term balance in supply and demand; and the complex interplay of micro- and macroeconomic forces in price policy that often produces conflicting direct and indirect results.

Agricultural prices play a conflicting role even in the context of growth. Growth in agriculture and the demand for labor (and hence food) are close complements. Much of the increased demand for labor to complement accelerated growth in agriculture must occur in the nonagricultural, although still rural, sector. Rising food prices raise the cost of labor and hence slow the growth in demand for labor. The general resolution of this conflict lies with increasing production incentives to agriculture, not by high prices but by cost-reducing technological change. Moreover, the book shows that improved agricultural technology makes agriculture

more responsive to price changes.

The book recommends approaches invoked by pragmatic considerations for managing price fluctuations and exchange rates; relating domestic to international prices; emphasizing the laggard side of the demand-supply equation whenever a disequilibrium indicates a need for corrective policy; anticipating these disequilibria in order to respond with supply and demand policies that are not price-oriented; and balancing the needs of producers and consumers in a consistent strategy of economic development.

Price Stabilization. Instability in food prices can create severe food insecurity in developing countries. In Bangladesh, price instability was linked to a severe famine in 1974. Research on determining a generalizable approach to price stabilization, with particular emphasis on Bangladesh, was undertaken in 1988. A model was developed to determine the procedures for setting the uppermost price for foodgrain sales and the lowermost price for government procurement and price supports. Results were simulated using these procedures and compared with actual procurement and distribution figures for the period 1976/77-1984/85 (see Table 2). The results indicate that in 1976/77, 1978/79, and 1980/81, actual procurement fell short of needs. Similarly, there should have been reduced procurement in 1979/80 and 1981/82-1983/84. These adjustments could have been made by changing the procurement price. In 1979/80, a very poor crop year, the open market sale of an additional 695,000 tons could have prevented the price from going above the ceiling. Public distribution of foodgrains in the following year, when production was good, should have been about 315,000 tons less than the actual distribution.

Table 2
Comparison of simulated and actual procurement and public distribution of foodgrains, Bangladesh, 1976/77-1984/85

Years	Public Distribution			Procurement from Domestic Production		
	Actual	Simulated	Difference	Actual	Simulated	Difference
(1,000 metric tons)						
1976/77	1,216	1,266	50	313	680	367
1977/78	1,557	1,569	12	541	557	16
1978/79	1,483	1,570	87	317	580	263
1979/80	1,784	2,479	695	226	0	-226
1980/81	1,123	808	-315	841	1,390	549
1981/82	1,344	1,662	318	287	241	-46
1982/83	1,190	1,440	250	168	141	-27
1983/84	1,202	1,472	270	145	128	-17
1984/85	1,327	1,340	13	133	286	153

Source: Raisuddin Ahmed.

CREDIT POLICIES

There is growing recognition that institutional credit plays an important role in the modernization of agriculture through technological change. As these processes of modernization occur, incomes rise

and expenditures on locally produced goods and services expand to increase the demand for labor and labor-intensive entrepreneurial activities. To what extent can institutional credit be offered to the very poor to facilitate their taking advantage of the developing entrepreneurial activities? This question is addressed in *Credit for Alleviation of Rural Poverty: The Grameen Bank in Bangladesh*, Research Report 65, by Mahabub Hossain. In this study, which was undertaken in collaboration with the Bangladesh Institute of Development Studies, Mahabub Hossain describes and evaluates the functioning of a financial institution that provides credit without collateral to the rural poor in Bangladesh. The study was based on two field surveys: one, a survey of 975 sample households, and the other an in-depth household survey of five project and two control villages.

The study shows that the Grameen Bank, a program begun in 1976 and officially established as a specialized credit institution in 1983, has significantly contributed to the alleviation of poverty. The income of member households, of which there were 250,000 in early 1987, is 43 percent higher than that of the target group in control villages, and member households spend 35 percent more on food, 32 percent more on clothing, 49 percent more on education, 32 percent more on health, and almost 500 percent more on housing.

The target group of the bank is those rural households that own less than half an acre of land (about 50 percent of the rural population of Bangladesh). Loans are made for crop cultivation and forestry; livestock and poultry raising and fisheries; processing and manufacturing; trading and shopkeeping; transportation operations; and collective enterprises. During the period of study, only 2 percent of the loans were for crop cultivation, almost half were provided for the livestock and fisheries category.

The bank is particularly outstanding in its coverage of women. Although less than 10 percent of the women in Bangladesh are in the labor force, about 75 percent of Grameen Bank members are women—half of these had been unemployed before becoming members. Seventy-five percent of the loans made in the livestock and fisheries category were made to women.

Much of the bank's success is due to the institutional framework that it has developed. The innovative system has attracted wide interest in other developing countries of Asia and Africa. The report indicates that many aspects of the Grameen Bank could be replicated in densely settled areas of Asia, but that the intensive interaction of bank employees with borrowers might be inappropriate and too costly for the more sparsely settled countries of Africa.

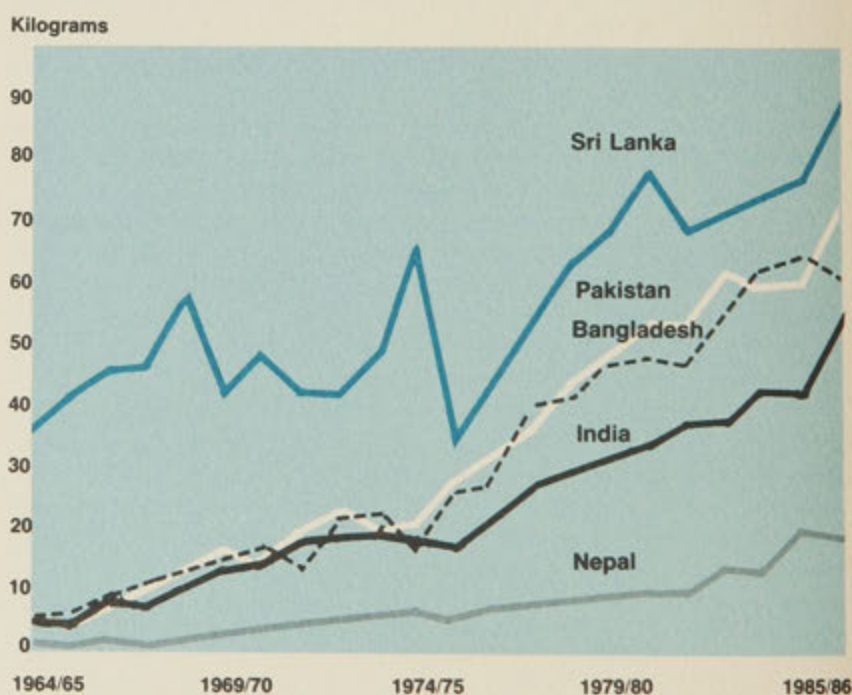
FERTILIZER POLICIES

Research on fertilizer policies during 1988 focused on South Asia and Sub-Saharan Africa.

South Asia. Although the chronic dependence of South Asia on massive food imports has substantially declined, the race between population growth and food production is far from over. The combined population of the five South Asian countries (Bangladesh, India, Nepal, Pakistan, and Sri Lanka), over one billion in 1986, is projected to increase by 460 million by the year 2000.

Growth in fertilizer use, from 0.5 million tons in the early 1960s to 12.3 million tons in 1986/87, has been a key factor in raising agricultural production in South Asia (see Figure 6). By the year 2000, fertilizer consumption will have to reach about twice the level of the mid-1980s to raise agricultural production to meet people's needs. A comparative overview of the past development of the fertilizer sector in the five South Asian countries reveals the crucial role of three factors—sizable deficit in food production, commitment of the national governments to boost food production through a variety of policies, and widespread diffusion of fertilizer-responsive foodgrain varieties. The analysis also highlights certain weaknesses in the past growth of fertilizer consumption, most notably deficiencies in supply and distribution systems, relatively low efficiency of fertilizer use, and excessive dependence on price incentives. It is suggested that future policies should aim at maximum cost-effectiveness and economic efficiency in agricultural production. This is especially crucial in developing countries once growth in domestic production replaces exports, and further expansion in markets for agricultural output depends on agricultural consumption by the poor and competitiveness in world markets.

Figure 6
Per hectare fertilizer use in South Asia, 1964/65-1985/86



Sources: Food and Agriculture Organization of the United Nations, *FAO Fertilizer Yearbook*, various issues (Rome: FAO, various years).

Sub-Saharan Africa. The poor performance of the fertilizer sector in Sub-Saharan Africa has been well documented. With the exception of a few countries, namely Zimbabwe, Kenya, and Malawi, fertilizer use in this region is the lowest in the world and is growing at a rate of only 9 percent. In collaboration with IFDC and local institutions, IFPRI has undertaken research to analyze the problems facing the fertilizer sector in this region. These problems appear to be in four areas: information, supply, use, and institutions.

Inadequate knowledge of the international market and poor organization of procurement, distribution, and marketing systems has put the price of fertilizers out of the reach of most smallholder farmers in Sub-Saharan Africa, creating a pressing need for subsidies. In Cameroon, for example, the costs of procurement, distribution, and marketing of fertilizers represent 90 to 100 percent of the import price. During 1984-86, to make fertilizers available to farmers, the Cameroon government subsidized 80 percent of the cost.

IRRIGATION

Research on irrigation financing policy in the Philippines continued during 1988. This work, in collaboration with the National Irrigation Administration (NIA) and the National Economic and Development Authority (NEDA), is examining irrigation investment in the Philippines, which is nearing the end of its third boom period since the beginning of the century. Reasons for the current downturn include the economic problems of the early 1980s in the Philippines and the low international price of rice prevailing in recent years. In addition, international lending to the Southeast Asian region for irrigation has declined by two-thirds in real terms since 1979, and lending to the Philippines has almost ceased.

Reduction in government operating subsidies in the early 1980s led NIA to delegate increased authority to field operating units, and to emphasize "financial viability," which has caused operating units to focus on programs designed to increase irrigation revenues and to cut operating costs. It is difficult to determine the quality of available data on system operations, although no dramatic decrease in quantity of irrigation service is apparent. A slow, long-term decline in wet season performance continues, while dry season performance steadily improves. (The latter is probably due to the building of reservoirs during the construction boom of the late 1960s and 1970s.)

The research indicates that the most significant aspect of the shifts in operating patterns exhibited by NIA during the last 10 years has been the emergence of effective problem-solving behavior and the ability to decentralize. However, it suggests that continued progress in improving financial viability will depend on shifting strategic emphasis to effective irrigation performance if fee collections are to rise above their current plateau of 60 percent of receivables.

ACCELERATING GROWTH WITH EQUITY CEREAL SUBSTITUTION IN SUB-SAHARAN AFRICA

West Africa. *IFPRI Report 1984* noted the rapid decline of coarse grain consumption per capita in the last 25 years in West Africa and the rapid rise in consumption of imported rice and wheat. The trends raised three main issues for policy research. First, can raising rice and wheat prices relative to everything else reverse these trends? Second, what will be the cost to equity and welfare of the neediest in West Africa? Third, what will be the impact on economic growth?

Research undertaken in subsequent years and completed in 1988 suggests that in Burkina Faso relative prices appear to play a minor role in driving West African rice consumption at household and national levels. An IFPRI study conducted with the University of Ouagadougou found that in the short run, a 1 percent increase in the price of rice, other things being equal, was associated with only a 0.6 percent decrease in the quantity of rice consumed in the capital city. Nonprice factors such as income distribution, the need to eat away from home, and occupation appear to be more important in explaining the substitution away from coarse grains to rice.

At the national level from 1970 to 1983 in Senegal, Burkina Faso, Niger, and Côte d'Ivoire, a 1 percent relative decrease in the urban rice price was associated with only a 0.1-0.6 percent increase in the share of rice in national cereal consumption. This suggests that to be successful at reducing imports, price-based measures would need to raise rice and wheat prices significantly relative to coarse grain prices.

An IFPRI study in collaboration with the University of Ouagadougou examined who would benefit and who would lose from increased rice and wheat prices. It suggests that the poorest third in the urban areas obtained about one-third of their cereal-based calories from rice, which accounted for one-half of their cash expenditures on cereals. Comparisons of urban and rural populations in survey work by IFPRI, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and the University of Ouagadougou indicate that in Burkina Faso, the richest third of the rural population in the South, where rice is produced, has a higher mean income per adult equivalent than the poorest third of the urban population. Thus policies that increase rice prices can have negative equity consequences on both the urban and rural populations.

The effect of higher cereal prices on overall economic growth is particularly complex in lower potential rural areas, where many individuals are net purchasers of cereals. In the rural Burkina Faso study, in 1984/85, a drought year, differences were found between the dry, climatologically vulnerable, Sahelian region—where 69 percent of household incomes come from livestock production and off-farm activities—and the higher rainfall Sudanian region—where 37 percent of household incomes come from nonagricultural activities. Although the Sahelian households received only 23 percent of their income from the agricultural sector, compared with Sudanian households who received 55 percent, their diversified income strategy resulted in about 25 percent more income per capita than in

the Sudanian households. In the Sahelian households hunger was much less prevalent as well. The average total annual income per adult equivalent in the Sahelian sample was 38,810 francs cfa (about US\$94 in that year). In the Sudanian sample, the figure was 30,880 francs cfa (about US\$75).

The study found that rural households are highly involved in the market both to generate income and purchase food. This suggests that real income transfers can be effected through concessional sales of cereals in rural areas. Though in some areas and years this may act as a disincentive to production, in others, such as in northern Burkina Faso, aid and concessional sales in drought years act primarily to shore up real incomes of households.

The income strategies of agriculturalists are central both to their short-run price responsiveness and the longer-run speed and direction of adjustment to changes in incentives. Moreover, whether and to what extent rural households adopt specific crop technologies and invest time and resources in specific crops, including cereals such as maize and sorghum, depends on the returns from these crops relative to other income opportunities. During 1988, ongoing work continued on these issues and new field studies were launched in Senegal, in conjunction with the Institut Sénégalais de Recherches Agricoles (ISRA), and in Niger, in conjunction with ICRISAT and starting in 1989 with the Institut National de Recherches Agronomiques du Niger (INRAN).

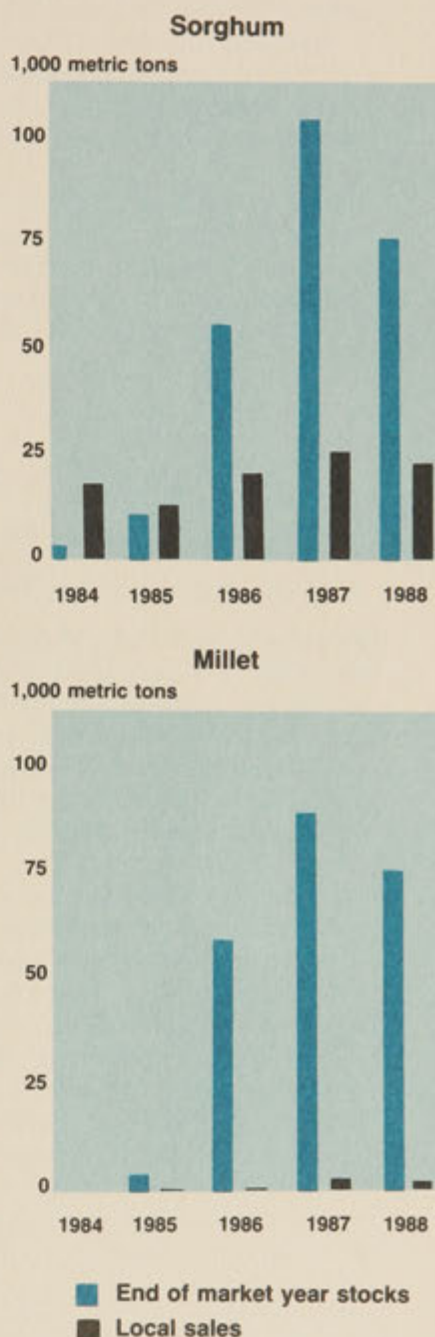
Zimbabwe. Stocks of millet and sorghum in Zimbabwe, as in several locations in West Africa, have reached historic highs in the past few years, the result of good weather, policies that have raised official procurement prices for sorghum and millet, and the expansion of marketing infrastructure. In 1988 the Zimbabwe Grain Marketing Board had three times as much sorghum and more than thirty times as much millet as local annual sales of these grains by the Board (see Figure 7). Though sorghum and millet inflows to the Grain Marketing Board were high, uncompetitive selling prices severely limited grain outflows.

During 1988, IFPRI embarked on a new study of the possibilities for better use of the productive potential of semiarid agriculture in the Southern African Development Coordination Conference (SADCC) region, in collaboration with the SADCC/ICRISAT Sorghum and Millet Improvement Project. Early results suggest that most coarse grains came from larger and relatively better-off producers. Further, there appear to be substantial opportunities for expanding the use of sorghum and millet in composite flours, beer production, and animal feed should official selling prices be realized and processing technologies improve.

ACCELERATING GROWTH IN ASIA

Ongoing research in Indonesia has involved the development of an Indonesian food crop supply/demand model and its use in determining the effects on crop production of eliminating fertilizer subsidies, investment in irrigation, and crop diversification policies. During 1988 research involved the updating, extension, and application of this model, developed jointly with the Center for Agro Economic Research in Bogor, to assess the effect of trade liberalization on Indonesian food crop production.

Figure 7
Grain Marketing Board stocks and sales, Zimbabwe, 1984-88



Sources: Agricultural Marketing Authority, *Grain Situation and Outlook Report and Quarterly Bulletin* (Harare: AMA, 1988).

Government policy has been a key factor in the rapid growth of the Indonesian agricultural sector in the past decade. However, the government has also influenced the price levels of food crops through control of imports and intervention in domestic markets, often keeping domestic prices above world prices, which may lead to inefficient production activities and higher costs to consumers. The analysis compares the phased elimination during five years of all price controls for rice, corn, soybeans, sugar, cassava, and wheat and partial liberalization, which combines elimination of price controls with a 20 percent import tariff on soybeans, wheat, and sugar, with the current structure of incentives.

Preliminary results indicate that liberalization would generate large gains for consumers, smaller losses for producers, and a slight shift from rice and soybeans toward the production of corn and cassava (see Table 3). The overall effect on the rice sector would be very small. The projected increase in import expenditures for food commodities would be less than 1 percent of total Indonesian export earnings. Partial liberalization would provide similar results but at a reduced level, perhaps making its implementation more palatable.

Table 3

Effect of trade liberalization policies on rice prices, food crop production, imports, and consumer expenditures, Indonesia, 1995

	Base Run: Fixed Domestic Prices	Trade Liberalization for Food Crops	Trade Liberalization with 20% Import Tariff on Soy- beans, Wheat, and Sugar
Domestic wholesale rice (Rp/kg)	348	344	349
Paddy production (1,000 metric tons)	47,657	47,331	47,608
Other crop production (1,000 metric tons)	25,951	26,264	26,078
Rice imports (1,000 metric tons)	91	-79	-26
Cost of food imports (billion Rp)	1,157	1,363	1,219
Net farm revenue (billion Rp)	9,874	9,369	9,724
Consumer food expen- ditures (billion Rp)	14,146	13,390	13,943

Source: Mark Rosegrant et al.

AGRICULTURAL GROWTH LINKAGES PROGRAM

Research in the Agricultural Growth Linkages Program examines how technological change in agriculture affects national economic growth and the welfare of the poor. The research is concerned with documenting to what extent the increased agricultural productivity and higher rural incomes associated with the adoption of technological change contribute to increased demand for agricultural products and other goods and services. An important part of the research effort focuses on the nature and effect of government policies on agriculture.

During 1988 the research effort involved the analysis of data from rural Zambia and Egypt and preliminary work in Pakistan. Primary data collection in rural Zimbabwe and secondary data collection in China were completed for two new studies. Research continued on resource transfers within national economies, focusing on Argentina and Chile.

H GROWTH AND EQUITY IN RURAL AREAS AGRICULTURAL GROWTH LINKAGES IN ZAMBIA

How much technological change in agriculture affects rural economies overall and rural poverty in particular is a major area of research within the program. During 1988 research on agricultural growth linkages in rural Zambia continued. Data from some 330 households in 10 villages in Eastern Province were analyzed and the preliminary results presented at a seminar in Livingstone (see the Outreach section). Study villages were located in the plateau and valley regions.

In Zambia, smallholder farmers contribute almost two-thirds of the GDP, but data from Eastern Province suggest that smallholders suffer from policies that discriminate against them. Technology—defined in this study as hybrid maize seeds, animal traction, and fertilizer—has not been widely adopted, even though it has been shown to lead to significant increases in incomes and productivity of farm resources. Only one-half of the smallholders use oxen technology, one-third grow hybrid maize, and one-half use fertilizer. Analyses suggest that more smallholder farmers have not been able to adopt the new technologies because of a lack of access to credit, poor transport and marketing infrastructure, adverse ecological factors, and a lack of policies focused on the poorer valley regions.

