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IFPRI

REPORT 1976-1978

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IFPRI

REPORT 1976-1978

International Food Policy Research Institute
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Contents

1. Origins and Objectives

This is the first published report which describes in detail the full range of activities of the International Food Policy Research Institute, past, present, and planned. It is intended not only to report on the Institute's activities during the past two years but to serve as a reference point for those who wish to know more about the origins and objectives of this new international institution, and how it has set out to fulfill the mandate foreseen for it by its founders.

i. Origins

IFPRI does not owe its origins to any single factor but rather to the confluence of several.

In January 1973 the Technical Advisory Committee (TAC) to the Consultative Group on International Agricultural Research (CGIAR), following discussions with staff of the Food and Agriculture Organization of the United Nations (FAO) and with social scientists working in the field in developing countries, expressed concern about the weak links between farm level socio-economic research and the translation of its results into public policy. The TAC noted that the application of the results of agricultural research is often vitiated by policy decisions which scientists have little opportunity to influence and which they may not even be able to foresee when attempting to develop new technology. In addition, the flexibility of farmers to adopt research results is limited by many matters beyond their control, but which can be influenced favorably or adversely by government policies. Research is therefore needed to help illuminate the choice of policymakers and to offer guidance as to the potential consequences of their decisions.

Similar concerns were expressed at a meeting sponsored by the U.S. Agency for International Development (USAID) under the aegis of the CGIAR in Washington in July of the same year, to review the directions of socio-economic research in developing countries. This meeting was attended by members of the TAC, the CGIAR, and eminent social scientists from institutions in eight developing countries. They noted that individual governments may also be able to exert only limited leverage on matters of global or regional significance related to agricultural production, trade, or fiscal policy; particularly when normal patterns are suddenly disrupted by unforeseen events. It was concluded that there is a need for research and monitoring of broader aspects of agricultural and food policy, and that such research might hopefully lead to the avoidance of or alleviation of major food crises.

Following these meetings, the TAC established a subcommittee to study these problems and how best to approach them. At its eighth meeting the TAC endorsed its subcommittee's recommendation that an autonomous world food policy research institute be established with a mandate to undertake independent analysis of global socio-economic problems affecting world agriculture and relations between regions and countries, with priority to research and related activities concerned with the

major issues affecting food production, utilization, and trade. It was hoped that the work of the institute would complement that of FAO, the World Bank, and the International Agricultural Research Centres, and that it would collaborate closely with these as well as with national institutions. However, a valuable role was anticipated for it in being able to undertake research on key issues that might have sensitive political or social connotations, and thus provide guidance to national and international planners and governments on measures required to improve the management of agricultural resources to increase world food supplies and to achieve a more equitable distribution of available food.

As a result, in July 1974 the TAC recommended the establishment of a world food policy research institute to the CGIAR. At the subsequent CGIAR meeting, three nongovernmental members of the Consultative Group—the International Development Research Centre of Canada (IDRC), the Ford Foundation, and the Rockefeller Foundation—agreed to accept initial responsibility for sponsoring such an institute.

At this time the world was in the grip of a particularly severe food crisis precipitated by poor weather over large areas of the globe. This was exacerbated by a fertilizer shortage that reflected poor industrial planning. The resulting high grain and fertilizer prices created heavy burdens on low income countries that were simultaneously facing sharply higher oil prices, a sudden decline in food aid, and a deterioration in export opportunities that further limited their capacity to import foodgrains. This crisis bore heavily on the interests of developing and developed countries, and in 1974 led to the convening of an emergency World Food Conference in Rome under the auspices of the United Nations. The aim was to discuss ways to maintain adequate food supplies and to harness the efforts of all nations to abolish hunger and malnutrition.

The Conference called for the reinforcement of technical and socio-economic research on the food problems of developing countries, at both the national and international levels, as a means of finding solutions to the unprecedented difficulties

their governments were facing in feeding their people. The three sponsors therefore decided to go ahead with the establishment of the proposed institute, and as a result the International Food Policy Research Institute (IFPRI) was incorporated on March 5, 1975, with headquarters in Washington, D.C.

With the recommendations of the TAC and the outcome of the World Food Conference, IFPRI was given a mandate to maintain an independent review of the global food and agriculture situation, to undertake analysis of major policy issues with international implications, and to study specific food policy questions of priority concern to developing countries. IFPRI was expected to play an important role in transmission of information to policymakers and others concerned with food policy, through the results of its own research and, in the broader sense, by providing a focal point for the exchange of ideas and the accumulation of knowledge on crucial issues, methodology, and approaches to their solution.

Because food is such a basic human need, affecting all people everywhere, but especially the poorer classes in developing countries who spend the highest proportion of their income on food, and because food dominates agricultural production in most developing countries and thus contributes most to rural income and employment, it was decided that the limited resources of the new institute would be concentrated largely on policies related to food production, trade, and distribution. The inter-relationships between food and other agricultural products, and the wider considerations of national and international economic policy within which food and agricultural policy must be framed were also to be studied.

It will be seen from the description of its programs in this report that IFPRI has undertaken research on relevant matters of agricultural policy of wide significance that transcend food production *per se* but which are inextricably linked to the solution of food problems. Examples include analysis of alternative policies for land use in Africa, or study of the implications of trade liberalization for agricultural exports of developing countries, particularly as they bear on the ability to finance food imports, and work on policies for irrigation development, input use, and agricultural research priorities.

To help achieve these objectives IFPRI has assembled a staff which, though relatively small, is highly experienced in research and policy determination and implementation. The senior staff of 21 represents 14 nationalities. Fifteen members of the staff are from developing countries.

IFPRI's evolution and the formation of its program has been guided by a Board of Trustees which is both truly international in character, and highly distinguished and widely experienced in the field of agriculture. Its fourteen members are from ten nations, and seven Trustees are from developing countries.

As an independent, nongovernmental body with a Board of Trustees and a research staff diverse in their intellectual and cultural backgrounds, IFPRI is able to maintain an objective position and to approach and analyze intrinsically sensitive issues in a manner which gives its findings widespread acceptability and credibility.

ii. Objectives and Approaches

In formulating its research program IFPRI has responded to the five categories of recommendations made by the World Food Conference. These were: to increase food production in developing countries; to improve food intake and nutrition; to achieve food security; to increase the quantity and efficacy of food aid; and to increase the effectiveness of world trade in meeting food needs.

In the pursuit of these objectives IFPRI has sought to establish complementary working relationships with organizations of the United Nations system. This has proved mutually beneficial. For example, the principal organizations established by the World Food Conference were not provided with the resources to undertake the kinds of research and analysis contained in its recommendations. Two have therefore drawn upon IFPRI's research capacity and output as a basis for policy formulation. IFPRI is also collaborating closely with FAO, the principal U.N. organization responsible for agriculture. Thus, at FAO's request IFPRI is applying its trade model to analysis of the effects of reduced trade restrictions on agricultural exports of developing countries in support of FAO's Agriculture Towards 2000 project. On FAO instigation it is undertaking research on estimating national expenditures on agricultural development. Conversely, IFPRI is an important user of FAO data and analysis and TAC has been generous in providing information on technical matters. The growing symbiosis between the two organizations is illustrated by the agreement of the Director-General of FAO to IFPRI's holding its first 1979 Board Meeting at FAO headquarters in Rome.

While IFPRI's Washington location has proved no disadvantage in its collaboration with FAO, the United Nations Conference on Trade and Development (UNCTAD), the International Institute for Applied Systems Analysis (IIASA), and other relevant international organizations based in Europe, it has proved of the utmost value in enabling it to capitalize on the vast human resource and information base related to agricultural policy research and development in North America. In particular IFPRI

has developed excellent working relationships with the World Bank, the Inter-American Development Bank, and the CGIAR. IFPRI is now working with FAO and USDA to reconcile and improve world food production data.

The United States government requested IFPRI's participation in a task force on food aid. IFPRI research on food aid and food security formed the basis for its contribution, which is now being expanded to include a special analysis of Sahelian food security issues.

The World Bank invited IFPRI to participate in a joint analysis of food policy in Bangladesh. This analysis contributed to IFPRI research on two price systems for concurrently maintaining production incentives and subsidizing consumption of the poor, work which forms the basis for part of its expanding research collaboration with IRRI. Subsequently, the government of Bangladesh requested an IFPRI staff member to assist it in implementing a recommendation from the World Bank/IFPRI study to establish a high level government capacity to analyze food policy issues.

Because IFPRI can integrate a wide geographic and disciplinary coverage on food policy issues, it has been able to make a complementary contribution to the efforts of the World Bank (which has drawn on IFPRI's research, for example, in its World Development Report), as well as to the Asian Development Bank (which utilized IFPRI data in its second Asian Agricultural Survey), various regional banks, and the International Fund for Agricultural Development.

IFPRI is also being asked to an increasing extent to contribute to the work of other bodies concerned with world or regional development policy, such as the Trilateral Commission and the Brandt Commission. The latter has recently requested IFPRI to prepare background paper on agricultural development with emphasis on its research results.

Since IFPRI staff believes that technological change forms the basis for future increase in Third World agricultural production, close association with the CGIAR system is essential to the larger contribution the Institute hopes to make, and has always been an important objective of its program and in the development of its working linkages. For example, at the request of the TAC, IFPRI undertook a study on criteria and approaches to evaluating international agricultural research priorities. That study tabled at the June 1978 Nairobi meeting of TAC is the first step in an expanding research program on expenditures and resource allocations related to national as well as international research systems. IFPRI's report on training needs for research to the CGIAR meeting in 1977 falls in the same category.

Collaboration with the production science centers on the wide range of resource allocation and price issues affecting the application of agricultural technology and the

effective demand for increased output is central to the Institute's work. The Board of IRRI has noted the importance of such broad issues to successful application of new rice technology, and has encouraged IFPRI collaboration with IRRI and the International Fertilizer Development Centre (IFDC) on analysis of rice policy. A joint project is under development.

Because of the importance of wheat in trade, the research of IFPRI on food security issues is of special interest to the International Maize and Wheat Improvement Centre (CIMMYT). The consequence was a joint CIMMYT/IFPRI conference in November 1978 on food security. Substantial developing country participation in that conference highlighted the difficulty of applying international schemes to individual country problems and indicated the need for analysis in order to evolve appropriate modification of such schemes. Collaboration with other International Agricultural Research Centres is also expanding. For example, IFPRI recently participated in a meeting held at the International Center for Tropical Agriculture (CIAT) in Colombia to help plan seminars for policymakers.

As it matures, IFPRI expects to be in a position to provide a point of contact for social science personnel in the Centres. IFPRI is just beginning to play this role, which it hopes will be helpful to social science work in the CGIAR system.

IFPRI is exploring avenues for relating to the several strong national centers of research on food policy that are located in advanced countries. IFPRI's broadly international staffing, its primary concern for developing countries, and its contacts with research institutions in developing countries should be an asset in forging such relationships.

In the final analysis IFPRI's value will be judged on the impact of its research on helping to provide guidelines to policymakers, particularly to those responsible for decision at the national level in Third World countries. Three main avenues are being followed to further this objective. First, the Institute is progressively developing working relationships with national research and development institutions in developing countries. This is gathering impetus as its core research program crystallizes. Second, the strong component of experienced people from the Third World on its Board of Trustees and its staff, both provides a vital link to policymakers in developing countries, and an essential input of knowledge and realism to its research programs concerning agricultural priorities and problems in those countries. Although IFPRI does not have a formal training program, the continuing flow of Third World researchers to its staff at various levels of seniority and for varying periods provides an expanding base of contacts in Third World countries on which to build IFPRI's future collaborative programs with national systems. In addition they make an important direct contribution to its research output while at the Institute. Third, the evolution of its information program, including research reports and other publications of the Institute, newsletters, seminars, and larger workshops or conferences, will ensure not only that policymakers are aware of the results of IFPRI's research but also that they are informed of other important developments bearing on agricultural policy, and are enabled to participate more fully in discussions of key issues.

2. Research Programs and Results

The Institute's research is divided administratively into four programs—trends analysis, production policy, consumption policy, and trade policy. An integrated approach to food policy problems is needed because much of the research cuts across two or more of these areas.

i. Trends and Statistics

IFPRI's Trends Analysis Program assesses current and prospective food situations in developing countries by projecting historical production trends into the future and comparing the resulting output projections with anticipated food needs, using specified assumptions of the growth of population and per capita income.