Households in the plateau region have better agroenvironmental conditions and have adopted the above technology to a greater extent. The analysis indicates that plateau households have higher levels of income than those in the valley region and have marginal budget shares that are 56 percent higher for purchased food, 86 percent higher for consumer goods, and 132 percent higher for agricultural inputs.

Analysis of the data also indicates that households adopting improved technology modify their consumption expenditure patterns in favor of nonfood goods. A shift in mixed-crop cultivation replacing local with hybrid maize was estimated to increase the nonfood expenditure share by 9 percentage points. The share of food expenditures dropped from 97 percent before to 88 percent

after, indicating that households continue to allocate a large share of their budgets to food purchases.

Although the number of calories consumed by adopting households increased, there was no improvement in nutritional status within the household. This was attributed to a lack of diversity in the diet and higher food requirements because of increased labor requirements.

Analysis of the data on household demand for rural services indicates that use of services related to purchased food, consumer goods, fuel, health care, and credit are negatively affected by the distance to these services. For example, with every one kilometer increase in distance from the household, there was a decline of expenditure by Kw 9.90 (Kw 1 = US\$0.10) for purchased food and by Kw 2.20 for consumer goods.

The lack of input and output marketing services was also found to be a deterrent to both growth and equity. Demand for these services was influenced not only by distance to them, but also by a combined availability of other relevant services. Every unit of output marketing service available with transportation, credit, and input marketing services was associated with an increase in gross household revenue from the sale of crops of Kw 219.26.

The analysis also indicates that households with two or more hectares of land spent more on services than those with less than two hectares. This included 18 percent more on purchased food, 46 percent more on consumer goods, 50 percent more on fuel and energy, 55 percent more on construction, 66 percent more on communications, 12 percent more on health care, 46 percent more on transportation, 46 percent more on credit, and 72 percent more on agricultural inputs.

Although technology adoption is associated with consumption of nonfood goods, thus stimulating growth in the nonfarm economy, households still allocate a high proportion of their incremental expenditure to food, but health problems, poor infrastructure, and low educational levels were found to work against the full realization of those income gains.

The research suggests that higher rates of technology adoption will require changes in pricing policies to remove price distortions and institutional reform to facilitate input and output marketing and credit and other support services. Government policies to promote investment in infrastructure, irrigation, electrification, marketing and service facilities, credit, and education will enhance agricultural development and generate secondary rounds of growth. These policies will be crucial to combating village isolation, particularly in the valley region.

During this current critical period of structural adjustment in the Zambian economy, expenditure on research and extension, rural infrastructure, health, and education is particularly important. The analysis indicates that rural household demand linkages are weak in Eastern Province, but that households in the plateau region or with two or more hectares of land are more responsive to changes in rural service infrastructure than those in the valley region or with less than two hectares. Although weak demand points to a lack of integration of the total rural economy, the varying degrees of responsiveness suggest the role improved rural service infrastructure can play in strengthening rural household demand links.

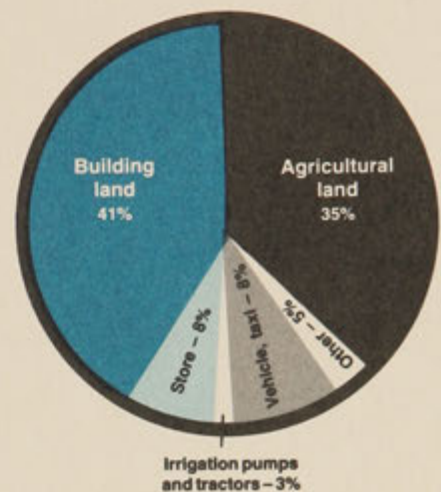
LOCAL INVESTMENT IN EGYPT

IFPRI continues to research the effects on local economies of remittances earned by laborers working abroad. Current research focuses on rural Egypt, where many villagers migrate to the oil-rich countries of Iraq, Kuwait, and Saudi Arabia. Analysis of survey data from 1,000 households from three villages in Minya Governorate, Egypt, suggests that upper-income groups produce a disproportionate share of international migrants. More than 50 percent of all migrants were from households with incomes in the top 40 percent of the income range. Apparently, the recent fall in oil prices has made international migration more difficult for poorer Egyptian villagers.

Like other studies, the Egyptian data suggest that migrant households spend a large proportion—54 percent—of their remittance earnings on durables, such as housing. However, this study also shows that migrant households invest a sizable portion of their earnings. According to the study, migrant households spent about 28 percent of their increased income on investment—land, vehicles, and equipment. About 76 percent of this investment went into land—building and agricultural—and less than 5 percent went into new agricultural technology—pumps and tractors (see Figure 8).

The fact that migrants in this study proved reluctant to invest their remittance earnings in new agricultural technology may point to the need for new policy initiatives in Egyptian agriculture. If the Egyptian government were to change present pricing and institutional policies in such a way as to raise the returns to investment in agriculture, it is likely that migrants would invest more of their remittance earnings in new technology.

Figure 8
Total per capita expenditure
on investment for 75 migrant
households in Egypt,
1986-87



Source: Richard H. Adams, Jr.

EDUCATION AND HUMAN CAPITAL ACCUMULATION IN RURAL DEVELOPMENT

Many developing countries are at a watershed in their allocation of educated labor. For the first time, large numbers of graduates from rural primary and secondary schools are breaking with the usual pattern of urban migration and employment. As a consequence, education levels in rural areas are rising rapidly.

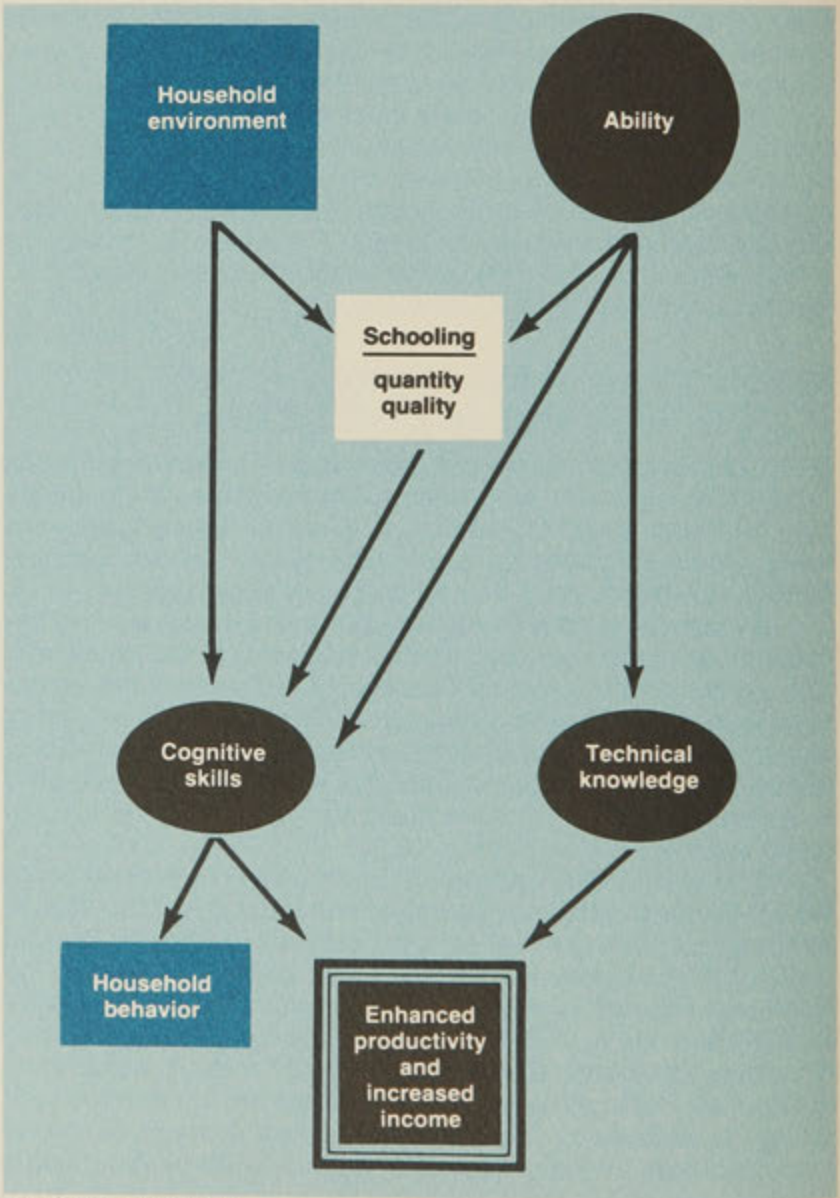
Investment in education in the developing countries now exceeds US\$50 billion per year. The social returns to this investment now depend on the economic effects of the increase of the educational level of the rural population. In addition, the pace and structure of rural development is sensitive to the accumulation of human capital, and rural development policies may have to be adjusted as a result. But little is known about the returns to education in the rural areas.

During 1988 IFPRI continued to define its research effort on the causes and consequences of human capital accumulation in rural areas, focusing specifically on Pakistan. With data from an ongoing IFPRI survey in the rural areas of the Punjab and the Northwest Frontier Province of Pakistan and new data collected in 1988 and 1989, IFPRI is studying the key linkages among education, various dimensions of household behavior, and productivity growth. Although educational development is generally considered to have been slow in Pakistan, preliminary investigation indicates that more than 40 percent of the 15- to 29-year-old males

in the sample from the Punjab and the Northwest Frontier Province have completed at least middle school.

The study is focusing on access to schooling of varying quality and the determinants of the production of cognitive skills and technical knowledge. The research will attempt to trace the various roots by which human capital accumulation can improve the welfare of the rural population (see Figure 9). The direct routes for this improvement include better access to jobs and increased productivity in those jobs and in agricultural and nonagricultural self-employment. Routes that raise income indirectly include better nutrition, reduced morbidity, lower fertility, improved performance in school, as well as regional multiplier effects of human capital accumulation on output, labor demand, and returns to labor.

Figure 9
Structural model of human capital accumulation, productivity growth, and the household



Source: Richard Sabot.

RESOURCE TRANSFERS IN THE NATIONAL ECONOMY

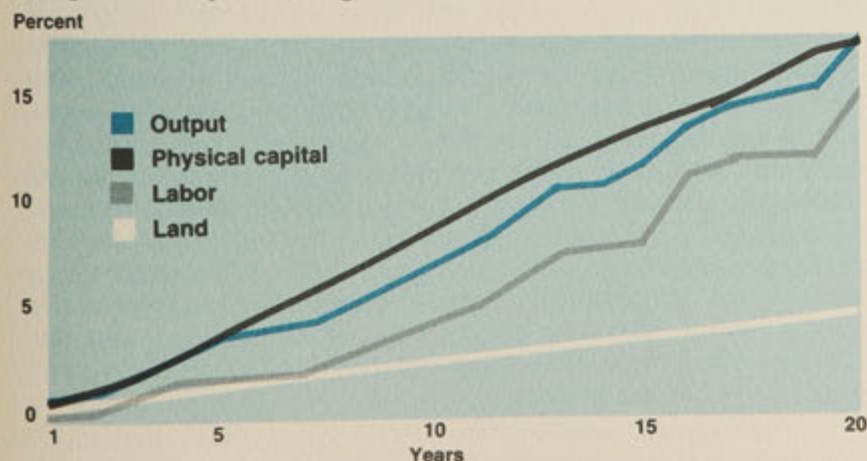
The issues of Third World development are closely linked to those of agricultural development. An important part of IFPRI's research effort focuses on the determinants of growth in the economy overall and the agricultural sector in particular. During 1988 research continued on the historical and quantitative aspects of resource transfers in the national economy. Studies on the determinants of growth in Argentina and Chile continued.

How prices affect output, which in turn affects resource allocation, was examined in Argentina in a three-sector economic model—agriculture, nonagriculture (nongovernment), and government—using data from 1913 to 1984. The empirical model was simulated by increasing agricultural prices by 10 percent, while keeping the overall price level constant. Preliminary results indicate that after four years, agricultural output increased by 2.9 percent; during 20 years, by 17.8 percent (see Figure 10). This resulted mainly from rapid capital accumulation in agriculture. The price change was also found to affect nonagricultural output positively through economywide capital accumulation.

The Chilean study examined a five-sector economy—agriculture, mining, manufacturing, services, and government—from 1962 to 1982. To determine the amount of substitution between sectors, the empirical model was simulated by increasing agricultural prices by 10 percent while keeping overall prices constant and restricting total investment and labor supply to their historical levels. This resulted in increased output of 6.1 percent after four years and 14.3 percent after 19 years. Had expansion of labor supply and investment been allowed for, the long-term growth in output would have been greater.

Because agriculture is more tradable than nonagriculture in these settings, the relative price of agriculture is more susceptible to changes in the real exchange rate. Thus the research suggests that general trade and exchange rate policies and pricing policies work together to influence agricultural output and overall economic growth.

Figure 10
Change in agricultural inputs and output with a 10 percent increase in agricultural prices, Argentina



FOOD CONSUMPTION AND NUTRITION POLICY PROGRAM

Research in the Food Consumption and Nutrition Policy Program is focused on how public policies affect real incomes, food consumption, and nutrition in low-income households. At the core of the research effort are the conceptual and empirical studies that ultimately contribute to policy formation and implementation. IFPRI places particular emphasis on understanding the processes that occur within the household, and many of the data used for analysis are collected in household surveys conducted by IFPRI staff in collaboration with local institutions.

During 1988 research continued in the areas of food subsidies, commercialization of agriculture, the environment and sustainable agriculture, seasonality, technological change in agriculture, and intrahousehold issues. Research was initiated on famine prevention and on adaptation to dietary stress.

P FOOD SUBSIDIES IN DEVELOPING COUNTRIES

Policies and programs that keep food prices low to consumers—consumer-oriented food subsidies—form a significant share of government expenditures in a number of developing countries. Food subsidies may introduce price distortions into the economy and may result in large economic losses to food producers. Current economic crises are forcing governments of many countries to look for ways to reduce government spending and improve the foreign exchange balance. Capping or reducing food subsidies has been part of about one-third of 94 adjustment programs supported by the International Monetary Fund during recent years. The issue has high political sensitivity and is highly relevant for economic policy.

IFPRI undertakes research on food subsidies to help governments assess how current and alternative subsidy policies affect human welfare, fiscal costs, and the production environment. During 1988 IFPRI issued three publications dealing with food subsidies.

Food Subsidies in Developing Countries: Costs, Benefits, and Policy Options, edited by Per Pinstrup-Andersen and published in the IFPRI/Johns Hopkins University Press series, reviews several years of empirical work done in collaboration with institutions in developing countries with large food subsidy programs. The studies reveal that consumer-oriented food subsidies may be powerful policy tools for reaching certain social, economic, and political goals. These include income transfers to certain population groups—usually urban consumers; reducing energy and nutrient deficiencies in low-income groups; maintaining low urban nominal wages; and ensuring social and political stability. Targeted food subsidies may also be effective in maintaining the standard of living of specific groups of poor households facing severe economic crises. In addition, if used discriminatingly and imaginatively, subsidies may effectively enhance the health, nutrition, and general well-being of the most disadvantaged with little or no negative effect on economic growth.

The long-term way to achieve these policy goals is to increase the ability of the poor to generate higher incomes. This implies increasing the efficiency of food production (through technological

change), improving rural infrastructure, increasing input use, and making markets efficient. Such measures can reduce consumer prices without adverse effects on producers. Food subsidy programs should be temporary, to ensure that the poor have sufficient food while they are working to increase their incomes. To be cost-effective, it is essential that the programs be targeted.

The book indicates that governments have not fully used food subsidies to create self-sustained incomes among the poor. As with so many other policy tools, the question is not whether consumer food subsidies are good or bad but when and how they are applied and how they are financed.

BRAZIL

Brazil's production and consumption subsidies on wheat, implemented in order to improve self-sufficiency and income distribution, have continued despite the recurrent government deficit and the pressing need for foreign exchange to service debt. These well-intentioned policies have failed to reach their objectives. Geraldo M. Calegar and G. Edward Schuh, in *Brazilian Wheat Policy: Its Costs, Benefits, and Effects on Food Consumption*, Research Report 66, examine the costs of wheat-market interventions in terms of welfare, income distribution, and trade during 1966-82. Wheat is still the major food item imported. To protect consumers from high import prices, Brazil has consistently overvalued its currency, but this acts as a tax on producers. For the production subsidy to be effective, producer wheat prices must more than cancel this tax; that is, they must be higher than border prices. They were, but only at the official exchange rate. If the overvaluation of the currency is taken into account, wheat prices were below border prices on average. Thus these guaranteed prices failed to stimulate farm production to the levels desired.

These policies were also bad for income distribution. Although 86 percent of the benefits of the consumption subsidy went to consumers, only 19 percent reached the low-income population. Urban consumers benefited more than rural, and the rich more than the poor, because wheat products play a larger part in the diets of the former groups. In addition, nutritional benefits were negligible: an increase of less than 1.5 percent of per capita calories consumed.

PAKISTAN

In *Household Food Security in Pakistan: The Ration Shop System*, Working Papers on Food Subsidies No. 4, Harold Alderman, M. Ghaffar Chaudhry, and Marito Garcia examine the consequences of replacing Pakistan's long-standing wheat flour ration system with a general flour subsidy. The rationing system was replaced before the study was completed, largely because of its inefficiency—not for fiscal reasons. The study projects that with derationing the subsidy bill would be reduced by only 20 percent during the first year, but unless policies are initiated to reduce the general subsidy gradually, future costs could be higher than those incurred by rationing. With derationing, the average urban ration user faces a 1.2 percent increase in cost of living, but the rural majority will enjoy close to a 1.5 percent decrease in living expenses.

The study finds that although derationing did not appreciably add to the problem of urban poverty during the year of the survey,

poverty was nevertheless widespread; 7.3 percent of the children under five were acutely malnourished. In addition, high incidence of childhood illnesses caused household monthly medical expenditures to be more than twice the value of the flour subsidy. Targeting health and other services for low-income neighborhoods ranks high as an alternative to the ration system.

Recently IFPRI collaborative research in Pakistan has shifted to a more general analysis of rural welfare. Data collected from 1,100 households in five provinces in the earlier study contain figures on sources of earnings and assets of low-income households, women in the labor force, education, farm productivity, demand for food, health care services, and seasonality, among others. Analysis of these data is providing information on most of the topics under study within the Consumption and Nutrition Program.

Preliminary findings suggest that one-third to one-half of household earnings came from nonfarm employment and less than 10 percent from wage labor in agriculture. This is in sharp contrast to Pakistan in the early 1970s, and to northern India today.

The data also indicate that consumption patterns are not seasonal, although earnings, female labor, and incidence of disease do follow seasonal patterns. This discrepancy between consumption patterns and seasonal earning patterns is explained by the active informal credit markets. More than 90 percent of the households borrowed during the first year of the study. Annual expenditures averaged Rs 20,000-25,000 and annual loans averaged Rs 3,000-5,000.

T COMMERCIALIZATION OF AGRICULTURE AND NUTRITION

he current foreign exchange crisis and debt burdens of many developing countries provide further impetus for the greater export orientation of agriculture. Expansion and improved efficiency of the agricultural export sector is a cornerstone of many structural adjustment programs for low-income countries.

But are higher average incomes achieved through agricultural commercialization? If so, are they sustainable and do they reach the malnourished poor? To what extent does higher household income actually translate into better nutrition for all household members? Because there are many possible policy variations to consider when weighing the choices associated with commercialization and self-sufficiency, and because economic and social conditions vary across countries and regions, it is impossible to answer these questions definitively. However, by studying the process of commercialization in different settings, key factors related to nutrition can be identified to provide guidance for policy formulation.

During 1988 IFPRI continued to research the effects of commercialization on agricultural production and nutrition of the poor. The studies examine rural areas of The Gambia, Guatemala, Kenya, the Philippines, and Rwanda where a number of programs have recently increased commercialized agriculture. The studies have focused on nutrition within the households, with particular emphasis on preschool children.

Nowhere did commercialization damage nutrition in preschool children (see Table 4). However, nutritional improvement

Table 4
Prevalence of malnutrition, stunting, and wasting among preschoolers:
participant and nonparticipant households in commercialized
agriculture

Country	Percent of Preschoolers with Less Than 90 Percent of					
	Height for Age		Weight for Age		Weight for Height	
	Partici- pants	Nonpar- ticipants	Partici- pants	Nonpar- ticipants	Partici- pants	Nonpar- ticipants
The Gambia	9.4	17.4	27.5	27.0	29.0	28.7
Guatemala	66.7	72.8	47.2	49.8	6.3	6.9
Kenya	24.3	25.3	20.1	23.3	12.3	16.3
Philippines	32.2	36.3	45.7	51.8	22.4	27.1
Rwanda	18.6	24.0	11.3	11.5	4.5	3.9

Sources: Joachim von Braun, Eileen Kennedy, and Howarth Bouis.