This assessment, together with an examination of major factors underlying production and consumption trends, provides the context for other IFPRI researchers in their evaluations of national and international food policy changes. It is also valuable to the work of such organizations as the World Food Council, the World Bank, and FAO, as well as to national policy groups for placing their analyses in a larger global framework.

Food Gap Analysis

In 1976, IFPRI inaugurated its research program with the publication of its first research report *Meeting Food Needs in the Developing World: Location and Magnitude of the Task in the Next Decade.* This report deals with the critical world food problem areas and the likely size of possible food deficits in the developing market economy (DME) countries in 1985.

The report put concrete dimensions on the food problem by concentrating on cereals, the major food staple in most of the developing world. Although foodgrain requirements were considered in a global context by the 1974 World Food Conference, IFPRI disaggregated the total into the potential needs of 83 DME countries and groups of countries with similar attributes (see Figure 1).

Based on a continuation of present trends in food deficit DME countries, IFPRI projected a 1985/86 shortfall in cereal production of about 100 million tons—more than double that of the 1974/75 food crisis.

Since most of these countries have extremely low incomes and little prospect of earning sufficient foreign exchange to finance imports of such magnitude, the only feasible way they will be able to meet food demand is to increase production more

rapidly. To eliminate the projected shortfall, the growth rate of cereal production will have to increase from 2 to about 4 percent per year.

The core of the food problem was found in countries with per capita incomes of less than US$ 200 in 1972, where 60 percent of DME population lives and where most population growth will occur. These countries included India, Bangladesh, Indonesia, Nigeria, and the low income Sub-Sahara countries.

In 1977, IFPRI updated and widened the scope of the earlier report. The second report, *Food Needs of Developing Countries: Projections of Production and Consumption to 1990*, looked five years further into the future and included other major staple foods—root crops, pulses, and groundnuts—as well as cereals. Most important, it estimated how much additional grain would be needed to feed the poor.

Using country-level production trends and projected food needs for 82 DME countries, the study concluded that by 1990 output of major staple food crops might fall short of demand by 120 million tons with slow growth in income, and by 145 million tons with faster income growth. Such projections indicate difficult times ahead for the low income, food deficit countries, especially in Asia and Sub-Sahara Africa.

When projected output is compared with the quantities of food needed to meet caloric standards, these problems become even more severe. To satisfy both market demand and dietary needs by 1990, 170 to 185 million tons more than the projected production of major staples would be required.

Nearly 90 percent of the total calorie gap might occur in the low income, food-deficit developing countries. Unless their food production increases rapidly, these countries will require large food imports, probably in the form of food aid, if basic human needs are to be met.

Production Trends in Selected Rapid-Growth Developing Countries

The 1977 report also showed that during 1960-76 a number of DME countries achieved average annual growth rates in food production of 3.25 percent or more, and output of major staples in Tunisia, El Salvador, Malaysia, and Pakistan grew at more than 4.5 percent annually. An understanding of the real and statistical causes of such growth rates would help guide policy for achieving faster growth in developing countries. As a result, IFPRI's Trends Analysis Program is collaborating with the Production Policy Program in a comparative study of the major components of increased food output in 16 DME countries selected to shed light on sources of high growth rates.

Comparative Study of FAO and USDA Food Production Data

IFPRI's gap analysis work has noted some differences between USDA and FAO country data on production and area of food crops. IFPRI is examining the data series from these two major sources in order to help identify these differences in order to contribute to their reconciliation.