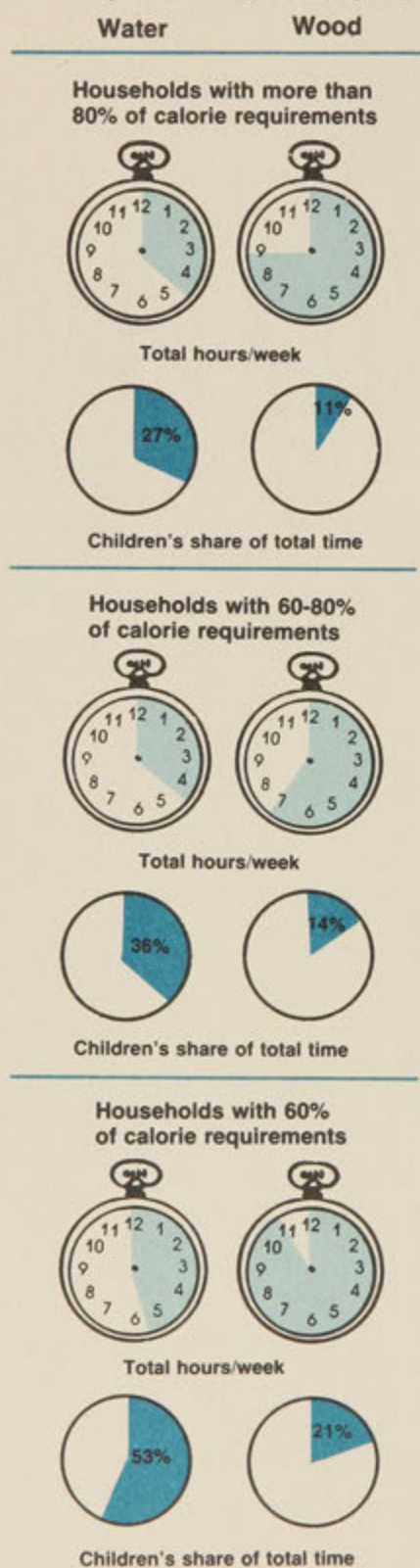
due to incremental income is not large in the short run, and decreases at higher incomes. In The Gambia, Guatemala, the Philippines, and Rwanda, a 10 percent increase in income in households with per capita incomes of US\$100 was associated with a 1-2.5 percent improvement in preschooler nutrition (measured by weight for age). Health and sanitation constraints may overshadow the favorable income effects for nutrition. The Kenya study found no significant improvement in nutrition of preschool children despite increased incomes, probably because of poor health and sanitation conditions in the study area. This suggests that agricultural development must be promoted in tandem with health and sanitation improvements.

As an outgrowth of this research, data on nutrient intakes collected in the commercialization studies have been reanalyzed to indicate the influence of reporting error in determining the relationship of income to nutrient intake. In the Philippines and Kenya, in particular, increased incomes appear to be associated with levels of food purchases that are higher than actual food intake. With improved statistical techniques, several sources of this upward bias can be eliminated. Some of this difference appears to be attributed to the use of food purchases for feeding guests and workers in wealthier households. Preliminary results also indicate that activity and work effort levels are higher in low-income households, which raises caloric intake needs. (Also see the Outreach section.)

THE ENVIRONMENT AND FOOD SECURITY IN MARGINAL AREAS

An important cause of environmental degradation in developing countries is deforestation. In Nepal, this occurs mainly because—as population grows—near-stagnant technology prevents any major yield increase in crops; hence output is increased instead by cutting down forests to increase crop areas. During 1988 research on the implications of deforestation and food security was completed in Nepal and continued in a study in Rwanda.

Figure 11
Water and wood fetching by calorie consumption levels, Rwanda, 1986



Source: Joachim von Braun and Graciela Wiegand-Jahn.

NEPAL

In addition to the problems associated with soil erosion, deforestation can also have adverse effects on the productivity and welfare of smallholder households. These effects are described in *Consequences of Deforestation for Women's Time Allocation, Agricultural Production, and Nutrition in Hill Areas of Nepal*, Research Report 69, by Shubh K. Kumar and David Hotchkiss, a study based on a year-long household survey in 1982/83 conducted jointly by the Agricultural Projects Services Centre (APROSC) of Nepal, the Food and Agriculture Organization of the United Nations, and IFPRI.

From the early 1970s to the 1980s, between 30 and 50 percent of the forests in the hill areas of Nepal have been cut down. The study finds that the recession of the forest means that more time is required to travel to and from the forest and to gather fuelwood and fodder for livestock. This has major effects on the allocation of women's time. Women are primarily responsible for gathering wood and fodder, but they also supply essential farm labor, without which household income will decline and family consumption and nutrition as well. Where deforestation is extensive, 75 percent more time is required for collection per load of fuelwood, which suggests a 45 percent increase in total collection time. Because other forest products collected, such as fodder, are also affected, women's total time spent on all collection activities increased by 1.13 hours per person per day. This resulted in a reduction in women's field labor of about one and a half hours a day. In addition, reduced time spent in preparing food and other nurturing activities also affects children's welfare adversely. Men's agricultural labor also declines, but to a lesser extent.

Strategies are needed to improve wheat and paddy yields in the lowlands of the hill areas, which would ease the pressure for area expansion in the highlands. Crop intensification in the lowlands would improve the area's market integration, making it easier to diversify the hill areas into increased horticulture production, for which the region is ecologically well suited. This study demonstrates that sustainability is relevant not only for the highly productive agricultural areas but also in the currently backward ones. Here the environmental degradation is directly a consequence of the low levels of productivity.

RWANDA

In a related study in a high-altitude area of northwest Rwanda, where population growth has been rapid (4.2 percent per year in the 1980s), agriculture has been moving into ecologically vulnerable marginal areas, leading to deforestation. In this area, which has an altitude of 2,000 to 2,500 meters, women provide about 70 percent of all field crop labor. In addition, with children, women gather most of the household's water, which requires nine hours per household per week.

Water- and wood-gathering are time-consuming activities for households and compete with other productive activities such as crop production. The research indicates that the poor, who have the highest calorie deficiencies, spend much more time collecting wood and water and rely more on children for these services (see Figure 11). Only 8 percent of better-off households—those consuming more than 80 percent of their calorie requirements—buy

wood, whereas 16 percent of the poorest group—those consuming only up to 60 percent of their caloric requirements—purchase wood. The data also indicate that when comparing the households that are better off with those that are the poorest, the poorest group has twice as many households in which children gather all wood and water.

This research suggests that increasing women's labor productivity in agriculture and reducing the time required for basic household activities are closely related and crucial to overall economic improvement.

FAMINE RESEARCH

Research initiated in 1987 on famine in Sudan and Ethiopia continued during the year. One focus of this effort is on the relationships between drought and production and their resulting price, consumption, and nutrition effects. The severe droughts that have plagued both countries since the 1970s have led to serious economic deprivation. Initial research indicates that because of poor infrastructure and limited market integration, aggregate food consumption fluctuations are determined primarily by national and regional production fluctuations (see Figure 12). Thus the key to stabilizing consumption at higher levels is stabilizing and expanding production and improving the environment for trade.

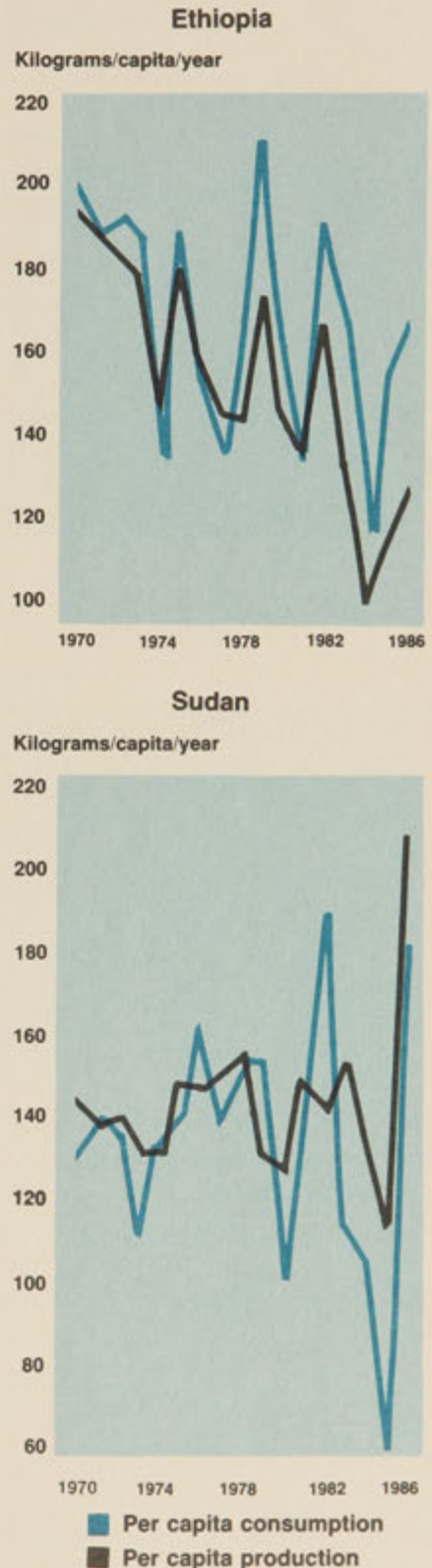
A number of questions are central to the research effort. Which population groups are most seriously affected and how can these groups be rapidly reintegrated into a productive development process? What policies would be most cost-effective in coping with the adverse effects of drought on a long-term basis? How do long-term policies for investment, food pricing, and technological change contribute to the ability of food production and marketing systems to respond to the food shortage shocks? In both studies field surveys are under way by outposted staff with collaborating institutions in the two countries.

SEASONALITY

Seasonal fluctuations in agriculture can affect household nutrition and productivity. Research in the Consumption and Nutrition Program has been examining the implications of seasonality particularly as it relates to technological change in agriculture in countries with varying degrees of seasonal fluctuations in the nutritional status of the population. The research is examining the effects on labor productivity of reduced nutritional levels of adults as well as labor allocation strategies in times of nutritional stress.

Preliminary results indicate that work loads, which change with the season, affect adult body weight to a greater extent than variations in household food availability. Thus, despite apparently normal amounts of food availability, because of extra work during planting and harvesting seasons adults may actually experience relative food scarcity. In Zambia, nutritional status declined despite higher than average caloric intake because of heavy work loads

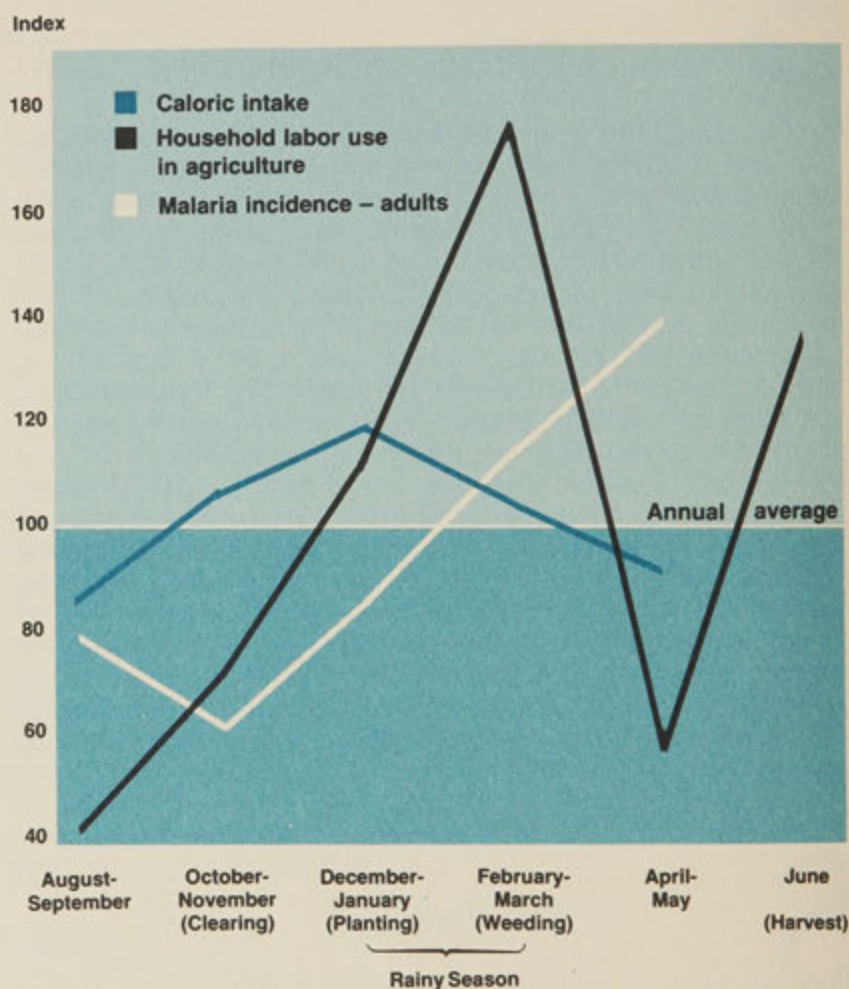
Figure 12
Per capita cereal production and consumption, 1970-86



Sources: Preliminary results from Tesfaye Teklu, Patrick Webb, and Joachim von Braun.

and high disease prevalence during the rainy season (see Figure 13). Nutritional status of adults and children was lowest in February and March, during the second half of the rainy season. When examining adult nutrition after a poor crop year, research in Zambia found that adults reduced the amount of work they performed because of limited food availability, thus reducing the production potential in the following year and affecting agricultural productivity.

Figure 13
Seasonal fluctuations, Chipata District, Zambia



Source: Shubh Kumar.

TECHNOLOGICAL CHANGE IN AGRICULTURE

The Consumption and Nutrition Program is undertaking research in rural countries on the effects of technological change in agriculture on food and nutrition levels within the household. The research effort recognizes that the benefits of new technology are associated with the links between agricultural and overall economic growth in rural areas. It also recognizes the importance of

infrastructure development in this relationship.

Studies in Bangladesh and Zambia are currently under way. Bangladesh is characterized by a high population density (1,566 people per square mile in 1981), high rural landlessness, and an average farm size of one hectare. Technological change has occurred through the adoption of high-yielding rice varieties and irrigation. Zambia has a population density of 10 people per square mile, no rural landlessness, and an average farm size of 2.5 hectares. Technological change has occurred through the use of hybrid maize and plough cultivation.

The research indicates that modern rice varieties in Bangladesh have been adopted by most smallholders. In Zambia, hybrid maize remains predominantly a cash crop, grown primarily by larger farmers. Yet in both countries a poor household's prospects for increased food consumption depend much more on the widespread adoption of the technology within the area than by the household. Small farmers, who are primarily nonadopters, are much better off in areas that have a higher level of adoption as a whole than nonadopters in low-adoption areas (see Figure 14). Higher adoption rates of new technologies were also found in both studies in areas with developed infrastructure (also see the Agricultural Growth Linkages and Production Policy Programs).

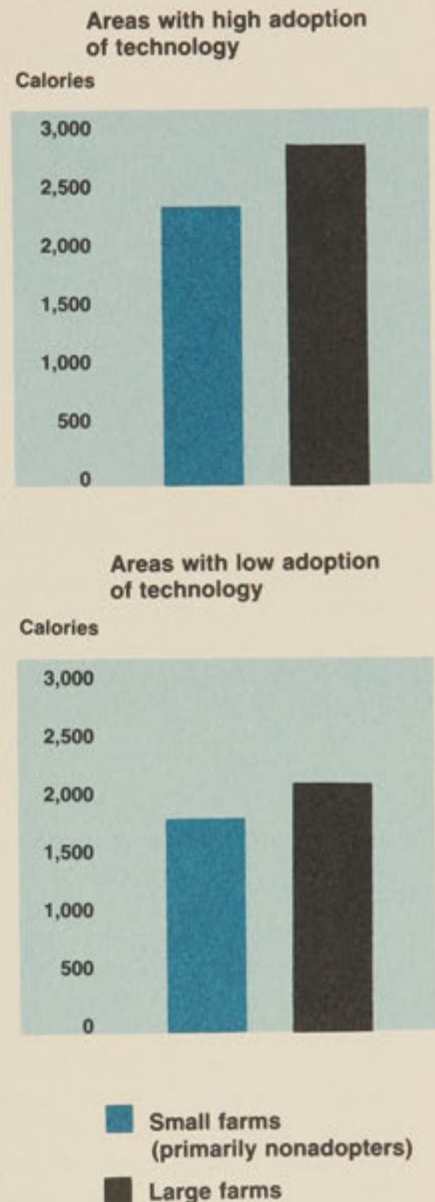
A INTRAHOUSEHOLD ISSUES

A number of studies in the Consumption and Nutrition Policy Program have examined resource allocations within the household, how they change with commercialization and technological change, and how they affect the welfare of the household members. The issues under study include the effects on women's income and economic role, labor allocation activities within the household, expenditure patterns, and the health and nutritional status of household members.

All the studies found that women had little or no access to changes in agriculture, including the introduction of new commercial crops or new varieties and technologies for existing crops. Women's proportionate contribution to household income was found to decline with these introductions, and this was usually associated with a reduction in their decisionmaking in agricultural transactions. Women maintained control of the production of non-commercial crops consumed within the home and had access to commercial crops only if these were a food source within the household. Thus with the introduction of potatoes with modern inputs in Rwanda, hybrid maize in Zambia, snow peas in Guatemala, and pump-irrigated rice in The Gambia, women's participation in the production of these more commercial crops was limited. The crops became largely "men's crops" even in environments where women play a dominant role in agriculture otherwise.

Preliminary data from Zambia indicate that even though the caloric content of diets was increasing, it was not sufficient to meet the increased requirements from heavier work loads. Thus no real improvement was occurring. This and related aspects of dietary improvement are being analyzed further.

Figure 14
Daily per capita energy consumption in high and low adoption areas by farm size in plateau zone, Zambia, 1986



Source: Shubh Kumar.

ADAPTATION TO DIETARY ENERGY STRESS

FPRI work suggests that nutritional status is sometimes slow to respond substantially to higher incomes, even among the poor. Is this because some poor people are "adapted" to low energy intakes? Research during 1988 analyzed materials on adaptation to dietary energy stress (DES).

The threat from DES is a sequence of risks: (1) source of DES (for example, a drought); (2) stress itself (for example, increased energy requirement); (3) strain (bodily reaction, for example, weight loss); and (4) damage (for example, reduced working efficiency).

Responses to these risks of DES comprise (1) avoidance (of source, stress, strain, or damage); (2) repartitioning, that is, redirection of stress, strain, or damage toward less vital body tissues or tasks; (3) resistance to strain or damage; or (4) tolerance of small or reversible damage. As the borders of damage are approached, a hierarchy of responses—biological or behavioral—appears. A response is adaptive if, and only if, it preserves or improves fitness to survive and reproduce under that stress. However, adaptation in humans is "acceptable" only if full functioning is preserved and serious pain or distress avoided.

Biological responses to DES include reduced body size or growth; a rising proportion of body tissues with low energy requirements per kilogram; biologically forced cuts in activity above basal metabolic rate (BMR), whether at work, at leisure, or involving the reproductive cycle; and, perhaps, cuts in BMR per kilogram of specific body tissues—that is, metabolic adaptation. The latter is less important than the extent to which people can be "small but healthy" in determining whether biological responses to DES are adaptive and, if so, acceptable.

Behavioral responses to DES are larger and more important than biological responses. They include voluntary reductions in energy expenditure; ergonomic adjustment, such as slower but less calorie-using performance of a given task; changes in children's activity or play, or in their management (the maternal "positive deviance" that helps some children to come through DES unharmed); and new patterns of acquiring or structuring diets.

The study reviews who is stressed and who adapts, and examines group differences by socioeconomic status (for example, landed and landless), income, age, and sex.

INTERNATIONAL FOOD TRADE AND FOOD SECURITY PROGRAM

A developing country's trade policies as well as the international setting in which they are implemented affect its short-term food availability as well as the structure of incentives for food production in the long run. Because developing countries typically have open economies dominated by agriculture, trade policies affect both the agricultural and nonagricultural sectors. Research in the International Food Trade and Food Security Program examines both the domestic and international issues associated with agricultural growth and food security.

During 1988 analyses of national trade policies and specific food supply programs of developing countries focused on short-term management needs and the long-run effects of trade and exchange rate policies on production incentives and growth in agriculture. Analyses of international policy issues focused on protectionism in light of the multilateral agricultural trade negotiations, implications for horticultural markets, and international food aid.