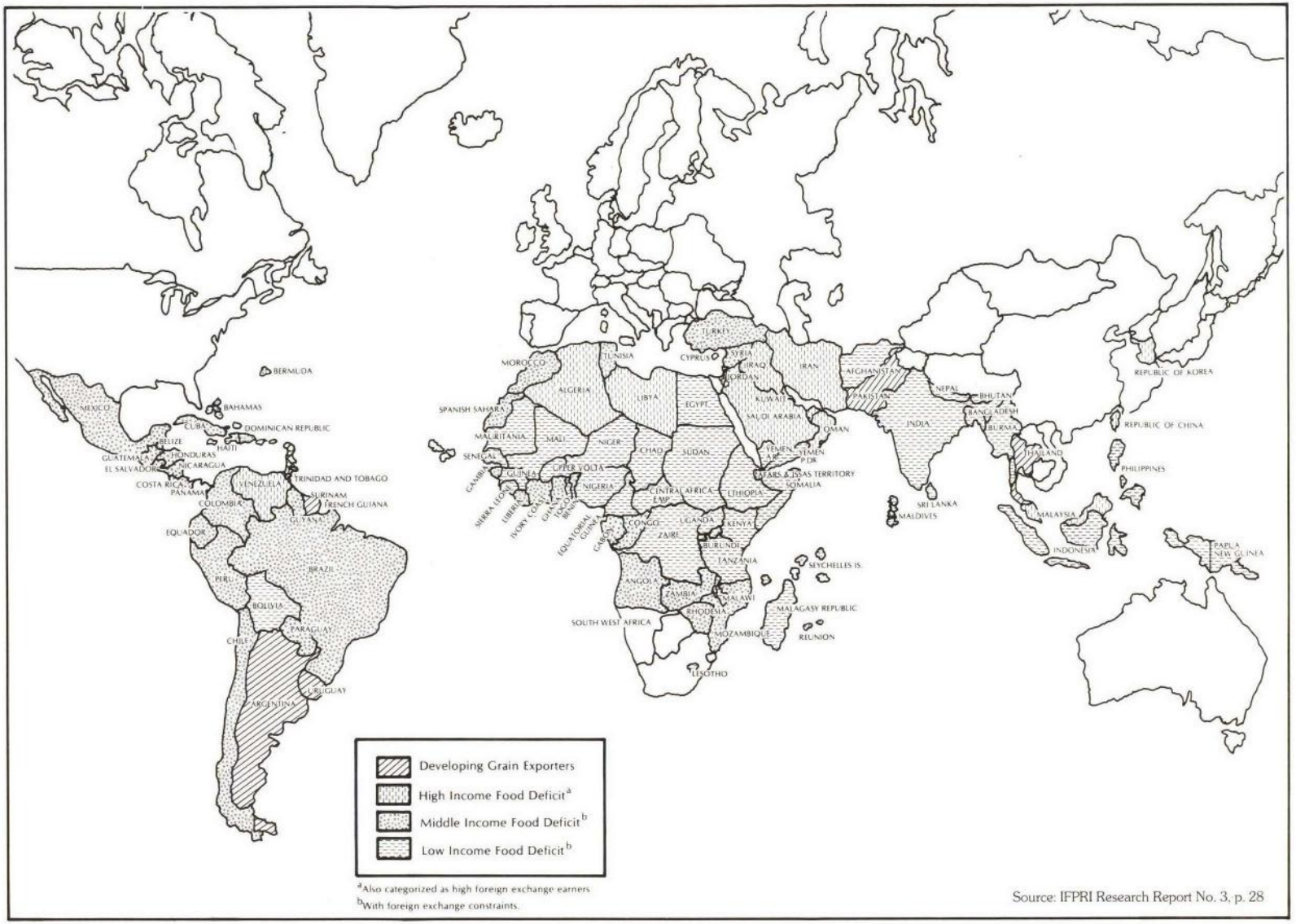

Figure 1. Developing Market Economies by IFPRI Category

Future Work

To improve the food gap analysis, work has already begun on including data from the People's Republic of China, which accounts for one-fifth of the world's staple food crop production. IFPRI is also planning to expand its projections to bananas, plantains, and sugar. With the inclusion of these commodities, the trend analysis will encompass 80 to 90 percent of total calorie intake in most developing countries.

The estimation methods themselves are also being refined. Rather than simply extending historical trends, future projections of crop output will attempt to remove the effects of extreme weather, and will also try to find immediate changes in trends.

ii. Production Policy

The Institute's production policy research has had three main thrusts: research resource allocations (in recognition of the vital role new technology must play in future food production increase), investment requirements and efficiency (with particular emphasis on water resources in recognition of the dominant claim of irrigation for fixed investment resources), and fertilizer policy (consistent with the dominant role of fertilizer as a complement to new technology and as a claimant on working capital resources).

Allocation of Resources to Agricultural Research
International Research Priorities

Late in 1977, the Secretariat of TAC asked IFPRI to work with it to determine whether the resources allocated to the various international research institutes in the CGIAR system corresponded to the importance of the crops studied.

Using data from 85 producing countries grouped according to commodities and ecological zones (see Figure 2), IFPRI's analysis identified commodities, production factors, and problem areas for continuing research. The report "Criteria and Approaches to the Analysis of Priorities for International Agricultural Research," February 1975, found that "an allocation of approximately 60 percent of international agricultural research expenditures to cereals appears correct, although in relation to their contribution to calorie and protein supply and their share of area and production, it could be argued that investment in cereals research is low compared to current investments in roots, tubers, pulses, and cattle."

According to this study, research on maize and rice would benefit the greatest number of countries; research on wheat, the next greatest. Even though millet and sorghum are major crops in the poorer countries, a number of factors seem to discourage expanding their production and to favor wheat and rice. Wheat, rice, and meat are the main food imports of developing countries. To satisfy food needs, it may be necessary to commit a larger share of research resources to rice and wheat.

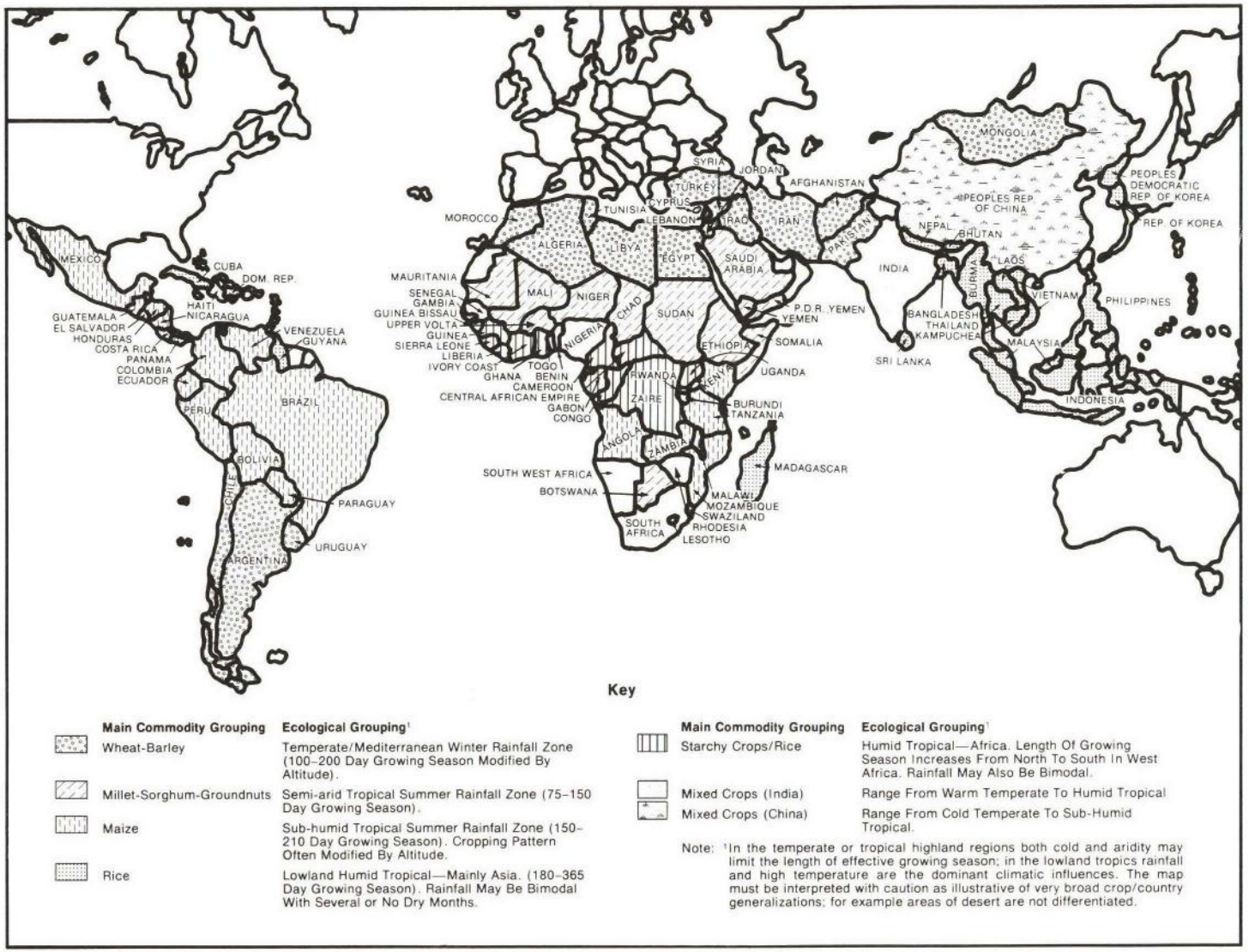

Figure 2. Developing Countries Grouped by Major Commodities and Ecological Zones

Priorities within current wheat and rice research efforts may also need to be shifted to reflect the needs and production potentials of different agroclimatic zones and the rising demand for wheat in the tropics.