A NATIONAL FOOD SUPPLY MANAGEMENT

Appropriate policies for managing food supplies are essential for national food security. This requires balancing consumption requirements with a government's budget, trade objectives, and balance of payments, all of which are linked to its import policies. During 1988 IFPRI research focused on food supply management in Kenya and Pakistan.

KENYA

Most governments in developing countries intervene in the marketing of the major staple food in order to promote self-sufficiency and stabilize producer and consumer prices despite large fluctuations in domestic production. These interventions have come under increased scrutiny in recent years as costs have escalated and government expenditure control has become more stringent. In *Storage, Trade, and Price Policy Under Production Instability: Maize in Kenya*, Research Report 71, Thomas Pinckney develops a framework for examining these issues and applies it to Kenya.

The study uses an interannual model in which the government's three objectives—minimizing imports, fiscal costs, and price variability—are combined into a single objective function that implies an efficient policy. Because the three objectives are qualitatively distinct and involve trade-offs, it is necessary to examine alternative policies that result from changes in the assumed degree of willingness to pay for one objective in terms of the others.

The study finds that optimal stocks for buffering maize production fluctuations between years are relatively small in the efficient policies, averaging less than 100,000 metric tons, as long as the government's willingness to pay for decreasing imports is less than US\$100,000 per 1,000 tons. Most fluctuations in domestic production are translated into changes in domestic consumption and international trade rather than into stock changes. The role of stock changes increases, however, as the world price declines. There is no one optimal stock level.

The study concludes that small fluctuations in official prices can lead to substantial decreases in fiscal cost and a reduction in imports. Increasing the standard deviation of price by one dollar per ton—which is equivalent to decreasing the minimum expected producer price and raising the maximum expected consumer price for 9 out of the next 10 years by 1.5 percent—decreases average annual costs by US\$600,000. The study acknowledges that developing countries cannot actually implement the policies that result from an optimizing model. But it suggests that major benefits are gained by increasing the sensitivity of the domestic price to the world price, allowing the maximum domestic stock level to decline with increases in the world price, and allowing even a small response in official prices to an unexpected change in domestic production.

PAKISTAN

In Pakistan the government holds wheat stocks to provide wheat in deficit years, deficit seasons, or when imports are on order but not yet available. Research is ongoing to analyze these sources of demand for storage, determine the size necessary for government facilities, and determine the most cost-effective role of the government in the wheat market.

The study indicates that the government has a role to play in year-to-year supply management. Without government intervention, it is estimated that average annual wheat prices would routinely vary by 25 percent from one year to the next, and would vary by more than 50 percent about one year in 10. The study suggests that the government can stabilize wheat supplies and prices through import and export trade and does not need to hold stocks for the following year unless domestic supplies are abundant and the world price for wheat falls below US\$80 per ton.

The study notes that international trade may not be timely enough to prevent seasonal shortfalls; however, the private sector in Pakistan holds most seasonal stocks and increases these in times of seasonal price rises. The study estimates that a 1 percent increase in the release price for wheat (holding the procurement price constant) would decrease required government storage by 200,000 tons and reduce government costs by US\$12 million annually. It notes that a redirection of only a small portion of this savings to poor consumers would compensate for the lower real income they would experience. Currently in Pakistan, wheat storage is more than 5 million tons annually. This is expected to rise to more than 8 million tons by the year 2000.

T TRADE AND EXCHANGE RATE POLICIES

Trade and exchange rate policies can have a substantial effect on relative prices and production incentives in agriculture. And the implicit taxation of agriculture through overvalued exchange rates can sometimes dominate, through its effect on production incentives, certain commodity policies. In addition there is often a substantial direct taxation of export crops. Research on trade and exchange rate policies is closely linked to work undertaken in the

Agricultural Growth Linkages Program on national resource transfers. During 1988 research on the effect of these policies on production incentives, growth, and employment in agriculture was completed in a comparative study of 18 developing countries. A study was completed on Colombia, and research continued on Pakistan.

DEVELOPING COUNTRIES

The comparative study, undertaken with the World Bank, examined agricultural pricing policies in 18 countries in Asia, North Africa/Middle East, Sub-Saharan Africa, and Latin America. The research used a common methodology to determine the extent to which policies within the agricultural sector (direct policies) and those within the economy as a whole (indirect policies) affected agricultural prices. The indirect effects have two components: the effect of industrial protection policies on the relative prices of agricultural commodities compared with those on nonagricultural traded goods, and the effect of industrial protection policies on the real exchange rate and thus on relative agricultural prices. These sectoral and economywide policies have a net effect on relative prices guiding farm investment and land and labor allocation in agriculture.

The study found that most countries adopted agricultural policies on exportables that resulted in the equivalent of export taxes—-11 percent on average (see Table 5). In contrast, and contrary to expectations, the study countries had positive direct protection of import-competing crops—21 percent on average. This degree of discrimination against exportables and in favor of import-competing crops was remarkable and is illustrated by the

Table 5
Direct and indirect effects on producers' incentives in 18 developing countries, 1980-84 average (percent)

Country	Exports			Indirect Effect	Imports		
	Product	Direct Effect	Total Effect		Product	Direct Effect	Total Effect
Argentina	Wheat	-13	-50	-37	...	...	...
Brazil	Soybeans	-19	-33	-14	Wheat	-7	-21
Chile	Grapes	0	-7	-7	Wheat	9	2
Colombia	Coffee	-5	-39	-34	Wheat	9	-25
Côte d'Ivoire	Cocoa	-21	-47	-26	Rice	16	-10
Dominican Republic	Coffee	-32	-51	-19	Rice	26	7
Egypt	Cotton	-22	-36	-14	Wheat	-21	-35
Ghana	Cocoa	34	-55	-89	Rice	118	29
Korea	...	...	...	-12	Rice	86	74
Malaysia	Rubber	-18	-28	-10	Rice	68	58
Morocco	...	...	...	-8	Wheat	0	-8
Pakistan	Cotton	-7	-42	-35	Wheat	-21	-56
Philippines	Copra	-26	-54	-28	Corn	26	-2
Portugal	Tomatoes	17	4	-13	Wheat	26	13
Sri Lanka	Rubber	-31	-62	-31	Rice	11	-20
Thailand	Rice	-15	-34	-19	...	...	...
Turkey	Tobacco	-28	-63	-35	Wheat	-3	-38
Zambia	Tobacco	7	-50	-57	Corn	-9	-66
Average		-11	-40	-29		21	-6

Sources: Anne Krueger, Maurice Schiff, and Alberto Valdés.

Note: The effects are measured as nominal rates of protection.

Malaysian example: Malaysian rice received 68 percent nominal protection, while Malaysian rubber was taxed at the equivalent of 18 percent.

The study found that the indirect effects were stronger than the direct effects for most countries. The effective taxation on exports by indirect policies exacerbated the negative direct protection, often resulting in extremely large total negative protection equivalents. Overall, agricultural export prices received by producers were half or less what they would have received under a free trade regime at realistic exchange rates with no direct intervention.

COLOMBIA

In *Coffee Boom, Government Expenditure, and Agricultural Prices: The Colombian Experience*, Research Report 68, Jorge García García and Gabriel Montes Llamas show that two actors in the late 1970s—the coffee boom and the growth in government spending—were largely responsible for initiating a decline in the growth rate of agricultural production in Colombia. The price of coffee, which provides more than 50 percent of Colombia's legal foreign exchange earnings, rose in 1974 and increased the real income of most Colombians. The resulting increase in demand for all goods caused the price of nontraded (domestic) goods and services to rise relative to prices of tradable ones, and resources were drawn away from production of other exports and import-competing goods, including agricultural goods.

The study also finds that efforts to decrease government spending—one way to reduce negative effects on other sectors of a boom in one sector—were unsuccessful, thus worsening the effects of the coffee boom. An increase in the ratio of government expenditure to GDP caused the relative price of nontraded commodities to rise. Imports increased because their prices fell relative to domestic goods.

The factors that affect the movement of real wages in agriculture were also studied. On the demand side, a 10 percent increase in the relative price of agricultural goods would increase the agricultural wage 5 percent, while a 10 percent increase in capital stock (value added per worker) would increase the wage rate nearly 15 percent. On the supply side, a 10 percent rise in urban wages would result in a 2.5 percent increase in rural wages, while a 10 percent rise in urban unemployment could cause rural wages to fall 9.4 percent by discouraging rural-urban migration.

On the supply side a 10 percent relative price increase would expand area cropped in the following year by 4 percent for rice, 10 percent for cotton, 7 percent for wheat, and only 2 percent for coffee. This positive response of output to price indicates that the decline of relative agricultural prices in the late 1970s and early 1980s largely explains the relative decline of agricultural production and exports during that period.

PAKISTAN

Research on Pakistan indicates that trade restrictions, particularly import tariffs and quotas on industrial goods, have resulted in an appreciation of Pakistan's real exchange rate by about 20 percent during the last two decades. Because most major agricultural commodities are traded goods in Pakistan, this appreciation has adversely affected price incentives for the production of agricultural

tradables. From 1982 to 1987, wheat prices were on average 50 percent below border prices adjusted for the appreciation of the real exchange rate. The *basmati* rice price was 70 percent and the price for cotton seed was 35 percent below the border prices adjusted for the exchange rate. Without exchange rate adjustment, the effects of agricultural trade and price policies were -10 percent for wheat, -40 percent for *basmati* rice, and 30 percent for cotton seed.

These preliminary results indicate that these policies have led to significantly lower production of cotton and *basmati* rice and higher production of sugar. The results point to the need to include the effects of economywide trade and exchange rate policies in agricultural price policy analysis.

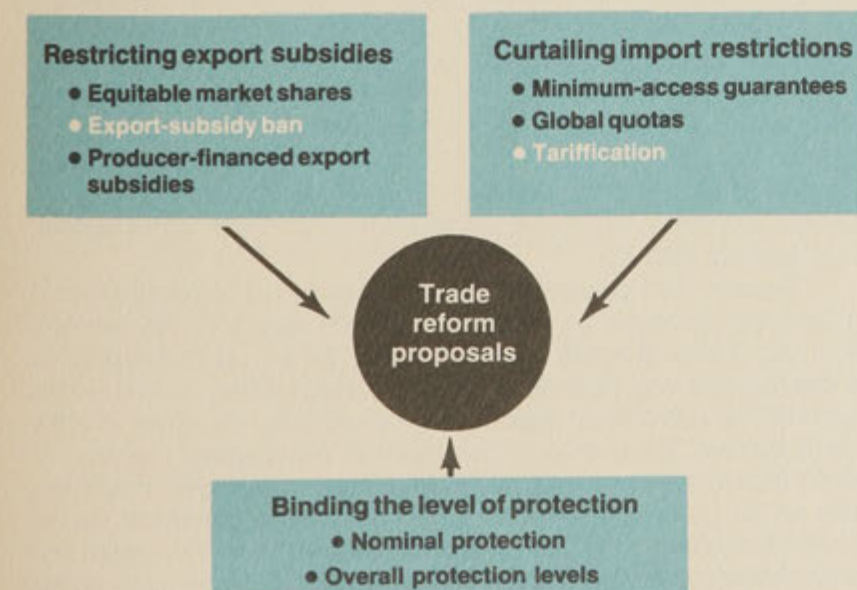
MULTILATERAL TRADE NEGOTIATIONS

International conditions greatly affect a country's domestic trade policies. Security and predictability of market access and stability of trade relations and international agricultural markets are of great importance to the economic growth of the food and agricultural sectors of developing countries. As part of this international research focus, the Trade Program completed a study on the Uruguay Round of the international trade negotiations, initiated research on the prospects for horticultural production and trade in the Third World, and continued research on food aid needs.

AGRICULTURE AND THE GATT

The Uruguay Round of negotiations of the General Agreement on Tariffs and Trade (GATT) opened in September 1986 with an emphasis on the urgent need for trade reform in agricultural products, which have become one of the most contentious areas of

Figure 15
Taxonomy of reform ideas for agricultural trade



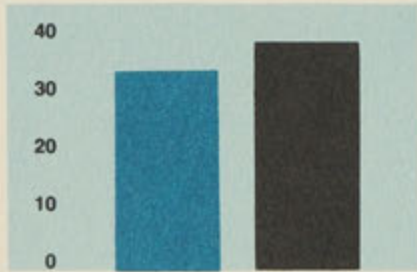
Source: Joachim Zietz and Alberto Valdés, *Agriculture in the GATT: An analysis of Alternative Approaches to Reform*, Research Report 70 (Washington, D.C.: IFPRI, 1988).

Figure 16
Horticultural trade of developing countries, 1961-63 and 1983-85

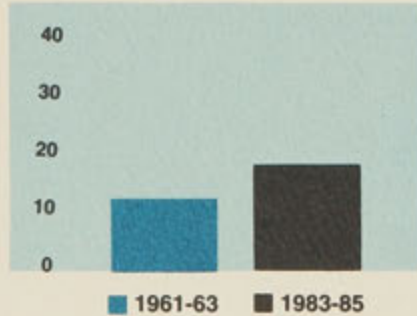
Share of horticultural products in the agricultural exports of developing countries
Percent



Share of developing countries in world horticultural exports
Percent



Share of developing countries in world horticultural imports
Percent



Source: Nurul Islam.

international trade. In *Agriculture in the GATT: An Analysis of Alternative Approaches to Reform*, Research Report 70, Joachim Zietz and Alberto Valdés analyze numerous alternative trade reform elements and present a reform proposal that offers a solution for achieving the objective of the Uruguay Round—an environment without trade-distorting government interventions, fully integrated into the GATT, but flexible enough to accommodate problems of domestic structural adjustment and income instability.

The two reform elements recommended are a strict ban on export subsidies and “tariffication” (see Figure 15). The latter could be the sought-after unifying theme of the present negotiations by providing the basis for trade reform in all goods-producing sectors. Tariffication consists of replacing all unbound tariffs and nontariff barriers (for example, variable levies, quotas, and voluntary export restraints) with bound base tariffs that are uniform across broad commodity groups for each country, as well as limiting the emergency safeguard measures for agriculture to temporary tariff increases.

Because the dividing line for agricultural policy and that for the major disputes in agricultural trade are found between the United States and the EC, much of the analysis in this study is devoted to developing their probable responses to alternative agricultural trade reforms and their implications for developing countries. Within the context of agricultural trade reform the report focuses on the importance to developing countries of considerations such as trade preferences, market access, and reciprocity.

HORTICULTURAL PRODUCTS

In recent years policymakers and trade analysts have expressed increased interest in the role of horticultural products—fruits and vegetables—in agricultural diversification and the generation of foreign exchange in developing countries. Current research on this topic indicates that in 1983-85 horticultural products constituted 12-13 percent of the agricultural exports of the world as a whole as well as of the developing countries; in the latter case, increasing from 9 percent in 1961-63 (see Figure 16). The share of developing countries in world horticultural exports during the last two decades increased to 37 percent by 1983-85, even when the rate of growth of world horticultural trade slowed down in the last decade and the share of developing countries in world agricultural exports declined.

Seventy-two percent of the increase in horticultural exports of developing countries between 1970-72 and 1983-85 resulted from expansion of world import demand, 24 percent from exports to the fast-growing markets, and only 4 percent from an increased competitive advantage gained by developing countries on the world market. Even though the share of developing countries in world import demand was on the increase, developed countries, with an 83 percent share, still remained the predominant source of world demand. The fastest-growing markets were in Japan and North America, while Western Europe provided the largest market in absolute size.

Future prospects for horticultural exports from developing countries depend partly on the growth in world import demand,

primarily in the developed countries whose trade restrictions reduce their import demand, and partly on the extent to which they can increase their share of world trade. If the developed countries' share of world horticultural imports continues to rise at past rates and the developing countries are able to maintain their share in world exports, they can almost double the value of horticultural exports by the year 2000. An elimination of trade restrictions in the developed countries would further contribute to the expansion of exports by almost one-third.

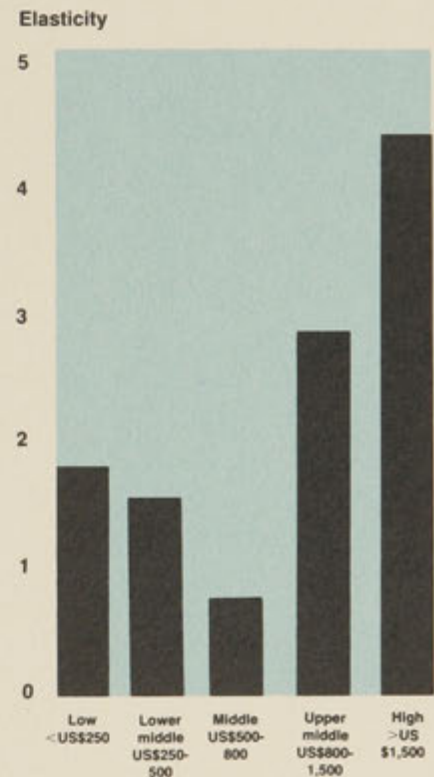
D FOOD AID

During 1988 research was undertaken on the patterns and sources of growth in the consumption of the major food crops and their relation to food aid needs in 105 developing countries between 1961 and 1983. This research includes analysis of feed consumption.

Preliminary findings indicate that per capita food consumption in the developing world grew at a rate of only 0.6 percent during the 23-year period. During this period population, which had a 2.7 percent growth rate, accounted for 80 percent of the growth in food consumption. Seventy-seven countries had food consumption growth rates below this average, and 40 of these had negative rates of growth. More than half of the countries with negative growth rates were in Africa.

In contrast, per capita feed consumption grew at a rate of 2.8 percent in the study countries, accelerating sharply during the second half of the period. Between 1961-63 and 1981-83, average aggregate feed consumption rose from 200 million to 600 million tons, increasing its proportion to aggregate food consumption from one-fifth to one-third. When the countries were classified into five per capita income groups, per capita feed consumption growth rates compared to food consumption growth rates first fell with increases in income, then rose sharply (see Figure 17). This suggests that as per capita incomes rise from low levels, growth in food consumption—mainly occurring among the poor—initially dominates growth in feed consumption. However, once annual per capita incomes reach a critical level of about US\$800, the relative growth of livestock products—mainly occurring among the upper income groups—and thus feed, dominates.

Figure 17
Feed/food consumption growth rates for developing countries, by income groups, 1961-83



Source: Hannan Ezekiel.

OUTREACH

IFPRI achieves its impact on policy through publishing and disseminating its research findings, collaborating on projects with other CGIAR centers and national institutions in developing and developed countries, and convening workshops, seminars, and conferences. These activities affect policies as their results reach IFPRI's main audience—policymakers and researchers. In the last four years overall outreach has doubled in magnitude as a result of increases in the amount of published output, the number of collaborations and meetings (see sections below), and the number of visiting researchers and outposted staff (see Personnel section). IFPRI's long-range plans call for this increase to continue.

M PUBLICATIONS

Major studies based on data analysis and research to advance methodology, both of which are undertaken in relation to specific policy issues, are published in the anonymously refereed research report series. (A list of the referees appears at the end of the Publications and Papers section.) These are distributed to researchers and libraries around the world, and, along with abstracts that summarize the major policy conclusions, to policymakers in developing and developed countries. In 1988 analyses were also reported in a new working paper series on cassava research; one on food subsidies; a "gray" report series that makes available conference papers and overviews of policy issues; a new policy briefs series that encapsulates recent research findings drawn from studies that may not yet be available to the general public; reprints of journal articles by IFPRI staff; food policy statements; the newsletter, which is now published four times a year instead of three; and two books published for IFPRI by The Johns Hopkins University Press. This latter series brings together the expertise of researchers from IFPRI and other institutions to investigate critical issues in food policy. A complete listing of 1988 titles appears in the Publications and Papers section.

These publications were distributed through the mailing list and special requests to more than 13,000 individuals and organizations, almost half of these being individuals, libraries, educational institutions, research organizations, and government agencies in the Third World. Responses from a survey of readers were collated for analysis and addresses continue to be updated from the same survey. Development issues were communicated to a more general audience as well through press briefings and press releases. The latter were used by newspapers and magazines around the world.

IFPRI also made known its research by displaying its publications at international meetings and book fairs in Berlin, Buenos Aires, Frankfurt, New Delhi, and several cities in the United States.

COLLABORATION WITH CENTERS IN THE CGIAR

IFPRI's collaboration with other CGIAR centers reflects the complementarity between technological innovation and policy research. By providing analysis of policy variables that enhance or

constrain the generation and diffusion of new technology and help or hinder access to its benefits a policy environment is created that is conducive to accelerating food production and ensuring its more equitable distribution. In addition, by supplying a social science perspective IFPRI helps broaden the network of research institutions that collaborate with centers in the CGIAR. Collaborative links have been strengthened by outposting five staff members at four international agricultural research centers, three of which are in the CGIAR system.

Collaborative activities with other CGIAR centers during 1988 are listed below. More detailed descriptions of some of these projects are given in the sections dealing with IFPRI's five research programs.

■ An outposted IFPRI research fellow at the International Rice Research Institute (IRRI) is investigating irrigation investment policies and issues related to agricultural diversification in the Philippines.

■ Overall coordination of a project designed to assess the outlook for millet and sorghum in West Africa is being provided by IFPRI. The other CGIAR center involved is the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). The study is looking at the substitution in consumption of wheat and rice for traditionally grown millet and sorghum and the substitution in production of maize and rice. The magnitude, determinants, and consequences of these substitutions at the household level are being investigated. IFPRI has posted a Rockefeller Foundation fellow at ICRISAT/Niger.

■ IFPRI has been collaborating with the directors general of the other centers in the CGIAR in preparing an agricultural research strategy for Sub-Saharan Africa. A policy paper was completed on the subject.

■ Three working papers were published this year as part of a completed study with the Centro Internacional de Agricultura Tropical (CIAT) and the International Institute of Tropical Agriculture (IITA) on the supply and demand prospects for cassava, with particular reference to its

food and feed uses in the Third World.

■ IFPRI is collaborating with other centers in the CGIAR and outside organizations to develop an intercenter approach to the characterization of agroecological zones and the integration of socioeconomic and agroecological parameters in agricultural research programs.

■ IFPRI and the International Livestock Center for Africa (ILCA) are working together to examine famine in the context not only of successions of bad crop years, but of the performance of rural markets and different household food security strategies. Contemporary famine theory, policy, and practice is being reviewed and field data on production-income-consumption-nutrition linkages associated with drought and food shortages will be collected. An IFPRI postdoctoral fellow has been outposted to ILCA for this project.

■ A paper submitted at a meeting organized by the International Center for Agricultural Research in the Dry Areas (ICARDA) and the Turkish government, and also attended by the Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT), was published this year as a "gray" IFPRI report. The research was on the role of high-elevation areas in West Asia and North Africa in helping to solve the increasing food deficits in the region. IFPRI and ICARDA

are also developing a project to evaluate the role of food legumes in farming systems and the economy of countries in West Asia and North Africa.

■ With CIMMYT, IFPRI is providing a report on the role of technical change in wheat production development in the People's Republic of China based on an examination of technical components and geographically disaggregated trends.

■ IFPRI and CIAT are studying supply and demand trends for cassava and technical change in its production in the People's Republic of China. In conjunction with the Centro Internacional de la Papa (CIP), IFPRI is undertaking a study of the production, technology, marketing, and utilization in the People's Republic of China of sweet and white potatoes.

■ IFPRI and ICRISAT are investigating how crop, livestock, and agroindustrial pro-

duction and marketing policies in the Southern African Development Coordination Conference (SADCC) region can be attuned with the production opportunities for sorghum and millet—particularly those of smallholders in the lower rainfall areas. An IFPRI research fellow has been seconded to ICRISAT in Zimbabwe for this project.

■ IFPRI also has a collaborative project with other international agricultural research centers, including the International Fertilizer Development Center (IFDC) and the International Irrigation Management Institute (IIMI). With IFDC, IFPRI is undertaking a study of policies conducive to accelerating fertilizer use in Sub-Saharan Africa. An IFPRI research fellow has been posted at IFDC/Togo. The studies with IIMI involve examination of the efforts of the Philippine government to make the irrigation sector more self-reliant.

COLLABORATION WITH INSTITUTIONS IN DEVELOPING COUNTRIES

IFPRI's institution-building efforts occur in a wide variety of settings—data collection, conferences, informal interaction, and research. The latter involves both training at headquarters and interaction with outposted IFPRI staff. Collaboration allows researchers from national systems to improve their professional skills in problem definition, project design, survey technique, and data analysis, all of which enhance the analytical capacity of developing-country research systems and, as a result, the policy planning process. Collaboration, in turn, enables IFPRI to define research priorities for policy improvement and understand the relationship between research and policy problems.

Collaborative research covers a wide range of issues related to food policy. In 1988 IFPRI collaborated with the following institutions in developing countries.

AFRICA

Burkina Faso

■ Centre d'Etudes, de Documentation, de Recherche Economique et Sociale (CEDRES), University of Ouagadougou,

Ouagadougou, on research on the substitution in consumption of wheat and rice for traditionally grown millet and sorghum and the substitution in production of maize and rice.

Côte d'Ivoire

■ Centre Ivoirien de Recherches Economiques et Sociales (CIRES), Abidjan, on research on the substitution in consumption of wheat and rice for traditionally grown millet and sorghum and the substitution in production of maize and rice.

Ethiopia

■ Office of the National Committee for Central Planning, Addis Ababa, on a study examining famine in the context of successions of bad crop years and the performance of rural markets and different household food security strategies.

The Gambia

■ Programming, Planning, and Monitoring Unit for the Agricultural Sector, Banjul, on studies of irrigation and rice production policy and the implications for economic and nutrition-related programs and policy of increased commercialization of agriculture in The Gambia.

Kenya

■ Food and Nutrition Planning Unit, Ministry of Planning and National Development, Nairobi, on a study to assess the income and nutritional effects of structural adjustment.

Nigeria

■ University of Ibadan, Ibadan, on analysis of the past trends and prospects for future use of cassava as food.

Rwanda

■ Ministry of Agriculture, Kigali, and National University of Rwanda, Butare, on research on policy issues for long-term growth in fertilizer use.

Senegal

■ Institut Sénégalais de Recherches Agricoles (ISRA), Dakar, on research on the substitution in consumption of wheat and rice for traditionally grown

millet and sorghum and the substitution in production of maize and rice, and on household income diversification and agricultural supply and consumption strategies in Senegal.

Sierra Leone

■ Rice Research Institute, Rokupr, and University of Sierra Leone, Njala, on a comparison of rice research in Sierra Leone and Sri Lanka to determine the transferability between Asia and Africa of lessons learned in agricultural research, and especially about relations between farmers and researchers.

Southern African Development Coordination Conference (SADCC)

■ Southern African Center for Cooperation in Agricultural Research (SACCAR), Gaborone, Botswana, on how crop, livestock, and agroindustrial production and marketing policies in the SADCC region can be attuned with the production opportunities for sorghum and millet—particularly those of smallholders in the lower rainfall areas.

Sudan

■ Ministry of Finance and Economic Planning, Khartoum, on a study examining famine in the context of successions of bad crop years and the performance of rural markets and different household food security strategies.

Zaire

■ University of Kinshasa, Kinshasa, on analysis of the past trends and prospects for future use of cassava as food.

Zambia

■ Eastern Province Agricultural Development Project of the Government of Zambia, Chipata, National Food and Nutrition Commission, Government of Zambia, Lusaka, and Rural Development Studies Bureau of the

University of Zambia, Lusaka, on a study of the effects of technological change in agriculture on rural welfare; the impact of rural infrastructure on agricultural development; and the factors affecting the diffusion of new agricultural technology.

■ Ministry of Agriculture, Lusaka, on a study of agricultural sector policies in Zambia.

■ Zambia Commercial Bank, Lusaka, on research on rural credit in Zambia.

Zimbabwe

■ Department of Physical Planning, Ministry of Local Government, Rural and Urban Development, Harare, on an analysis of the impact of rural service infrastructure on agricultural and rural development in Zimbabwe.

ASIA

Bangladesh

■ Bangladesh Institute of Development Studies (BIDS), Dhaka, on research on the developmental effects of rural infrastructure and the publication of a report on issues related to technological diffusion and its effect on agricultural production, economic development, and human welfare.

■ Government of Bangladesh, on a United Nations Development Programme/Government of Bangladesh evaluation of the agricultural research system in Bangladesh.

People's Republic of China

■ Beijing Agricultural University, Beijing, on research on sweet and white potato marketing and use.

■ Beijing Institute of Synthetic Agricultural Development, Beijing, on a study of technological and policy options for Chinese livestock development.

■ Chinese Academy of Agricultural Sciences (CAAS), Bei-

jing, on analysis with researchers from CAAS' Institute of Agricultural Economics of various aspects of Chinese agriculture, including the changing demand for livestock products and productivity growth in rice.

■ Chinese Academy of Sciences (CAS), Beijing, on research with scholars from CAS' Institute of Geography on water management policy in Shandong and Hunan provinces; a project summarizing available statistical information on China's 700 poorest counties; and a study of rural services and the modernization of small towns in Shandong Province.

■ Chinese Academy of Social Sciences, Beijing, on farm household surveys with the academy's Rural Development Institute on farmers' choices of investment and production technique in rice cultivation in Jiangsu and Hubei provinces.

India

■ Center for Development Studies, Trivandrum, on an analysis of the past trends and prospects for future use of cassava as food and feed, which was published this year.

■ Indian Council of Agricultural Research, New Delhi, on a U.S. Agency for International Development (USAID)/Government of India (GOI) review of the impact of USAID/GOI support to the state agricultural universities in India.

■ Institute of Rural Health Studies, Hyderabad, on a longitudinal study of household responses to drought in an area where improvements in agricultural technologies have taken place, with an emphasis on investigating how households can sustain the production and nutritional levels of predrought years.

■ National Institute of Nutrition, Hyderabad, on a study of

adaptations and other responses to dietary energy stress.

■ Reserve Bank of India, Bombay, on a high-level committee on rural credit.

■ Tamil Nadu Agricultural University, Coimbatore, and Department of Geography, University of Madras, Madras, on research on the impact of rural service infrastructure on agricultural and rural development in North Arcot district in the state of Tamil Nadu, and on a workshop on irrigation policy with the former.

Indonesia

■ Badan Urusan Logistik (BULOG), Jakarta, on an analysis of postharvest losses of rice grains in Indonesia.

■ Center for Agro Economic Research, Bogor, on an investigation of food demand and supply prospects for Indonesia in relation to agricultural policies and strategies such as irrigation development and an analysis of the past trends and prospects for future use of cassava as food and feed, which was published this year.

Nepal

■ Agricultural Projects Services Centre of the Government of Nepal (APROSC), Kathmandu, on a study of the ways in which the depletion of forests, which provide wood as cooking fuel, influences time allocation, nutrition, and agricultural productivity in the hill areas of Nepal. The report was published this year.

Pakistan

■ Applied Economic Research Centre, Karachi, Centre for Applied Economic Studies, Peshawar, Pakistan Institute of Development Economics, Islamabad, and Punjab Economic Research Institute, Lahore, on research to formu-

late and assess policies related to food security and human nutrition, including the issue of education, at the household level in urban and rural areas in Pakistan.

Philippines

■ National Economic and Development Authority, Manila, and National Irrigation Administration, Manila, on a study of the efforts by the Philippine government to make the irrigation sector more self-reliant.

■ Philippine Institute for Development Studies, Manila, on a study of comparative saving behavior among rural and urban households in the context of agriculture-based development.

■ University of the Philippines, Los Baños, on an investigation of food demand and supply prospects for the Philippines in relation to agricultural policies and strategies such as irrigation development and analysis of the past trends and prospects for future use of cassava as food and feed. The latter study was published this year.

■ Xavier University, Cagayan de Oro, on a study of the food consumption and nutrition effects of the shift from semisubsistence maize to commercialized sugarcane production in the Philippines.

Sri Lanka

■ University of Peradeniya, Peradeniya, on a comparison of rice research in Sierra Leone and Sri Lanka to determine the transferability between Asia and Africa of lessons learned in agricultural research, and especially about relations between farmers and researchers.

Thailand

■ Kasetsart University, Bangkok, on a study of the equity and income distribution effects of irrigation in Thailand and an analy-

sis of the past trends and prospects for future use of cassava as food and feed.

■ Thailand Development Research Institute, Bangkok, on a study of the relationships that exist between and along the growth paths of agriculture and the rest of the economy in Thailand.

■ Thammasat University, Bangkok, on a study of the equity and income distribution effects of irrigation in Thailand.

LATIN AMERICA

Argentina

■ Fundación Mediterránea, Córdoba, on a study of the relationships that exist between and along the growth paths of agriculture and the rest of the economy in Argentina.

Brazil

■ Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA), on studies of the forces influencing the adoption and diffusion of modern agricultural practices in Brazil; the nutritional consequences of changes in agricultural technology; the distribution of benefits generated by agricultural research; the connection between quality and quantity of human capital and the generation of new agricultural knowledge and technology; and a published report on the costs, benefits, and effects on food consumption of the Brazilian wheat policy.

■ Federal University of Viçosa, Viçosa, on analysis of data collected for the Program

of Integrated Rural Development in the Zona da Mata (PRODEMATA).

■ Instituto de Economia Agrícola, São Paulo, on an analysis of the forces influencing the adoption and diffusion of modern agricultural technology in Brazil.

Chile

■ Pontificia Universidad Católica de Chile, Santiago, on a study of the relationships that exist between and along the growth paths of agriculture and the rest of the Chilean economy.

Colombia

■ Colombian Agricultural Research Institute, Bogotá, on a report published this year of the effects of the coffee boom and government expenditure on relative prices, agricultural wages, and the distribution of income between labor and nonlabor factors of production.

Costa Rica

■ Center for the Promotion of Sciences and Socioeconomic Development (PRODESAR-ROLLO), San José, and Central Bank of Costa Rica, San José, on a study of agricultural protectionism in Costa Rica.

NORTH AFRICA/ MIDDLE EAST

Tunisia

■ Ministry of Higher Education and Scientific Research, Tunis, on research on appropriate agricultural technology for Tunisia.

COLLABORATION WITH INSTITUTIONS IN DEVELOPED COUNTRIES AND MULTI-LATERAL AGENCIES

Several projects listed above include collaboration with developed-country institutions and international agencies other than the CGIAR. Such links strengthen IFPRI's ability to collaborate with both CGIAR centers and institutions in developing countries and increase the scope for new links between developed- and developing-country institutions. The list below encompasses collaborators in 1988.

■ Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Paris, France

■ German Agency for Technical Cooperation (GTZ), Eschborn, Federal Republic of Germany

■ Institute for International Economics, Stockholm, Sweden

■ London School of Hygiene and Tropical Medicine, London, United Kingdom

■ Oxford University, Oxford, United Kingdom

■ Rice University, Houston, United States

■ United Nations Development Programme

■ United States Agency for International Development (USAID)

■ University of Detroit, United States

■ University of Goettingen, Goettingen, Federal Republic of Germany

■ University of Kiel, Kiel, Federal Republic of Germany

■ University of Pennsylvania, Philadelphia, United States

■ Williams College, Williams-town, United States

■ World Bank

A POLICY SEMINARS

An integral part of IFPRI's collaborative activities with national agricultural research systems are the policy seminars sponsored by the Institute, often jointly with national partners, that explore food policy issues of operational concern to decisionmakers in developing countries as well as the international community. By furnishing a forum for interaction between policymakers, researchers, and IFPRI staff, these seminars provide the means to test the applied value of collaborative research and improve its relevance to policy problems. In 1988 the dialogues generated by such meetings contributed to timely debate on key policy issues in a number of areas, ranging from the relationship between macroeconomic and agricultural sector policies to the implications of structural adjustment for agricultural and rural development.

AGRICULTURAL POLICY IN MEXICO

The need to better synchronize macroeconomic policies with agricultural sector policies in Mexico was one of the major issues discussed during a seminar involving Mexican researchers and policymakers and the IFPRI Board of Trustees and research staff.

The meeting took place in Mexico City on January 26 and was jointly organized with the Centro de Estudios Económicos, El Colegio de Mexico. It involved participants from the Office of the President, Central Bank, Ministry of Agriculture and Water Resources, and other elements of the national agricultural research system.

Historically agriculture has played a key role in Mexico's economic development, supplying labor and capital for industrialization and providing a market for domestic manufactured goods. In recent years, however, performance of the agricultural sector has diminished because of a lack of coordination between trade and exchange rate policies on the one hand, and agricultural price and subsidy policies on the other. The result has been an erratic domestic food supply and a deficit in the agricultural balance of trade. The need for a more consistent agricultural pricing policy and trade and exchange rate policies, which enhance the competitiveness of Mexico's farmers in international markets, was stressed by participants. The results of IFPRI research on this issue, much of it based on work in Latin America, underscored the complexity of moving toward a more neutral trade regime. The seminar also addressed issues related to agricultural marketing and exchange, irrigation systems, and agricultural research in Mexico.

GROWTH AND EQUITY IN ZAMBIAN AGRICULTURE

The results of a three-year field study jointly conducted by IFPRI and collaborators from the University of Zambia, the National Food and Nutrition Commission, and the government's Eastern Province Agricultural Development Project were presented at a policy seminar held in Livingstone, Zambia, December 8-11. As reported in more detail in the sections on the Agricultural Growth Linkages, the Production Policy, and the Consumption and Nutrition Policy Programs, the research focused on the direct and indirect income and employment effects generated by technological change in rural Zambia. The meeting was addressed by the prime minister of Zambia and also involved officials of the Office of the Permanent Secretary-Eastern Province, Cabinet Office, Ministry of Agriculture and Cooperatives, Prices and Incomes Commission, and National Agricultural Marketing Board, as well as participants from the collaborating institutions and representatives of donor agencies. The discussion centered on the hypothesis that technical change in the form of hybrid-maize cultivation and oxen and fertilizer use translates into increased land and labor productivity and hence increased income for technology adopters. The resulting changes in farmers' expenditure patterns have large multiplier effects promoting growth in both the farm and rural nonfarm economies. Conferees considered various factors, such as land tenure, credit, access to markets, and pricing policies, that facilitate or constrain adoption of technology and diffusion of related benefits. The policy implications of the research results were discussed in the context of the structural adjustment process currently under way in Zambia, with a view to improving performance of the rural economy in the areas of adoption of new technology, provision of rural infrastructure, and expenditures for agricultural and nonagricultural goods and services. These issues were related to the respective roles of the public and private sectors in facilitating development of the rural economy.

WORKSHOPS

In a joint venture with the World Bank, IFPRI organized a series of monthly workshops in 1988 to discuss and promote research on poverty in developing countries. The purpose is to identify policies and programs that lead to cost-effective, sustainable reduction of the incidence and severity of poverty under varying circumstances. The poverty research group, which consists of World Bank and IFPRI staff as well as experts from academia and other research institutes, focuses on concepts and measurement of poverty and their policy implications, events affecting the poor such as technological change, structural adjustment and demographic shifts, and remedies for poverty ranging from employment guarantee schemes to public health and literacy programs to food subsidy and feeding programs. The series will culminate in an international conference to be held in 1989.

To examine the effects of government economic policies on the supply and demand of fertilizer in Sub-Saharan Africa, a workshop on fertilizer policy was held April 5-7 in Lomé. The meeting was jointly organized with IFDC, IFPRI's principal international collaborator on this fertilizer project, which is more fully reported on in the Food Production Policy Program section. Consultations were held with senior African policymakers and analysts from ministries of planning and agriculture in 12 countries representing different stages in development of the fertilizer subsector across the Sub-Saharan region. Participants also included researchers from IITA, ICRISAT, and CIMMYT. A number of recommendations for documenting and analyzing fertilizer use and constraints to use were developed and are currently under consideration for the project.

On December 19 IFPRI sponsored a workshop on "Incomes and Nutrient Consumption" that examined the link between incomes and calorie demand and the econometric, behavioral, and policy implications of recent research by IFPRI and others in this area. (Also see the Food Consumption and Nutrition Policy Program section.) Participants included economists, agricultural economists, and nutritionists from universities and international development agencies. While there was a degree of consensus that increases in incomes had a marked effect on energy intake in special situations such as famines and, possibly, adjustment to unemployment and severe economic contraction, there was less agreement on whether the very poor respond to moderate increases in income with appreciable changes in food energy intake. Research at IFPRI is continuing to investigate the effect of price and income on demand for particular characteristics of foods—for example, texture, variety, and taste. This should further elucidate household and individual responses to changes in income.

IN-HOUSE SEMINARS

IFPRI's in-house seminar program serves the Washington, D.C., area's network of research and policymaking institutions concerned with food policy. These meetings typically involve researchers, administrators, and visiting officials from developing countries in informal discussions of the results and policy implications of IFPRI research. Seminars are also occasionally given by guest speakers. In 1988, 13 seminars were held on such topics as growth in agricultural production in Brazil, farmers and middlemen in Indonesia's agricultural development, water management and rural development in Pakistan, and agricultural price policy in Zimbabwe.

PUBLICATIONS AND PAPERS

RESEARCH REPORT AND ABSTRACT SERIES

Research Report 65

Credit for Alleviation of Rural Poverty: The Grameen Bank in Bangladesh, by Mahabub Hossain, February 1988.

Research Report 66

The Brazilian Wheat Policy: Its Costs, Benefits, and Effects on Food Consumption, by Geraldo M. Calegar and G. Edward Schuh, May 1988.

Research Report 67

Nature and Impact of the Green Revolution in Bangladesh, by Mahabub Hossain, July 1988.