This report noted that most developing countries find it difficult to provide adequate support for research on such crops as sweet potatoes, yams, broadbeans, chickpeas, soya beans, cowpeas, pigeonpeas, and many vegetables and fruits. Only one or two countries cultivate a large enough area (exceeding a million hectares) of these crops to justify a concentrated national research effort. Yet, the International Agricultural Research Centres would begin to dissipate their resources if they attempted to act as substitutes for national programs on such crops. However, an international research commitment can be justified for three widely distributed commodities—cassava, Phaseolus beans, and groundnuts—because a large food crop area is devoted to them in 20 or more countries and because they are important either as efficient sources of energy (cassava) or protein (beans, groundnuts). In order to tackle other crops of more localized importance, international assistance might be used to reinforce appropriate national institutions.

IFPRI's report on research priorities disclosed three other relatively high value, labor intensive crops in a number of producing countries, with little international research investment: cotton, bananas/plantains, and sugarcane. All have important implications for foreign exchange earnings in developing countries, and two of them, cotton and sugarcane, offer the possibility of a twofold payoff to greater research efforts: as raw materials alone and as raw materials that can be used to supply industries to process them.

IFPRI's study concluded that the current allocation of resources between research on commodities, the understanding and management of the physical resources for production (climate, water, and soil), and the efficient use of agricultural inputs merits further examination. Research that concentrates on the management of inputs such as fertilizer and irrigation currently receives approximately 13 percent of international agricultural research support. However, the increasingly important contribution to output expected in the next two decades from irrigation and fertilizer probably means that expenditures in these areas are too low compared to research spending on, for example, genetic improvement of specific minor crops. Research on agricultural inputs was stressed as a priority.

Several other policy issues were also identified as deserving added attention. These include a possible reordering of commodity and regional research priorities; assessment of the impact of technology on employment; and the choice of appropriate technology given the cost, productivity, and availability of labor in different geographic and agroclimatic regions. These issues are all closely linked; thus, for example, a shift in the distribution of income might alter the demand for different foods and result in the need to reassess commodity research priorities.

Strengthening National Research Systems

In addition to studying international research priorities, IFPRI is examining the needs of national research systems in Third World countries.

Each year, donor members of the CGIAR and the directors of the International Agricultural Research Centres meet to review and evaluate programs. For a special forum on training at International Centers Week in September 1977, IFPRI prepared "Training Requirements for Research and Its Application—An Overview," which concluded that the allocation of additional resources to information, education, and training is crucial to improved research capacity in developing countries. Although the number of skilled research and extension personnel has increased markedly in the last decade, many more are needed at the national and regional levels to develop agricultural technology appropriate to the developing countries.

Subsequent analysis drawing on recent data completed just prior to the 1978 International Centres Week ("Current and Projected Agricultural Research Expenditures and Staff in Developing Countries") confirms that significant progress appears to have been made in a number of developing countries compared to estimates made at the time of the World Food Conference. It also shows, however, that the countries that are most dependent on agriculture often spend the smallest proportion of their gross domestic product on research, and that there are marked regional imbalances, with two-thirds of the scientists in the 65 countries studied located in less than 10 countries.

In addition to a need to train some 85,000 new graduate scientists to enter research services during the next 15 years, the report shows that there are grave weaknesses in numbers and quality of supporting technicians for laboratory research, field experimentation, and seed production which, if not remedied, will impede both research and the adoption of its results.

Moreover, if farmers in poor countries are to benefit from research they will need technical assistance from adequately trained personnel at various levels, as well as grass roots training directed to the farming community and the farm family. As the report points out, "IFPRI's ongoing analysis of agricultural performance since 1961 in the main food deficit countries indicates the failure of a large number of these countries to attain relatively modest growth rates in food production. This failure does not stem mainly from their inability to achieve proposed targets for resource development, but rather from a shortfall in growth rates of yields because farmers are unwilling or unable to adopt the appropriate technology." These findings imply that a massive investment in building up human skills is necessary.

To complement these broad studies on international agricultural research and manpower requirements, IFPRI is preparing a study on Nigerian agricultural research to test the criteria developed in relation to international research priorities at the national level in a developing country with dynamic economy and in a wide range of conditions.

Investment Requirements

At the request of the Consultative Group on Food Production and Investment (CGFPI), in 1977 IFPRI began a study to estimate the investment required over the next 15 years to bring food production up to demand in 36 low income, food deficit DME countries. All the countries studied had an average per capita income below US $350 in 1974, and at least half of their population was employed on the land. Their total population of about 1.25 billion represents approximately 33 percent of the world's inhabitants and about 68 percent of the people in the DMEs.

The prevention of further deterioration of the food situation in these countries is a formidable task. Even though major strides in family planning are occurring, they are unlikely to reduce population growth within the next 15 years to significantly change the rate of increase in the demand for food. With population projected to rise at 2.7 percent annually, merely to maintain 1975 per capita consumption levels will require production to grow faster than the 2.4 percent trend rate. To alleviate malnutrition, food output will have to increase at a sustained 4.4 percent per year, an agricultural growth rate that is rare in developed or developing countries.

A first priority in assessing future needs and investment opportunities for boosting food production is irrigation and drainage. IFPRI addressed the water resource development issue by asking these questions: What is the additional area that can be brought under irrigation between 1975 and 1990 through new projects and improvement of existing irrigation works? How much of this land would be devoted to foodgrains? How much additional production would it yield? What are the additional investment costs?

The study found that if irrigation targets are achieved, the use of complementary inputs could produce an additional 80 million tons of foodgrains by 1990. But even this increase would provide only 63 percent of the extra production required to maintain per capita consumption at 1975 levels—45 to 50 percent of market demand, and 38 percent of the basic nutritional requirements.