Research Report 68

Coffee Boom, Government Expenditure, and Agricultural Prices: The Colombian Experience, by Jorge García García and Gabriel Montes Llamas, August 1988.

Research Report 69

Consequences of Deforestation for Women's Time Allocation, Agricultural Production, and Nutrition in Hill Areas of Nepal, by Shubh K. Kumar and David Hotchkiss, October 1988.

Research Report 70

Agriculture in the GATT: An Analysis of Alternative Approaches to Reform, by Joachim Zietz and Alberto Valdés, November 1988.

Research Report 71

Storage, Trade, and Price Policy Under Production Instability: Maize in Kenya, by Thomas C. Pinckney, December 1988.

Policy implications of each research report are summarized in the four-page *IFPRI Abstract*, which is published in English, French, and Spanish.

OTHER SERIES

IFPRI/The Johns Hopkins University Press Book Series

Agricultural Price Policy for Developing Countries, edited by John W. Mellor and Raisuddin Ahmed. Baltimore: The Johns Hopkins University Press for IFPRI, 1988. US\$35.

Food Subsidies in Developing Countries: Costs, Benefits, and Policy Options, edited by Per Pinstup-Andersen. Baltimore: The Johns Hopkins University Press for IFPRI, 1988. US\$39.

"Gray" Report Series

Analysis of Trends and Projections of Food Production and Consumption in Brazil and Nigeria, by Leonardo A. Paulino and J. S. Sarma, 1988.

Prospects for Agricultural Production and Food Deficits in West Asia and North Africa: The Role of High-Elevation Areas, by Peter Oram, 1988.

Working Papers on Cassava

Number 1

Trends and Prospects for Cassava in India, by P. S. George, May 1988.

Number 2

Trends and Prospects for Cassava in the Philippines, by Liborio S. Cabanilla, July 1988.

Number 3

Trends and Prospects for Cassava in Indonesia, by Faisal Kasryno, December 1988.

Working Papers on Food Subsidies

Number 4

Household Food Security in Pakistan: The Ration Shop System, by Harold Alderman, M. Ghaffar Chaudhry, and Marito Garcia, May 1988.

IFPRI Policy Briefs

Number 1

The Emerging World Food Situation & Challenges for Development Policy

Number 2

Third World Food Markets: Option for Agricultural Exporters?

Number 3

Infrastructure & Agricultural Development: Policy Issues/Research Priorities

Food Policy Statements

Number 8

Agricultural Price Policy for Developing Countries, by John W. Mellor and Raisuddin Ahmed, April 1988.

Number 9

Food Subsidies in Developing Countries, by Per Pinstrup-Andersen, October 1988.

IFPRI Reports

The newsletter, *IFPRI Report*, is published four times a year in English, French, and Spanish.

Reprints

Bautista, Romeo M. "Effects of Trade and Exchange Rate Policies on Export Production Incentives in Philippine Agriculture." Reprinted from *The Philippine Economic Journal* 24 (Nos. 2 and 3, 1985): 87-115.

Braun, Joachim von. "The Emerging Role of International Food Policy Research." Reprinted from *Quarterly Journal of International Agriculture* 26 (July-September 1987): 292-310.

Delgado, Christopher L. "Setting Priorities for Promoting African Food Production." Reprinted from *Satisfying Africa's Food Needs: Food Production and Commercialization in African Agriculture*, pp. 31-46. Edited by Ronald Cohen. Boulder, Colo., U.S.A.: Lynne Rienner, 1988.

Garcia, Marito. (With Benjamin Senauer and Elizabeth Jacinto.) "Determinants of the Intrahousehold Allocation of Food in the Rural Philippines." Reprinted from *American Journal of Agricultural Economics* 70 (February 1988): 170-180.

Gonzales, Leonardo A. "Rice Production and Regional Crop Diversification in the Philippines: Economic Issues." Reprinted from *Philippine Review of Economics and Business* 24 (Nos. 1 and 2, 1987): 125-148.

Gonzales, Leonardo A. (With Bienvenido O. Juliano.) "Rice and Corn Technology and Policy in the Philippines." Reprinted from *Transactions of the (Philippine) National Academy of Science and Technology*, vol. 8, 1986.

Islam, Nurul. "Agricultural Growth, Technological Progress, and Rural Poverty." Reprinted from *Strengthening the Poor: What Have We Learned?*, pp. 121-131. Edited by John P. Lewis. New Brunswick, N.J., U.S.A.: Transaction Books in cooperation with the Overseas Development Council, 1988.

———. "Agriculture in GATT Negotiations and Developing Countries." Reprinted from *World Agricultural Trade: Building a Consensus*,

- pp. 169-189. Edited by William M. Miner and Dale E. Hathaway. Ottawa and Washington, D.C.: Institute for Research on Public Policy and Institute for International Economics, 1988.
- Jha, Dayanatha. "Strengthening Agricultural Research in Africa: Some Neglected Issues." Reprinted from *Quarterly Journal of International Agriculture* 26 (July-September 1987): 265-275.
- Koester, Ulrich. "Market Integration in Southern Africa: A Route to Regional Food Security." Reprinted from *Ceres* 20 (July-August 1987): 13-16.
- . "Trade in Agricultural Products Among African Countries." Reprinted from *Quarterly Journal of International Agriculture* 26 (April-June 1987): 190-206.
- Lipton, Michael. "Report on the National Situation: Zaire." Reprinted from *Food and Nutritional Strategies: Concepts, Objectives, Application*, seminar proceedings, pp. 257-272. Edited by R. Delleré and J. J. Symoens. Brussels: Technical Centre for Agricultural and Rural Co-operation and Royal Academy of Overseas Sciences, 1988.
- Mellor, John W. "Agricultural Development in the Third World: The Food, Development, Foreign Assistance, Trade Nexus." Paper prepared for the World Food Conference, European Parliament, Brussels, April 6-8, 1988.
- . "Food Policy, Food Aid and Structural Adjustment Programmes: The Context of Agricultural Development." Reprinted from *Food Policy* 13 (February 1988): 10-17.
- . "Links Between Technology, Agricultural Development, Economic Growth and Trade Creation." Reprinted from *Building on Success: Agricultural Research, Technology, and Policy for Development*, ACIAR Technical Reports 7, pp. 19-25. Canberra: Australian Centre for International Agricultural Research, 1987.
- Mundlak, Yair. "Endogenous Technology and the Measurement of Productivity." Reprinted from *Agricultural Productivity: Measurement and Explanation*, pp. 316-331. Edited by Susan Capalbo and John Antle. Washington, D.C.: Resources for the Future, 1988.
- Pinckney, Thomas C. (With Carl H. Gotsch.) "Simulation and Optimization of Price Stabilization Policies: Maize in Kenya." Reprinted from *Food Research Institute Studies* 20 (No. 3, 1987): 265-298.
- Sabot, Richard H. (With M. Boissiere and J. B. Knight.) "Earnings, Schooling, Ability, and Cognitive Skills." Reprinted from *The American Economic Review* 75 (December 1985): 1016-1030.
- Sabot, Richard H. (With J. B. Knight.) "Educational Expansion, Government Policy and Wage Compression." Reprinted from *Journal of Development Economics* 26 (August 1987): 201-221.
- Sabot, Richard H. (With J. B. Knight.) "Educational Policy and Labour Productivity: An Output Accounting Exercise." Reprinted from *The Economic Journal* 97 (March 1987): 199-214.
- Sabot, Richard H. (With Jane Armitage.) "Efficiency and Equity Implications of Subsidies to Secondary Education in Kenya." Reprinted from *The Theory of Taxation for Developing Countries*, pp. 589-614. Edited by D. Newbery and N. Stern. New York: Oxford University Press, 1987.
- Sabot, Richard H. (With J. B. Knight.) "The Rate of Return on Educational Expansion." Reprinted from *Economics of Education Review* 6 (No. 3, 1987): 255-262.
- Sahn, David E. "The Effect of Price and Income Changes on Food-Energy Intake in Sri Lanka." Reprinted from *Economic Development and*

Cultural Change 36 (January 1988): 315-340.

Sarma, J. S. "Improvements in Basic Agricultural Statistics in Support of African Food Strategies and Policies and the Role of Donor Agencies." Reprinted from *Figures for Food in Africa*, proceedings of the workshop on Statistics in Support of African Food Policies and Strategies, published as a special edition of *Eurostat News* by the Statistical Office of the European Communities, 1987.

Valdés, Alberto. "Farming Protection Costs the Poor." Reprinted from *Ceres* 21 (January-February 1988): 16-19.

OTHER PUBLICATIONS

Funding Requirements 1989, September 1988.

The International Food Policy Research Institute (general brochure on IFPRI printed in English, French, and Spanish), January 1988.

Senior Research Staff 1988, April 1988.

NON-IFPRI PUBLICATIONS

Environment, November 1988, special issue on "Sustainable Agriculture in Developing Countries," which IFPRI was invited to contribute to and coordinate. Articles by John W. Mellor, Peter A. Oram, and E. T. York, Jr.

La Substitution des Céréales Locales par les Céréales Importées: La Consommation Alimentaire des Ménages à Ouagadougou, Burkina Faso, by Thomas Reardon, Taladidia Thiombiano, and Chris Delgado. Research Result Series 002. Ouagadougou: CEDRES, University of Ouagadougou, 1988.

World Development 16 (September 1988), special issue on "Current Issues in Food Security," edited by IFPRI staff members Shubh K. Kumar and Michael Lipton. Articles by John W. Mellor; Roger W. Hay and Mandivamba Rukuni; Thomas C. Pinckney and Alberto Valdés; Raisuddin Ahmed; Shubh K. Kumar; Thomas Reardon, Peter Matlon, and Christopher Delgado; Eileen Kennedy and Bruce Cogill; Joachim von Braun; Jane Corbett; and Roger W. Hay.

BOOKS, JOURNAL ARTICLES, AND OTHER PUBLISHED WORKS BY IFPRI STAFF

BOOKS

Mellor, John W. *Lectures on Agricultural Growth and Employment: An Equitable Growth Strategy and Its Knowledge Needs*. Lectures in Development Economics No. 7. Edited by Sohail J. Malik and Syed N. H. Naqvi. Islamabad: Pakistan Institute of Development Economics, 1988.

JOURNAL ARTICLES

Ahmed, Raisuddin. "Rice Price Stabilization and Food Security in Bangladesh." *World Development* 16 (September 1988).

Alderman, Harold. "Estimates of Consumer Response in Pakistan Using Market Price as Data." *Pakistan Development Review* 27 (Summer 1988).

———. "The Twilight of Flour Ration in Pakistan." *Food Policy* 13 (August 1988).

- Bautista, Romeo. "Foreign Borrowing as Dutch Disease: A Quantitative Analysis for the Philippines." *International Economic Journal* 2 (Autumn 1988).
- . "General Equilibrium Effects of Increasing Productivity in Philippine Manufacturing with Special Reference to Food Processing." *Journal of Philippine Development* 15 (Second Semester, 1988).
- . "Macroeconomic Models for East Asian Developing Countries." *Asian Pacific Economic Literature* 2 (September 1988).
- Braun, Joachim von. "Effects of Technological Change in Agriculture on Food Consumption and Nutrition: Rice in a West African Setting." *World Development* 16 (September 1988).
- Ezekiel, Hannan. "An Approach to a Food Aid Strategy." *World Development* 16 (November 1988).
- Islam, Nurul. "Fast Growing Agricultural Exports of Developing Countries." *Food Policy* 13 (August 1988).
- Kumar, Shubh. "Effect of Seasonal Food Shortage on Agricultural Production in Zambia." *World Development* 16 (September 1988).
- Kumar, Shubh, ed. (With Michael Lipton.) *World Development* 16 (September 1988).
- Lipton, Michael. "The Place of Agricultural Research in the Development of Sub-Saharan Africa." *World Development* 16 (No. 10, 1988).
- Malik, Sohail J. (With G. E. Battese.) "Estimation of Elasticities of Substitution for CES AND VES Production Functions Using Firm-level Data for the Food Processing Industries in Pakistan." *The Pakistan Development Review* 27 (Spring 1988).
- Mellor, John W. "Global Food Balances and Food Security." *World Development* 16 (September 1988).
- Nerlove, Marc. "Population Policy and Individual Choice." *Journal of Population Economics* 1 (No. 1, 1988).
- Nerlove, Marc. (With E. Ghysels.) "Seasonality in Surveys: A Comparison of Belgian, French and German Business Tests." *European Economic Review* 32 (January 1988).
- Pinckney, Thomas. (With Alberto Valdés.) "Short-run Supply Management and Food Security: Results from Pakistan and Kenya." *World Development* 16 (September 1988).
- Reardon, Thomas. (With Peter Matlon and Chris Delgado.) "Coping with Household-level Food Insecurity in Drought-affected Areas of Burkina Faso." *World Development* 16 (September 1988).
- Sabot, Richard. (With R. Mahan.) "Educational Expansion and the Inequality of Pay: Colombia, 1973-78." *Oxford Bulletin of Economics and Statistics* 50 (No. 2, 1988).
- Stone, Bruce. "Developments in Agricultural Technology." *The China Quarterly* 116 (December 1988).
- Valdés, Alberto. (With Anne Krueger and Maurice Schiff.) "Agricultural Incentives in Developing Countries: Measuring the Effect of Sectoral and Economywide Policies." *The World Bank Economic Review* 2 (September 1988).
- Valdés, Alberto. (With J. Quiroz and P. Barahona.) "Reformas Económicas en la Agricultura y Repuesta de la Producción Agregada: Chile 1960-87." *Cuadernos de Economía* 25 (December 1988).
- Wanmali, Sudhir. "Dilemma of Absorbing the Poor in the Urban Economy: Looking Beyond the Cities in India." *Regional Development Dialogue* 9 (Winter 1988).

OTHER PUBLISHED WORKS

- Adams, Richard H., Jr. Review of *Agricultural Transformation in Egypt*, by Nicholas Hopkins. *Journal of Development Studies* 25 (October 1988).
- Delgado, Chris. Review of *Le Radeau de la Méduse: Analyse des Dilemmes Alimentaires*, by Jean-Marc Burniaux. *Cahiers d'Economie et de Sociologie Rurales* 6 (No. 1, 1988).
- Desai, Gunvant. (With Bruce Stone.) "Fertilizer Market Development Processes in India." *Agro-Chemicals News in Brief*, January 1988.
- Islam, Nurul. "Nutrition: World Food Consumption and Supply Equation." In *Encyclopedia of the Social Sciences*. Rome: Instituto della Enciclopedia Italiana, 1988.
- Lipton, Michael. "Regional Trade and Food Security in Southern Africa." In *Poverty, Policy, and Food Security in Southern Africa*. Edited by Coralie Bryant. Boulder, Colo., USA: Lynne Rienner, 1988.
- Lipton, Michael. (With E. de Kadt.) *Agriculture-Health Linkages*. WHO Offset Publication 104. Geneva: World Health Organisation, 1988.
- Mellor, John W. "The Intertwining of Environmental Problems and Poverty." *Environment*, November 1988.
- . "Toward an Ethical Redistribution of Food and Agricultural Science." In *Science, Ethics, and Food*, papers and proceedings of a colloquium organized by the Smithsonian Institution. Edited by Brian W. J. LeMay. Washington, D.C. and London: Smithsonian Institution, 1988.
- . "United States Agriculture in the Global Context." In *World Food and Agriculture: Economic Problems and Issues*. Edited by Sisay Asefa. Kalamazoo, Mich., USA: W. E. Upjohn Institute for Employment, 1988.
- Nerlove, Marc. *Modernizing Traditional Agriculture*. Occasional Paper Series 16, International Center for Economic Growth. San Francisco: Institute for Contemporary Studies, 1988.
- . "The Use of Modern Inputs in the Agricultural Sectors of Developing Countries: The Case of Brazil." In *Proceedings of the International Economic Association Meeting in New Delhi*. Greencourt, England: IEA, 1988.
- Nerlove, Marc. (With E. Ghysels.) "Evidence from the Belgian Business Tests on Seasonal Instability of Relationships among Responses." In *Proceedings of the 19th CIRET Conference*. Aldershot, England: Gower, 1988.
- Nerlove, Marc. (With J. W. Duncan and D. R. Ross.) "Expectations, Plans and Realizations of U.S. Manufacturing Firms: Results from the New Dun and Bradstreet Survey." In *Proceedings of the 19th CIRET Conference*. Aldershot, England: Gower, 1988.
- Nerlove, Marc. (With B. Chizzolini, L. Pupillo, and D. R. Ross.) "Price and Production Adjustments of British and Italian Industrial Firms." In *Proceedings of the 19th CIRET Conference*. Aldershot, England: Gower, 1988.
- Oram, Peter. "Moving Toward Sustainability: Building the Agroecological Framework." *Environment*, November 1988.
- Reardon, Thomas. Review of *Coping with Hunger: Hazard and Experiment in an African Rice Farming System*, by Paul Richards. *American Journal of Agricultural Economics* 70 (August 1988).
- . "The Role of Household and Market Level Economic Research in Improving the Design and Management of Technology." In *Social Science Perspective on Managing Agricultural Technology*.

- Edited by D. Groendfeldt and J. Moock. Digana Village, Sri Lanka: International Irrigation Management Institute, 1988.
- Rosegrant, Mark. (With James A. Roumasset.) "Economic Feasibility of Green Manure in Rice-Based Cropping Systems." In *Green Manure in Rice Farming*. Los Bãnos, Philippines: International Rice Research Institute, 1988.
- Sabot, Richard. "Urban Unemployment: The Policy Options." In *Urbanization in Developing Countries*. Edited by J. Gugler. London and New York: Oxford University Press, 1988.
- Sabot, Richard. (With A. Gelb and J. Knight.) *Lewis Through a Looking Glass: Public Sector Employment, Rent-Seeking, and Economic Growth*. Policy Planning and Research Working Paper WPS133. Washington, D.C.: World Bank, 1988.
- Stone, Bruce. "China Will Continue to Need Imports but Domestic Production Is Expanding." *Green Markets*, October 24, 1988.
- . "China's Food Technology." *BioScience*, November 1988.
- . "Comment." In *Efficiency in Irrigation: The Conjunctive Use of Surface and Groundwater Resources*. Edited by Gerald T. O'Mara. Washington, D.C.: World Bank, 1988.
- . Review of *Smashing the Communal Pot—Formulation and Development of China's Rural Responsibility System*, by Wang Guichen, Zhou Qiren, et al. *American Journal of Agricultural Economics* 70 (May 1988).
- Svendsen, Mark. "The Changing Concept of Management in Irrigation." In *IIMI Review*, vol. 2, no. 2.
- Wanmali, Sudhir. "Periodic Markets, Periodic Marketing and Rural Development in India." In *Progress in Rural Geography*. Edited by H. N. Misra. New Delhi: Concept Publishing, 1988.

PAPERS PRESENTED BY IFPRI STAFF

- Adams, Richard H., Jr. "Worker Migration, Remittances and Inequality in Upper Egypt." Paper presented to the Research Program in Development Studies, Princeton University, Princeton, N.J., USA, October 13, 1988.
- . "Worker Remittances and Inequality in Rural Egypt." Paper presented at the Annual Meeting of the Middle East Studies Association, Los Angeles, November 3-5, 1988.
- Ahmed, Raisuddin. "Domestic Terms of Trade Between Agriculture and Non-Agriculture Sectors in Asian Countries and Effects of Agricultural Price Policies." Paper presented at the Symposium on Agricultural Output and Input Pricing organized by the Asian Productivity Organization, Kuala Lumpur, November 7-12, 1988.
- . "Employment and Income Growth in Asia: Some Strategic Issues." Paper presented at the Harvard Institute for International Development/U.S. Agency for International Development conference, Agriculture in the 1990s, Washington, D.C., September 9-12, 1988.
- . "Long-term Food Problems of Bangladesh: Options and Policy Directions." Paper presented at a conference on Food and Development Strategy of Bangladesh organized by the European Economic Community and the Government of Bangladesh, Dhaka, October 8-12, 1988.
- Bautista, Romeo. "Agricultural Growth and Food Imports in Developing Countries: A Reexamination." Paper presented at the first convention of the East Asian Economic Association, Kyoto, October 29-30, 1988.