The capital cost of the irrigation program in the 36 countries studied is estimated at US $45 billion (in 1975 prices). This works out to an average capital investment of approximately US $570 to produce one additional ton of foodgrains each year.

IFPRI is examining the probable costs of various investment options, including alternatives to capital-intensive approaches in resource development. Investment in irrigation must be compared with alternative investments to develop rainfed agriculture or infrastructure.

Water resource development is a key to increasing food production for most Asian developing countries. Therefore, the Production Policy Program is analyzing the literature on economic aspects of irrigation in Asia to classify and identify policy variables related to the adoption of irrigation and means of transforming it from a traditional factor of production to a modern one.

In Africa, where there is very little irrigated area and the analysis of plans for water resource development does not indicate a major change in the period covered by the study, emphasis has been placed on the potential for increasing production from rainfed land. Despite optimistic estimates by some authorities about the availability of new land for cultivation in Africa, it is apparent from the low and declining yields and the modest rate of expansion of arable area in many African countries that there is an urgent need to raise the productivity of land and labor. The study concludes that this will require carefully planned investments in roads, infrastructure, disease control, settlement or resettlement of populations, and research and technology development; and that facile assumptions about cheap gains from "horizontal" area expansion in Africa cannot be taken for granted.

The investment study has also led to work which has been undertaken at the request of the World Food Council on the technology and related agricultural inputs required to reach the 4 percent growth in food production targeted in the Council's 1977 Manila Declaration. The Production Program is focusing on policies related to the development and application of new technology required for the main food commodities and agroclimatic regions, and their implications for investment in research and resource development, training priorities, and the quality of extension and its link to research.

Economic Trade-offs Between Food and Cash Crop Production and Optimal Food Policy Choices for East African Countries

Kenya, Uganda, and Tanzania rely on a few export crops to earn the foreign exchange necessary to finance their development programs, but they are also low-income, food deficit countries. Ideally, food production and export crop production would both increase, and achieving the goals of one would not conflict with the other. A current IFPRI research effort seeks to find out the extent to which the two objectives are indeed in conflict. The study will also attempt to develop policy guidelines for achieving the appropriate balance between food and cash crop production.

Future Work

Asian rice policy research. IFPRI's Production Policy Program and its Trade Policy Program have just begun a two-part study on macro-rice policy in Southeast Asia in collaboration with IRRI and IFDC. This study,

which is being planned as a comparative research effort with four Southeast Asian countries (Indonesia, Malaysia, the Phillippines, and Thailand), represents the first major "off-campus" research effort in which IFPRI plays the coordinating role.

The Production Policy Program will focus on the main variables—water resource development, seeds, and fertilizers—that could increase the supply of rice in the ASEAN member countries. The study will assess the investment opportunities for water resource development for each ASEAN country, particularly irrigation's potential contribution to increased rice production.

IFPRI will cooperate with the IFDC in establishing a comprehensive conceptual framework to examine the factors that determine the growth of fertilizer use as a second key variable for increasing food production in developing countries, including those of the ASEAN region.

Linkages Research

The work of the Production Policy Program reflects an increasing concern with how food production growth rates and growth in effective demand can be kept in balance at high growth rates, particularly in the low income countries. This is necessary not only to meet humanitarian objectives, but also to maintain the remunerative prices that are essential to high rates of production growth. Research shows that growth of effective demand for food is determined largely by the growth in the purchasing power of the poor. Thus, the lower income deciles of the population spend half or more of their income increments on grain alone, while those in the upper income decile spend 10 percent or less of their income on grain. An analysis is therefore planned of how a rural-led growth strategy can affect market forces and how it links to overall economic growth.

iii. Consumption Policy

IFPRI's Consumption Policy Program is concerned with a wide range of policy options. During its first two years, it has focused on more specific food distribution policies, including:

1. improved quantitative measurement of the incidence and location of deficiencies in food availability and nutritional intake;
2. evaluation of the impact of intervention policies on food availability and consumption among broad segments of the population;
3. evaluation of the distributional consequences of agricultural development strategies and policies; and
4. study of the impact of food aid on the distribution of food consumption and the means of improving its effectiveness.

The results thus far show that food subsidy-ration schemes can make an important contribution to the improvement of food consumption levels. But the efficiency of such systems in reaching those with the greatest need is generally low and the costs of attaining given consumption goals are correspondingly inflated. Moreover, only a

part of the food put through the ration system results in a net increase in consumption; the remainder tends to depress prices received by farmers. When public procurement schemes are used to solve that problem by simultaneously maintaining prices to farmers, the costs quickly become very high.

Food Policy System in Bangladesh

In 1977, IFPRI joined the World Bank and the government of Bangladesh in studying the management of the food policy system in Bangladesh in order to recommend improvements. Preliminary results and policy recommendations are contained in a report issued by the World Bank. A more extended analytical version of the report will be published by IFPRI.

The joint IFPRI/World Bank analysis found that food policies in Bangladesh have tended to be crisis-oriented and at times contributed to unstable food prices while failing to provide either adequate incentives to farmers or stable supplies to consumers. These policies also hamper the goals of improved food consumption levels and future food self-sufficiency.

For city dwellers, the subsidy/rationing system has been a considerable help. Two-thirds of the public distribution of foodgrains in Bangladesh goes to urban consumers, although only about 9 percent of the country's population is urban. The ration has been very successful in supporting the consumption level of the urban population's poorest 20 percent, whose food intake appears to have increased by 15 to 24 percent. However, ration supplies go to rural areas only after urban requirements have been met. Since the ration system is the sole means for bringing imported supplies to consumers, in very bad years the system tends to reduce food security among marginal groups.

The study recommended a number of important changes for the ration system, including:

1. a reduction in the size of the ration quotas issued;
2. a gradual elimination of eligibility for higher income consumers; and
3. a substitution in the ration of wheat and atta (flour) for rice.

The study also suggested that the government procurement system be reorganized to place an effective floor under harvest prices. Procurement and imports could be used in conjunction with open market sales to minimize what appeared to be excessive seasonal price fluctuations.