- _____. "Agricultural Incentives and Macroeconomic Linkages in Asia." Paper presented at the 20th International Conference of the International Association of Agricultural Economists, Buenos Aires, August 24-31, 1988.
- _____. "Agriculture-based Development Strategy: Issues and Policy Framework." Paper presented at a development policy seminar at the East-West Center, Honolulu, July 20, 1988.
- _____. "Macro-policies and Technology Choice in the Philippines." Paper presented at a conference on The Implications of Technology Choice on Economic Development, organized by A. T. International, Thailand Development Research Institute, and Queen Elizabeth House at Oxford University, Pattaya, Thailand, March 21-24, 1988.
- Braun, Joachim von. "Alleviating Hunger in Central America (Guatemala)." Paper presented at the Hunger Research Briefing and Exchange, Brown University, Providence, RI, USA, April 6-8, 1988.
- _____. "Households' Responses to Severe Food Shortages in Two African Settings (Rwanda and The Gambia)." Paper presented at the Workshop on Famine and Famine Policy, Tufts University, Medford, Mass., USA, March 25, 1988.
- _____. "Promoting Nontraditional Exports from Third World Countries: Performance and Prospects." Paper presented at a meeting of the Society for International Development, Washington, D.C., March 18, 1988.
- _____. "Technology Utilization in Developing Countries' Agriculture: Elements of Poverty-Oriented Policy and Programs." Paper presented at the conference on Generation and Transfer of Technology for Poor Small Farmers, organized by the International Fund for Agricultural Development, Seoul, June 1-7, 1988.
- Braun, Joachim von. (With David Hotchkiss.) "The Effects of the Increased Commercialization of Traditional Smallholder Agriculture on Health and Nutrition in Guatemala." Paper presented at the annual meeting of the Population Association of America, New Orleans, September 1988.
- Celis, Rafael. "The Distribution of Benefits Arising from Price Changes and Factor Substitution in Agriculture: A Mathematical Programming Approach." Paper presented at the Eighth Latin American Meeting of the Econometric Society, San José, August 2-5, 1988.
- Delgado, Chris. "Questions à Propos d'un Espace Régional Protégé Pour les Céréales." Paper presented at the spring 1988 meetings of the Société Française d'Economie Rurale, Paris, April 19-20, 1988.
- _____. "The Scope for Price Policy to Slow Down the Consumption of Imported Wheat and Rice in West Africa." Paper presented to the Informal Working Group on Cereals Policies in the Sahel, Organisation for Economic Cooperation and Development/Club du Sahel, Paris, September 27-29, 1988.
- _____. "Structural Adjustment and the Speed of Aggregate Agricultural Supply Response in Sub-Saharan Africa." Paper presented at the seminar on Beyond Mindelo: Food Security Policy and the Competitiveness of Agriculture in the Sahel, organized by the U.S. Agency for International Development's Africa Bureau, Washington, D.C., October 17-18, 1988.
- Delgado, Chris. (With Thomas Reardon.) "Why the Urban Poor Pay More for Their Grain: Transaction-Derived Cereals Prices in Burkina Faso." Paper presented at the summer meetings of the American Agricultural Economics Association, Knoxville, Tenn., USA, July 31-August 3, 1988.

- Garcia, Marito. "The Determinants of Farm Earnings: A Study of Five Districts in Rural Pakistan." Paper presented at a U.S. Agency for International Development Seminar on Food Security Management, Islamabad, October 27, 1988.
- Gonzales, Leonardo. "Agricultural Incentives and Comparative Advantage of Food Crops Production in Indonesia and the Philippines." Paper presented at the Seventh Biennial Meeting of the Agricultural Economic Society for Southeast Asia, Manila, 1988.
- . "The Economics of Diversifying into Irrigated Non-Rice Crops in the Philippines." Paper presented at the International Irrigation Management Institute Workshop on Irrigation Management for Diversified Cropping, Puerto Azul, Ternate, Philippines, 1988.
- Gonzales, Leonardo. (With R. Guino.) "Irrigation Investment under Different Rice-Based Cropping Patterns in the Philippines." Paper presented at the fourth meeting of the Federation of Crop Science Society of the Philippines, Davao City, Philippines, 1988.
- Hopkins, Jane. (With Thomas Reardon.) "Innovative Methods in Survey Research: Examples from IFPRI's West Africa Work." Paper presented at a Rockefeller Foundation/Centro Internacional de la Papa seminar on Farmers and Food Systems, Lima, September 1988.
- Hopkins, Jane. (With Thomas Reardon.) "Intersectoral Income Strategies and Household Cereal Economy Choices: IFPRI's Niger Project." Paper presented at a Rockefeller Foundation/Centro Internacional de la Papa seminar on Farmers and Food Systems, Lima, September 1988.
- Islam, Nurul. "Agriculture in GATT Negotiations and Developing Countries." Paper presented at a meeting on the Uruguay Round, organized by the Canadian Institute for Research and Public Policy and the Institute for International Economics, Bangkok, March 1988.
- . "Food Strategy and Development in Bangladesh." Paper presented at a conference on Food and Development Strategy of Bangladesh organized by the European Economic Community and the Government of Bangladesh, Dhaka, October 8-12, 1988.
- . "Linkages Between Agriculture and Overall Economy." Paper presented at the seminar on The Changing Dynamics of Global Agriculture: Research Policy Implications for National Agricultural Research Systems, organized by the International Service for National Agricultural Research, German Foundation for International Development (DSE), and the Technical Centre for Agriculture and Rural Co-operation, Feldafing, Federal Republic of Germany, September 22-28, 1988.
- . "World Hunger and Nutrition: Magnitude, Pattern and Measures for Alleviation." Paper presented at the World Food Conference on Hunger in the Midst of Plenty, organized by Iowa State University, Des Moines, Iowa, USA, June 1988.
- Kumar, Shubh. "The Interaction of Women and Agricultural Technology—IFPRI Research Programmes and Findings." Paper presented at the International Conference on Appropriate Agricultural Technologies for Farm Women, organized by the Indian Council of Agricultural Research and the International Rice Research Institute, New Delhi, November 30-December 6, 1988.
- . "Strategies for Protecting the Nutrition of the Poor During Structural Adjustment." Paper presented at the UNICEF Regional Workshop on Protecting Nutrition During Periods of Adjustment: Food and Nutrition Surveillance Systems and Appropriate Response to Threats to Nutrition, Lombok, Indonesia, August 29-September 2, 1988.

- Lipton, Michael. "Attacking Undernutrition and Poverty: Some Issues of Adaptation and Sustainability." Paper presented at the Pew Memorial Trust/Cornell University Lecture Series, Ithaca, N.Y., USA, September 20, 1988.
- . "New Seeds and Poor People." Paper presented at Carleton College, Northfield, Minn., USA, September 15-16; the Economics Institute, Boulder, Colo., USA, September 19, 1988; Toronto University, Toronto, September 29-30, 1988; and Williams College, Williamstown, Mass., USA, October 6-7, 1988.
- . "Population and Poverty: Statics and Dynamics." Paper presented at a workshop on Issues in International Food Security, organized by Colgate University and Interfaith Hunger Appeal, Hamilton, N.Y., USA, June 17, 1988.
- . "Regional Issues in Agricultural Research." Paper presented at a graduate seminar at Williams College, Williamstown, Mass., USA, October 6-7, 1988.
- . "Social Science Roles in Meeting the Donors' Needs for Agricultural Technology Assessment." Paper presented at a meeting of the Social Sciences Agricultural Agenda Program, Phase II, Woodlands, Tex., USA, March 1988.
- . "Urbanization in South Asia." Paper presented at a seminar at the Canadian International Development Agency, Ottawa, October 3, 1988.
- . "Who Are the Poor? What Do They Do? What Should We Do?" Paper presented at a conference on The Changing Nature of Third World Poverty in the 1990s, organized by the Center for Advanced Study of International Development, Michigan State University, East Lansing, Mich., USA, March 13, 1988.
- Malik, Sohail J. "The Role of Agriculture in Economic Development: The Case of Pakistan." Paper presented to the Convention of College Teachers of Economics from the Northwest Frontier Province held at the Centre for Applied Economic Studies, University of Peshawar, Pakistan, August 1988.
- Malik, Sohail J. (With G. E. Battese.) "The Possibilities of Employment Generation in the Large-Scale Food Processing Sector of Pakistan." Paper presented at the Australian Economic Congress, Canberra, September 1988.
- Mellor, John W. "Ending Hunger: An Implementable Program for Self-Reliant Growth." Paper presented at the World Food Council Consultative Group meeting on the Cyprus Initiative, Paris, December 20, 1988.
- . "Food and Agricultural Development Needs for the 1990s." Paper presented at the BIFAD Symposium on Development Partnership in World Agriculture for the 1990s: Hunger, Sustainable Agriculture, and Trends, Washington, D.C., September 14-15, 1988.
- . "The Political and Economic Context for Development of Animal Agriculture in Developing Countries." Paper presented at the Animal Agriculture Symposium: Development Priorities Toward the Year 2000, organized by the U.S. Department of Agriculture and the U.S. Agency for International Development, Chantilly, Va., June 1-3, 1988.
- . "Problems and Tendencies of Modern Agriculture in Developed and Developing Countries." Paper presented at the study week at Casina Pio IV on Agriculture and Quality of Life: New Global Trends, Vatican City, October 17-24, 1988.
- . "Using U.S. Food Surpluses for Development: Interaction of Food Aid with Other Forms of Foreign Assistance." Paper presented at

- the Winrock International Colloquium on Future U.S. Development Assistance: Food, Hunger, and Agricultural Issues, Morrilton, Ariz., USA, February 17-19, 1988.
- Mellor, John W. (With Uma Lele.) "Agricultural Growth, Its Determinants, and Its Relationship to World Development: An Overview." Paper presented at the 20th International Conference of the International Association of Agricultural Economists, Buenos Aires, August 24-31, 1988.
- Mundlak, Yair. "Agricultural Growth and World Development." Paper presented at the 20th International Conference of the International Association of Agricultural Economists, Buenos Aires, August 24-31, 1988.
- . "On the Relevance of World Agricultural Prices." Paper presented at the Agricultural Economics Workshop, University of Chicago, April 1988.
- Oram, Peter. "Study of Agricultural Research Objectives, Priorities, and Constraints to the Development of Agricultural Research Institutions in Arab Countries." Paper presented at the first meeting of the Council for Arab Agricultural Research, Kuwait, March 1988.
- Puetz, Detlev. (With Joachim von Braun.) "Parallel Markets and the Rural Poor in a West African Setting." Paper presented at the Workshop on Parallel Markets, Harvard Institute for International Development, Cambridge, Mass., USA, November 11-12, 1988.
- Reardon, Thomas. "Implications of IFPRI Project Results in Burkina Faso for Policy Issues." Paper presented at the seminar on Beyond Mindelo: Food Security Policy and the Competitiveness of Agriculture in the Sahel, organized by the U.S. Agency for International Development's Africa Bureau, Washington, D.C., October 17-18, 1988.
- . "The Rural Household: Two-way Interaction with the Regional Food System—Some Results and Implications." Paper presented at the Rockefeller Foundation/Centro Internacional de la Papa seminar on Farmers and Food Systems, Lima, September 1988.
- Reardon, Thomas. (With Taladidia Thiombiano and Chris Delgado.) "L'Importance des Céréales Nontraditionnelles dans la Consommation des Riches et des Pauvres à Ouagadougou." Paper presented at the spring 1988 meetings of the Société Française d'Economie Rurale, Paris, April 19-20, 1988.
- Rohrbach, David. (With Charles Mbwanda.) "Small Grain Markets in Zimbabwe: The Food Security Implications of National Market Policy." Paper presented at the University of Zimbabwe/Michigan State University Conference on Food Security Research in Southern Africa, Harare, October 31-November 3, 1988.
- Rosegrant, Mark. "The Impact of Trade Liberalization for Indonesian Food Crops." Paper presented at the 20th International Conference of the International Association of Agricultural Economists, Buenos Aires, August 24-31, 1988.
- Rosegrant, Mark. (With Gil Levine, Randolph Barker, and Mark Svendsen.) "Irrigation in Asia and the Near East in the 1990s: Problems and Prospects." Paper presented at the seminar on Economic Development in Asia, organized by the Harvard Institute for International Development and the U.S. Agency for International Development, Washington, D.C., September 7-9, 1988.
- Stone, Bruce. "Fertilizer Development and Distribution System Reform in Bangladesh and China." Paper presented at a seminar organized for Chinese Communist Party cadres by the Foreign Economics Association of China, Beijing, August 1, 1988.

- _____. "Fertilizer Market Development and National Policy in China." Paper presented at a FADINAP meeting, Bangkok, March 29, 1988.
- _____. "Notes on Special Characteristics for Development Strategy and Technological Change in China's Mountainous Areas." Paper presented at the Conference on Mountain Agricultural Development in Western Sichuan and Tibet, organized by the International Centre for Integrated Mountain Development and the Sichuan Institute for Mountain Development and Natural Disaster Research, Chengdu, People's Republic of China, October 8, 1988.
- _____. "Reacceleration in China's Fertilizer Development, 1987-90." Paper presented at the Southeast Asia and Pacific Regional Fertilizer Conference organized by IFA/FADINAP, Manila, October 11, 1988.
- Stone, Bruce. (With Jiang Dehua.) "China's Impoverished Areas." Paper presented at the Institute for Food and Agricultural Sciences, University of Florida, Gainesville, Fla., USA, February 2, 1988.
- Valdés, Alberto. "Agricultural Policy Reforms and the Aggregate Supply Response, Chile 1960-87." Paper presented at the Catholic University of Chile, Santiago, November 1988.
- _____. "Opportunities and Prospects for Multilateral Agricultural Trade Negotiations." Paper presented at the American Agricultural Economics Association's preconference Agricultural Policy Workshop, Knoxville, Tenn., USA, July 30-31, 1988.
- _____. "A Political Economy Analysis of Agricultural Price Interventions in Chile." Paper presented at the Catholic University of Chile, Santiago, November 1988.
- Vosti, Steve. "Changing Paradigms in Sovioeconomic Research: The Case of Malaria in Brazil." Paper presented at Vanderbilt University, Nashville, Tenn., USA, November 1988.
- _____. "Recent Contributions to Research on the Adoption of Agricultural Technology." Paper presented at the Instituto de Economia Agrícola, São Paulo, September 1988.
- Vosti, Steve. (With Roy Nord.) "Professional Obsolescence and the Loss of Human Capital at EMBRAPA." Paper presented at EMBRAPA, Brasília, August 1988.
- Vosti, Steve. (With Shubh Kumar.) "Seasonal and Socioeconomic Dimensions of Malaria." Paper presented at The Johns Hopkins University School of Hygiene and Public Health, Baltimore, Md., USA, March 1988.
- Wanmali, Sudhir. "Dilemma of Absorbing the Poor in the Urban Economy—The Need to Look Beyond Cities: Some Observations from India." Paper presented at the Expert Group Meeting on Increasing the Absorptive Capacity of Metropolitan Economies of Asia, Nagoya, Japan, January 11-14, 1988.

SPECIAL REPORTS

Dietary Patterns in East and West Africa. Prepared by Eileen Kennedy, Shubh Kumar, Peter Matlon, and Thomas Reardon for the U.S. Agency for International Development, March 1988.

Infrastructure and Development of a Rural Economy. Prepared by Raisuddin Ahmed and Mahabub Hossain for the U.S. Agency for International Development, 1988.

Is the Rate of Return to Primary Schooling Really 26%. Prepared by Richard Sabot and John Knight for the Oxford Institute of Economics and Statistics, 1988.

Major Issues in the Development of the Agricultural Sector in Sri Lanka. Prepared by Neville Edirisinghe for the World Bank, January 1988.

Networks as a Research Modality. Prepared by Peter Oram for the United Nations Development Programme/World Bank/Rockefeller Foundation Task Force on Tropical Forestry Research, August 1988.

The Policy Framework in Agriculture in Sri Lanka: The Unfinished Agenda. Prepared by Neville Edirisinghe for the Food and Agriculture Organization of the United Nations/World Bank Investment Center, 1988.

Review of the Agricultural Sector in Sri Lanka. Prepared by Neville Edirisinghe for the World Bank, January 1988.

A Review of Horticultural Crops: The Case of Processed Fruits and Vegetables in the Philippines. Prepared by M. L. Drilon and Leonardo Gonzales for the International Rice Research Institute, 1988.

Sweet Potato Research in the People's Republic of China: A CIP/AVRDC/IFPRI Study. Prepared by Edward French, Peter Gregory, Masa Iwanaga, Romeo Opena, Bruce Stone, and Charles Gitomer, 1988.

Technical Change in Chinese Wheat Production Development. Prepared by Bruce Stone for Centro Internacional de Mejoramiento de Maíz y Trigo, May 1988.

Wheat Storage Policy in Pakistan: Implications of Price Policy and Production Instability. Prepared by Thomas Pinckney, with Naved Hamid, Marshall Klaus, and Alberto Valdés, for the U.S. Agency for International Development, May 1988.

REFEREES

IFPRI is most grateful for the efforts of the following people who reviewed manuscripts for the research report series during 1987 and 1988.

- | | |
|--|--|
| D. Bajracharya
<i>International Centre for Integrated
Mountain Development, Nepal</i> | J. Hoorweg
<i>African Studies Centre,
Netherlands</i> |
| P. Bardhan
<i>University of California, Berkeley,
U.S.A.</i> | M. Husain
<i>Bangladesh Agricultural University</i> |
| R. Barker
<i>Cornell University,
U.S.A.</i> | K. Johm
<i>Programming, Planning, and
Monitoring Unit for the Agricultural
Sector, The Gambia</i> |
| D. Bigman
<i>The Hebrew University of
Jerusalem, Israel</i> | U. Lele
<i>World Bank</i> |
| H. Binswanger
<i>World Bank</i> | J. Leonard
<i>World Wildlife Fund/The
Conservation Foundation, U.S.A.</i> |
| P. Bronzi
<i>International Fund for Agricultural
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<i>Stanford University, U.S.A.</i> |
| N. Chowdhury
<i>Bangladesh Institute for
Development Studies</i> | R. L. Meyer
<i>Ohio State University, U.S.A.</i> |
| E. Clay
<i>Relief and Development Institute,
England</i> | S. R. Osmani
<i>World Institute for Development
Economics Research, Finland</i> |
| M. Collinson
<i>World Bank</i> | J. Otieno
<i>Ministry of Planning and
Development, Kenya</i> |
| A. Deaton
<i>Princeton University, U.S.A.</i> | S. Qureshi
<i>Pakistan Institute of Development
Economics</i> |
| A. de Janvry
<i>University of California, Berkeley,
U.S.A.</i> | S. Reutlinger
<i>World Bank</i> |
| A. Deolalikar
<i>University of Pennsylvania, U.S.A.</i> | S. Rwamasirabo
<i>Michigan State University, East
Lansing, U.S.A.</i> |
| A. Dommen
<i>U.S. Department of Agriculture</i> | E. Sadoulet
<i>University of California, Berkeley,
U.S.A.</i> |
| S. Edwards
<i>University of California,
Los Angeles, U.S.A.</i> | A. Siamwalla
<i>Thailand Development Research
Institute</i> |
| C. Eicher
<i>Michigan State University,
East Lansing, U.S.A.</i> | J. Strauss
<i>Yale University, U.S.A.</i> |
| V. Elias
<i>Universidad Nacional de Tucuman,
Argentina</i> | E. Thorbecke
<i>Cornell University, U.S.A.</i> |
| J. Flinn
<i>International Rice Research
Institute</i> | F. Thoumi
<i>Inter-American Development Bank</i> |
| R. Florentino
<i>Food and Nutrition Research
Institute, Philippines</i> | E. Tollens
<i>Catholic University of Leuven,
Belgium</i> |
| P.S. George
<i>Centre for Development Studies,
India</i> | D. S. Tyagi
<i>Ministry of Agriculture, India</i> |
| Y. Hayami
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V. Gandhi
Research Fellow, India

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*Research Fellow, Philippines
(outposted to the International
Rice Research Institute,
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J. Hopkins
*Visiting Research Fellow, U.S.A.
(outposted to the International
Crops Research Institute for the
Semi-Arid Tropics, Niger)*

D. Jha
Research Fellow, India

V. Kelly
*Research Fellow, U.S.A.
(outposted to Senegal)*

J. Nagy
*Research Fellow, Canada
(outposted to the International
Fertilizer Development Center,
Togo)*

M. Nerlove
Research Fellow, U.S.A.

P. Oram
*Research Fellow Emeritus, United
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T. Reardon
Research Fellow, U.S.A.

D. Rohrbach
*Research Fellow, U.S.A.
(outposted to the International
Crops Research Institute for the
Semi-Arid Tropics, Zimbabwe)*

M. Rosegrant
Research Fellow, U.S.A.

M. Svendsen
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T. Tshibaka
Research Fellow, Zaire

S. Vosti
Research Fellow, U.S.A.

B. Hojjati
Research Analyst, Iran

M. Rechache
Research Analyst, Algeria

R. Cubagee
Research Assistant, Ghana

C. Donovan
Research Assistant, U.S.A.

N. Estes
Research Assistant, U.S.A.

E. Gabre-Madhin
Research Assistant, Ethiopia

L. McNeilly
Research Assistant, U.S.A.

J. Ramirez
Research Assistant, Colombia

S. Rustagi
Research Assistant, India

K. Selvaggio
Research Assistant, U.S.A.

P. Tatian
Research Assistant, U.S.A.

PERSONNEL

J. Witcover
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Secretary, Afghanistan

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M. Garcia
Research Fellow, Philippines
S. Kumar
Research Fellow, India
S. Malik
Research Fellow, Pakistan
(outposted to Pakistan)
T. Teklu
Visiting Research Fellow, Ethiopia
(outposted to Sudan)
P. Webb
Postdoctoral Fellow, United
Kingdom (outposted to Inter-
national Livestock Center for
Africa, Ethiopia)
D. Katikineni
Research Analyst, India

D. Puetz
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Republic of Germany
S. Bhattarai
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Research Assistant, U.S.A.