A major recommendation of the study called for the establishment of a governmental body to oversee and coordinate national food policies. To facilitate the work of such a body, a simplified framework was developed to help coordinate procurement and imports, rationing, open market sales, and storage policies. This program, which has become the focal point for major national and international food policy decisions in Bangladesh, seeks to:

1. ensure adequate supplies to avoid sharp fluctuations in consumer prices;
2. provide incentives to producers to increase the degree of self-sufficiency;
3. satisfy the needs of the poorest consumers through an internal distribution program; and
4. coordinate food aid policy of the major donors.

The government of Bangladesh asked IFPRI to work with it to devise means of implementing the policy proposals put forward in the joint IFPRI/World Bank study.

Impact of Subsidized Food Consumption on Nutrition in Kerala

To measure the effect of subsidized rice consumption on food intake and child nutrition, IFPRI analyzed data on incomes, food consumption, and nutrition in low income households in rural Kerala, India. Preliminary findings indicate that among lower income households, subsidized rice from the ration shop system contributed one-fifth of their caloric and protein supplies. Without the subsidized rice, a net decline in intake of both calories and protein could be expected, even though open market purchases of rice would increase. Subsidized rice consumption was also positively related to the nutritional status of children because of caloric and protein improvements in the household's diet. Despite the clear benefits to the poor of subsidization, more subsidized rice was available to middle income groups than to the lower income groups during periods of limited supply.

Procurement of rice within the state for the ration supply also affects the distribution of income within the farming community to the benefit of small farmers. As a food deficit state, in the national context, Kerala is favored by the existence of the ration system. Such benefits must be weighed against possible welfare losses in surplus states.

Minimum Price and Storage Policies in Northeast Brazil

With the interest and logistical support of the Bank of Northeast Brazil, IFPRI recently analyzed Brazil's program of storage loans for corn, rice, beans, and cotton. The investigations found that producers and their cooperatives—the target beneficiaries of the program—received less than 25 percent of funds in most years, with most loans going to a few—primarily large producers and handlers. Moreover, the study found no evidence of reduced variations in producer prices in Northeast Brazil as a result of the program.

In addition to pecuniary incentives, which are apparently substantial, use of the program by farmers appears to be limited by other factors. Encouraging producer cooperatives to use the program might improve small farmer participation.

Future Work

The Consumption Policy Program plans to pursue its work on food distribution policies. A comparative analysis of the effect of rationing schemes drawing on the individual country studies already undertaken for Bangladesh, India, and Sri Lanka is planned. This work will be extended to a broad review of the use of subsidies and targeted intervention policies as means of raising consumption. Work will also be initiated in collaboration with national institutions on studies to compare the consumption impact of alternative intervention policies under field conditions.

Other areas of planned research include evaluating the distributional consequences of agricultural policies in the Southeast Asia region. Emphasis will be placed on estimating the structure of demand for food and on measuring the impact of changes in rice prices and production on incomes and purchasing power of the poor. Special attention will also be directed to the potential role of cheaper substitutes for rice as components of the diet.

iv. Trade Policy

Most developing countries depend increasingly upon imported foodgrains, a dependence that is likely to grow in the next decade. Also, increased food insecurity as a result of weather fluctuations and trade policies designed to protect domestic food markets from changes in world supply and demand have meant greater price and supply variability.

Negotiations are currently being conducted under the auspices of UNCTAD/GATT (General Agreement on Trade and Tariffs) on a number of international agricultural policy issues, including international cooperation to stabilize prices in the grains market, trade liberalization, and market stabilization arrangements for agricultural export commodities.

The Trade Policy Program has focused its research efforts on these and related topics of immediate policy relevance, including:

1. agricultural export prospects for developing countries;
2. food security;
3. food aid studies; and
4. commodity market analysis.

Agricultural Export Prospects for Developing Countries

In January 1976, the Trade Policy Program inaugurated its research program by publishing *Commodity Trade Issues in International Negotiations.* This discussed various approaches to negotiating commodity trade arrangements and considered other international trade and monetary policies affecting the agricultural export earning potential of developing countries.

Potential of Agricultural Exports to Finance Increased Food Imports in Selected Developing Countries, a second report, which was published in August 1977, presented a brief description of the aggregate trade and payments picture and highlighted some of the economic pressures faced by many developing countries. The IFPRI study found that the problem of financing food imports may indeed become a barrier to adequate consumption in many countries and that the close relationship between food deficits and trade prospects cannot be understood without careful study at the country level.

Among the 28 representative countries selected for closer examination, the study found that for some low and middle income countries production variability poses a more serious problem than low growth rates. Furthermore, it concluded that income level is not necessarily a good indicator of whether or not a country will face foreign exchange constraints in meeting future food deficits.

Analysis of export performance disclosed that about half of the 28 countries had suffered a decline in the world market share of their principal agricultural exports. This indicates that domestic policies can be as important as world demand in determining a country's export success. The study analyzed the impact of one ex-

ternal factor on exports and trade liberalization. It concluded that even if trade barriers to agricultural products were completely removed in the Organization of Economic Cooperation and Development (OECD) countries, the relative gains for most of the countries studied would be slight.

Additional research is continuing on agricultural export prospects for food deficit developing countries. Related to IFPRI's larger effort in this area is the proposed collaboration with FAO on its Agriculture Towards 2000 project. FAO's Commodity Policy and Projections Service has requested that IFPRI analyze in greater detail the potential increase in agricultural exports that would result in the developing countries if tariffs and nontariff barriers were removed in developed countries by the year 2000.

One case study, "Growth Potential of the Beef Sector in the Economic Context of Latin America," analyzed growth potential of beef exports from developing countries under freer trade policies. This report, coauthored with a senior economist of CIAT, identifies the economic forces in beef production and in the domestic and export markets, and relates them to the need for future development in the context of tropical Latin America. The analysis concludes that a 50 percent reduction in OECD trade barriers could boost the value of beef and veal trade by 51 percent, increasing annual export revenues by US$ 406.1 million.

The report points to the dilemma policymakers often face when considering expanding exports of "wage goods" which are central to consumer diets, such as beef in South America. On the one hand, freer trade policy causes pressure on the cost of living and on domestic consumption, but has a positive impact on production and foreign exchange earnings. On the other hand, "cheap food" policy benefits consumers across all incomes, but reduces private investment and export growth.

IFPRI is also examining the generalized systems of preferences (GSP) established by the OECD to reduce tariffs on selected developing country exports. Data showing the trade value of all agricultural exports covered by GSP are being analyzed to identify production categories with particularly good potential for expansion.