L. Garcia-Pinto
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Research Assistant, Kenya
J. Stuyt
Research Assistant, Canada
M. Thomas
Research Assistant, U.S.A.
N. Bonifazi
Secretary, Italy
J. Vaughn
Secretary, U.S.A.

Visiting Researchers

About 50 researchers visiting from around the world spent time at IFPRI during 1988. Those listed below spent periods of a month or more at IFPRI.

- M. Banda, *Zambia Commercial Bank*
S. L. Bapna, *Indian Institute of Management, Ahmedabad*
T. Bedingar, *International Livestock Center for Africa, Ethiopia*
M. Benoit-Cattin, *Centre de Cooperation Internationale en Recherche Agronomique pour le Développement, France*
G. S. Bhalla, *Centre for the Study of Regional Development, Jawaharlal Nehru University, India*
S. Chishti, *Applied Economic Research Centre, University of Karachi, Pakistan*
A. Elminiawy, *Ain Shams University, Egypt*
O. Guayneychya, *Ministry of Higher Education and Scientific Research, Tunisia*
L. Irias, *Brazilian Agricultural Research Company (EMBRAPA)*
K. Katongo, *Ministry of Agriculture, Zambia*
I. Majid, *Centre for Applied Economic Studies, University of Peshawar, Pakistan*
M. Sarwar, *Punjab Economic Research Institute, Pakistan*
E. Shula, *Rural Development Studies Bureau, University of Zambia*
C. Siandwazi, *National Food and Nutrition Commission, Zambia*
P. Svedberg, *Institute for International Economic Studies, Sweden*
J. Zietz, *University of Detroit, U.S.A.*

RESEARCH SUPPORT

- | | |
|--|--|
| L. Halsey
<i>Director of Finance and Administration, U.S.A.</i> | B. Cordero
<i>Administrative Assistant, Philippines</i> |
|--|--|

Budget and Contracts

- | | |
|--|---|
| A. Orlin
<i>Administrator, U.S.A.</i> | R. Zamora
<i>Assistant to Administrator, Philippines</i> |
|--|---|

Accounting

- | | |
|--|---|
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<i>Accounting Assistant, U.S.A.</i> |
| E. Reyes-Mendoza
<i>Senior Accountant, U.S.A.</i> | P. Manalansan
<i>Accounting Assistant, Philippines</i> |
| J. Tatlonghari
<i>Staff Accountant, U.S.A.</i> | |

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| Z. Emam
<i>Head, Afghanistan</i> | M. Loarca
<i>Travel Coordinator, Philippines</i> |
| J. Cabahug
<i>Personnel Coordinator, Philippines</i> | G. Briscoe
<i>Photocopy Operator, U.S.A.</i> |
| L. Gaskell
<i>Office Services Coordinator, Philippines</i> | A. Thomas
<i>Office Aide, U.S.A.</i> |

Computer Services

- | | |
|--|--|
| N. Walczak
<i>Head, U.S.A.</i> | D. Fuxa
<i>Programmer, U.S.A.</i> |
| W. Alvarado
<i>Senior Programmer, Philippines</i> | M. Mastroianni
<i>Technical Assistant, U.S.A.</i> |

Information Services

B. Rose <i>Head, U.S.A.</i>	E. Banda <i>Publication Specialist, U.S.A.</i>
P. Klosky <i>Librarian, U.S.A.</i>	A. Basilio <i>Manuscript Word Processor, Philippines</i>
M. Harben <i>Editor, U.S.A.</i>	L. McCoy <i>Typesetter, U.S.A.</i>
P. Skillman <i>Editor, U.S.A.</i>	B. Rosencrantz <i>Information Assistant, U.S.A.</i>
U. Mohan <i>Information Specialist, India</i>	C. Murphy <i>Clerical Assistant, U.S.A.</i>

Policy Seminars Program

R. Bordonaro <i>Head, U.S.A.</i>	C. Saenz <i>Secretary, Guatemala</i>
L. Goldberg <i>Conference Coordinator, U.S.A.</i>	

**International Board for
Plant Genetic Resources Liaison Office**

D. Witmeyer,
Liaison Officer, U.S.A.

List includes part-time staff members. Country indicates citizenship.

RESEARCH AREA COORDINATORS

Research at IFPRI is built on the base of the research projects described in this annual report. These projects are administered in the research programs. To assure the integration of research results from the research projects, the five research areas, which are described in the introduction, crosscut the research programs. Each research area is coordinated by members of the research staff. The coordinators are

Development Strategy	Africa
Romeo Bautista	Christopher Delgado
Richard Sabot	Tshikala Tshibaka
Poverty Alleviation	Food Aid
Joachim von Braun	Hannan Ezekiel
Shubh Kumar	
Technology Policy	
Guvant Desai	
Mark Rosegrant	

STANDING COMMITTEES

To ensure effective communication on the research priorities and management of IFPRI, there are six standing committees comprised of IFPRI research staff. The committees and their chairmen are

Administrative Review Committee, Joachim von Braun, chairman
 Appointments Review Committee, Romeo Bautista, chairman
 Director's Advisory Committee, John Mellor, chairman
 Outreach Planning Committee, Nurul Islam, chairman
 Planning Committee on the Environment, Nurul Islam, chairman
 Publications Review Committee, Guvant Desai, chairman

BOARD OF TRUSTEES

Dick de Zeeuw, Chairman, Netherlands, is president of the Agricultural University of Wageningen and professor of world food problems at the Catholic University of Nijmegen. He previously served as general director of agricultural research at the Ministry of Agriculture and Fisheries of the Netherlands.

Eliseu Roberto de Andrade Alves, Brazil, currently president of the San Francisco River Development Company (CODEVASF), was previously president of the Brazilian Agricultural Research Company (EMBRAPA).

Yahia Bakour, Syria, serves as secretary general of the Arab Agronomists' Union and chairman of the Syrian Agricultural Engineers Syndicate. His previous posts include that of professor at the Faculty of Agriculture, Damascus University.

Anna Ferro-Luzzi, Italy, is director of the Human Nutrition Unit at the National Institute of Nutrition in Rome. Her other activities include serving as an adviser to the World Health Organization and a lecturer at the University of Rome.

Yujiro Hayami, Japan, is a professor of economics at the School of International Policies, Economics and Business, Aoyama Gakuin University, Tokyo. He has won a number of awards from Japanese and American institutions for his published research.

Gerald K. Helleiner, Canada, a professor of economics at the University of Toronto, has taught and conducted research for a number of institutions. He is a member of several boards, including the Board of Governors and Executive Committee of the International Development Research Centre and the United Nations Committee for Development Planning.

Dharma Kumar, India, has held several posts in the Indian government, including deputy director of the Reserve Bank of India's Rural Economics Division. She is currently professor of economic history at the Delhi School of Economics and has taught or conducted research at various institutions, including the World Bank and the Institute of Advanced Studies, Princeton University.

Anne de Lattre, France, joined the Organisation for Economic Cooperation and Development in 1962. She currently heads its Club du Sahel Secretariat. She was recently North Carolina National Bank visiting professor at the Dean Rusk Center for International Studies at Davidson College.

James R. McWilliam, Australia, is director of the Australian Centre for International Agricultural Research. He has also served as professor of agronomy and soil science at the University of New England in Australia and as a research scientist with the Commonwealth Scientific and Industrial Research Organization in Canberra.

Harris Mule, Kenya, has served in the Kenyan government in various senior posts, including chief economist and deputy permanent secretary of the Ministry of Economic Planning and Development. Most recently he was the permanent secretary at the Ministry of Finance, a post he took on in 1980. He is currently a consultant for the International Fund for Agricultural Development, a member of the World Bank's Council of African Advisers, and chairman of the Advisory Committee to the African Economic Research Consortium.

Sukadji Ranuwihardjo, Indonesia, is the director general of higher education in the Indonesian Ministry of Education and Culture. His other government posts have included member of Parliament and assistant to the Minister of Trade.

Theodore W. Schultz, U.S.A., is a Nobel laureate in economics. He is currently professor emeritus of economics at the University of Chicago.

Leopoldo Solís, Mexico, serves as chairman of the Mexican Council of Presidential Economic Advisers. He previously held the deputy governorship of the Central Bank of Mexico.

M. Syeduzzaman, Bangladesh, a development planner and administrator, began his government career in 1956. He has held various senior posts in the Ministries of Commerce, Planning, and Finance. Recently he was Minister of Finance of Bangladesh.

Charles Valy Tuho, Côte d'Ivoire, is his country's ambassador to the European Community. He has served as adviser to the Ministry of Scientific Research and rector of the University of Côte d'Ivoire.

John W. Mellor, Director, Ex Officio, U.S.A.



Certified Public Accountants

Peat Marwick Main & Co.

2001 M Street, N.W.
Washington, D.C. 20036

Independent Auditors' Report

The Board of Trustees
International Food Policy Research Institute:

We have audited the accompanying balance sheets of the International Food Policy Research Institute as of December 31, 1988 and 1987, and the related statements of revenue, expense and general fund balance and cash flows for the years then ended. These financial statements are the responsibility of the Institute's management. Our responsibility is to express an opinion on these statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the International Food Policy Research Institute at December 31, 1988 and 1987, and the results of its operations and its cash flows for the years then ended in conformity with generally accepted accounting principles.

Peat Marwick Main & Co.

February 24, 1989



Member Firm of
Klynveld Peat Marwick Goerdeler

FINANCIAL STATEMENTS

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Balance Sheets as of December 31, 1988 and 1987

ASSETS

	1988	1987
Current Assets		
Cash and short-term investments (Notes 2 and 7)	\$1,607,163	1,663,733
CGIAR unrestricted grants receivable	182,181	218,189
CGIAR restricted grants receivable	72,055	100,206
Special project contracts receivable (Note 4)	798,206	743,023
Other receivables	225,284	96,232
Prepaid expenses and other current assets	230,372	199,512
	<u>3,115,261</u>	<u>3,020,895</u>
Property and Equipment (Notes 3 and 8)	<u>522,698</u>	<u>534,626</u>
Total assets	<u>\$3,637,959</u>	<u>3,555,521</u>

LIABILITIES AND FUND BALANCES

Current Liabilities		
Accounts payable	\$ 189,601	143,396
Current portion of long-term debt (Note 8)	13,674	12,226
Accrued vacations and other liabilities	302,621	283,567
Advance payment of CGIAR unrestricted grant funds	150,000	1,124,064
Advance payment of CGIAR restricted grant funds	522,022	285,375
Unexpended special project contract funds	1,082,452	707,769
	<u>2,260,370</u>	<u>2,556,397</u>
Long-term Debt (Note 8)	<u>1,212</u>	<u>14,886</u>
Total liabilities	<u>2,261,582</u>	<u>2,571,283</u>
Fund Balances - Unrestricted		
Working capital fund	756,044	401,977
Equipment replacement fund	150,000	100,000
General fund	470,333	482,261
Total fund balances	<u>1,376,377</u>	<u>984,238</u>
Total liabilities and fund balances	<u>\$3,637,959</u>	<u>3,555,521</u>

See accompanying notes to financial statements.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Statements of Revenue, Expense and General Fund Balance For the years ended December 31, 1988 and 1987

	1988	1987
Revenue		
Grant income:		
CGIAR-unrestricted	\$6,314,134	5,526,803
CGIAR-restricted	642,331	406,240
Special project income-restricted	2,387,613	2,229,362
Investment income	115,094	92,138
Other income	8,931	40,691
	<u>9,468,103</u>	<u>8,295,234</u>
Expenses		
Personnel	4,143,988	3,612,436
Fringe benefits	1,304,092	1,059,209
Collaboration	1,134,944	1,298,150
Travel	412,448	336,276
Computer	190,071	143,466
Publications	453,385	393,958
Trustees' expenses	160,723	154,383
Office operations	1,115,688	987,098
Depreciation	160,625	148,048
	<u>9,075,964</u>	<u>8,133,024</u>
Excess of Revenue Over Expenses	392,139	162,210
Transfer to working capital fund	(354,067)	(67,805)
Transfer to equipment replacement fund	(50,000)	(50,000)
Increase (decrease) in general fund balance	(11,928)	44,405
General Fund Balance, Beginning	<u>482,261</u>	<u>437,856</u>
General Fund Balance, Ending	<u>\$ 470,333</u>	<u>482,261</u>

See accompanying notes to financial statements.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Statements of Cash Flows
For the years ended December 31, 1988 and 1987

	<u>1988</u>	<u>1987</u>
Cash flows from operating activities:		
Excess of revenue over expenses	\$ 392,139	162,210
Adjustments to reconcile excess of revenue over expenses to net cash provided by operating activities:		
Depreciation	160,625	148,048
Grants receivable	64,159	(216,745)
Contracts receivable	(55,183)	270,102
Other receivables	(129,052)	(15,107)
Prepaid expenses and other current assets	(30,860)	(87,871)
Accounts payable	46,205	(1,293)
Accrued vacations and other liabilities	19,054	28,483
Advance payment of grant funds	(737,417)	(190,561)
Unexpended contract funds	374,683	(223,006)
Net cash provided by (used in) operating activities	<u>104,353</u>	<u>(125,740)</u>
Cash flows from investing activities:		
Acquisition of property and equipment	(148,697)	(192,282)
Disposal of property and equipment	—	1,548
Net cash used in investing activities	<u>(148,697)</u>	<u>(190,734)</u>
Cash flows from financing activities:		
Repayment of long-term debt	(12,226)	(10,930)
Net cash used in financing activities	<u>(12,226)</u>	<u>(10,930)</u>
Net (decrease) in cash and short-term investments	(56,570)	(327,404)
Cash and short-term investments at beginning of year	<u>1,663,733</u>	<u>1,991,137</u>
Cash and short-term investments at end of year	<u>\$1,607,163</u>	<u>1,663,733</u>

See accompanying notes to financial statements.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Notes to Financial Statements December 31, 1988 and 1987

Note 1. Summary of Significant Accounting Policies

Organization

By Executive Order 12359, the International Food Policy Research Institute (the Institute) is a public international organization entitled to certain privileges, exemptions and immunities conferred by the International Organizations Immunities Act, including exemption from Federal income tax under Sec. 501(c)(3).

Revenue

Grant income is support received from agencies participating in the Consultative Group on International Agricultural Research (CGIAR) and is classified as restricted or unrestricted based on the donor's stipulations. Restricted grant income is recognized as the related expenses are incurred. Unrestricted grant income is recorded during the period stipulated by the donor. Unrestricted grants which have been pledged for the current year but not received at year end are recognized as revenue and the related receivables are recorded. Grants received for funding of future periods are recorded as advance payment of grant funds.

Special project income-restricted is recorded as the related costs are incurred. Contracts receivable represents income which has been earned but for which funds have not yet been received. Unexpended contract funds represent funds received for which costs have not yet been incurred. The receivables as stated are considered fully realizable.

Other income is recorded when earned.

Property and Equipment

Property and equipment is stated at cost. Depreciation is provided using the straight-line method over estimated useful lives of 5 years. Expenditures for additions are capitalized and expenditures for maintenance and repairs are charged to operations as incurred. When properties are retired or otherwise disposed of, the cost and the related accumulated depreciation are removed from the respective accounts and the resulting gain or loss is reflected in operations.

Some restricted project sponsors allow equipment to be purchased for use on a particular project. Predominantly, these purchases have been in the field, and the items will be left in the countries involved in the studies. However, some equipment will be retained by the Institute at the conclusion of the project and will be available for continued use as donated property. This equipment has not been capitalized, but has been charged as an expense of the related project in the year of purchase. The total of these purchases is \$39,329 and \$58,816 for the years ended December 31, 1988 and 1987, respectively.

Working Capital Fund

Under guidelines of the CGIAR, the Institute is strongly encouraged to establish a working capital fund equivalent to 60 days of CGIAR expenses. The working capital fund would be comprised of cash and short-term investments and certain receivables less certain liabilities, prepaid grant funds and contract funds received in advance.

The December 31, 1988 working capital fund balance of \$756,044 includes the December 31, 1987 balance of \$401,977 plus the current year transfer from the general fund of \$354,067. The budgeted working capital fund balance, using the CGIAR criteria, was \$1,090,641 at December 31, 1988. Therefore, the working capital fund was \$334,597 less than the working capital fund balance using CGIAR criteria.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Notes to Financial Statements
December 31, 1988 and 1987 (continued)

Note 1. (continued)

Equipment Replacement Fund

The December 31, 1988 equipment replacement fund balance of \$150,000 includes the December 31, 1987 balance of \$100,000 plus the current year transfer from the general fund of \$50,000. The equipment replacement fund represents a reserve for the future replacement of the Institute's existing property and equipment.

Reclassifications

Certain reclassifications of the prior year's information have been made to conform with the current presentation.

Note 2. Cash and Short-Term Investments

Cash and short-term investments at December 31, 1988 and 1987 consist of the following:

	<u>1988</u>	<u>1987</u>
Cash and interest-bearing deposits	\$1,260,960	967,530
Certificates of deposit	200,000	500,000
U. S. government and agency investments	146,203	196,203
	<u>\$1,607,163</u>	<u>1,663,733</u>

U.S. government and agency investments had a market value of \$149,156 and \$197,968 at December 31, 1988 and 1987, respectively.

Note 3. Property and Equipment

Property and equipment at December 31, 1988 and 1987 are summarized as follows:

	<u>1988</u>	<u>1987</u>
Furnishings	\$ 270,111	235,523
Equipment	256,035	253,355
Computer Equipment	499,485	395,498
Leasehold Improvements	128,726	121,284
	<u>1,154,357</u>	<u>1,005,660</u>
Less: accumulated depreciation	631,659	471,034
	<u>\$ 522,698</u>	<u>534,626</u>

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Notes to Financial Statements December 31, 1988 and 1987 (continued)

Note 4. Special Project Contracts Receivable

Special project contracts receivable at December 31, 1988 and 1987 consist of the following:

	<u>1988</u>	<u>1987</u>
Amounts billed	\$614,314	311,831
Recoverable costs, not yet billed	183,892	431,192
	<u>\$798,206</u>	<u>743,023</u>

Note 5. Leases

The Institute occupies office space under various leases expiring through 1990. The leases provide for additional rents based on increases in building operating costs and the Consumer Price Index.

Minimum lease payments for all noncancellable leases having a remaining term in excess of one year at December 31, 1988, are as follows:

1989	\$571,748
1990	381,165
	<u>\$952,913</u>

Note 6. Retirement Plan

The Institute maintains a defined contribution retirement plan for substantially all full time employees under which the Institute contributes 5%-20% of an employee's base compensation depending on age and length of service. Contributions for U.S. employees are made to the Teachers Insurance and Annuity Association and the College Retirement Equities Fund. Contributions for the international staff are made to the Alliance Capital Management International and Generali. Total contributions were \$535,053 and \$420,250 for the years ended December 31, 1988 and 1987, respectively.

Note 7. Restricted Foreign Accounts

As part of certain special project provisions, various foreign bank accounts have been opened to receive payments from donors in the local currencies.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Notes to Financial Statements
December 31, 1988 and 1987 (continued)

Note 8. Long-term Debt

Long-term debt consists of an installment note for \$55,860, payable in 60 monthly installments of \$1,221, including interest at 11.25% per annum. A copier with a carrying value of \$17,640 at December 31, 1988, serves as the collateral for this note. The outstanding balance at December 31, 1988 and 1987 follows:

	<u>1988</u>	<u>1987</u>
Note payable	\$14,886	27,112
Current portion	(13,674)	(12,226)
Long-term debt	<u>\$ 1,212</u>	<u>14,886</u>

Note 9. Line of Credit

The Institute has a line of credit available with First American Bank in the amount of \$800,000. At December 31, 1988, the Institute had no amount outstanding relating to the line of credit.

Note 10. Contingency

A substantial portion of special project revenue is with agencies of the U.S. government, and is subject to audit by cognizant government audit agencies. Until such audits are completed there exists a contingent liability. Management believes the effects of any such audits would not be material to the financial statements presented. The Institute's cost records have been audited through 1985 by the Defense Contract Audit Agency.

IFPRI

1776 MASSACHUSETTS AVENUE, N.W. • WASHINGTON, D.C. 20036 • USA
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