Food Security for Food Deficit Developing Countries

The international community's responsibility for the food security of food deficit developing countries is one issue in the negotiation of a new International Wheat Agreement. In the event that a comprehensive price-stabilizing buffer stocks agreement does not occur, a more modest plan will be needed to alleviate the year-to-year food insecurity problem of food deficit developing countries. Researchers at IFPRI developed a food security scheme based on insurance principles that was designed to assist food deficit countries. The scheme is described in *Food Security: An Insurance Approach*, Research Report 4. The objective of the scheme is to permit these countries to stabilize cereal consumption within a range of projected demand at

relatively stable cost. This approach reflects IFPRI's belief that the food security needs of the poor in low income countries have to be met separately from the larger problems of dealing with instability in world grain markets. This instability often reflects the direct and indirect effects of the demand for grain to feed the livestock demanded by consumers in high income countries.

Two alternative schemes evaluated were (1) a compensatory financing mechanism and (2) a financing mechanism combined with a physical grain reserve. Under both, compensation from the scheme would be permitted whenever a developing country's cereal import bill exceeded a specified percentage of the trend import bill (e.g., 110, 120, 130 percent of trend). When the scheme includes grain stocks in addition to compensatory financing, grain would be released only during very high price years and only to countries experiencing a production shortfall of more than 5 percent during those years. Rules were specified so that a country could maintain at least between 95 and 100 percent of projected consumption in all years, depending upon the performance of its own cereal production.

Research shows that a scheme with both funds and stocks is slightly more cost-effective than a scheme with just funds. Also a scheme that includes stocks has the advantage of providing a supply guarantee to back up the financial insurance, and is likely to be preferred by potential developed country contributors. Without a physical reserve, the additional purchasing power acquired by developing countries could, in periods of particularly short supply, pressure developed countries to make politically unacceptable adjustments to their own domestic consumption or cause the scheme to fail because of the imposition of export controls. The physical reserve would also provide an outlet for surplus stocks that accumulate in certain developed exporting countries in low price years.

The analysis also showed that relatively low insurance coverage and relatively large stocks would make the best use of a given level of funds. (Including a grain reserve at a given level of funds also makes it more probable that the scheme will achieve its objectives.)

The expected cost of a scheme operating with a 20 million ton grain reserve covering food import costs in excess of 130 percent of trend is $2.6 billion in compensatory payments and $1.1 billion for the grain reserve over the next five years. This level of funding would assure at least a 75 percent probability of the scheme achieving its objectives. Additional funding of about $2.4 billion would increase this probability to about 90 percent.

A crucial component in the success of any food security scheme is the source and management of funds needed for its operation. With the proposed scheme, developing countries could make annual premium payments based on their expected withdrawals from the system. In practice, most low income countries could probably not afford to participate unless their payments were subsidized by developed countries. Developed countries could make their contributions bilaterally or through a multilateral mechanism. Donor countries could subsidize the premium payments of low income countries or make concessional food aid available to lower the cost of imports for recipient countries, thereby reducing the cost of their food security premiums. As an alternative, donors could pay the carrying costs of the reserves.

One potential means of funding could be through the compensatory financing facility of the International Monetary Fund (IMF), either by including cereal import expenditures in the IMF's existing compensatory financing facility for commodity exports or by creating a new facility.

One of the questions raised by IFPRI's analysis of an insurance approach to food security concerns the role existing grain reserves and food aid programs would play. If a new International Wheat Agreement is negotiated, grain reserve commitments by participating countries would affect the operation of a food insurance scheme in high price years. Even without an agreement, the presence of reserve stocks held unilaterally in certain developed countries would have to be taken into account. Furthermore, negotiators are considering incorporating countercyclical food aid commitments in a new Food Aid Convention. If such commitments are agreed upon multilaterally, or are incorporated into the bilateral food aid programs of major donor countries, they too will affect the level of food insurance required by certain developing countries and the method of operation of the scheme. How these policies can be effectively integrated is another subject of IFPRI's research.

The concept of food security is also being refined. Variability of domestic cereal production is only one measure of food insecurity; and for several developing countries it is an inadequate one. IFPRI is developing a single quantitative measure of food insecurity by incorporating the following variables:

1. degree of food self-sufficiency;
2. patterns of domestic food consumption and degree of substitutability between cereals and noncereals during shortages;
3. breakdown of the variability in the food import bill attributed to fluctuations in domestic production and in world prices;
4. size of the food import bill in relation to the availability of foreign exchange in country; and
5. relationship between the variability in the food import bill and the overall balance of trade and capital flows.

A taxonomy of country situations based on such a single measure could aid in assessing how a country's food security is affected by changes in the external environment.

Food Aid

The World Food Conference recommended a collective minimum food aid target of 10 million tons of grain a year for donor countries based on their past performance and on an assessment of probable food aid requirements in the crisis year 1973-1974. A more realistic basis for assessing food aid requirements will be needed if the concept of minimum food aid target is to be taken seriously by donor countries.

In 1978, IFPRI reported preliminary findings from a comprehensive analysis of food aid in "Programming United States Food Aid to Meet Humanitarian and De-

velopmental Objectives," a paper that was contributed to a larger Brookings Institution study assessing U.S. development assistance strategy. The paper noted that food aid of more than 70 million tons a year would have been needed in 1975 to close the calorie gap in 49 countries designated as needy by international agencies. Annual U.S. food aid flows since 1973 have been less than one-tenth that amount. Moreover, the report found little relation between individual country calorie needs and actual levels of past food aid, with as much as a third of all cereal food aid in 1971-1975 going to countries classified as middle income or oil exporters.

The analysis also stressed the need for assuring that food aid would be used as a tool to increase domestic production, and not as a disincentive to domestic production, so that food aid could eventually be phased out.

The Trade Policy Program will continue to work on establishing statistical criteria to identify the portion of the calorie gap that food aid can effectively fill. In addition, the program is assessing the impact of food aid as a resource transfer which affects trading patterns of recipient countries.

Future Work

Structure of international commodity markets

IFPRI is studying the international marketing systems of rice and wheat. An analysis of the international rice market is forthcoming, and additional work on other aspects of the rice trade are planned.

National trade policies

IFPRI plans country-level research on agricultural trade policy options regarding pricing, stocks, and international trade. In collaboration with the Trends Analysis Program, a classification for food deficit countries will be developed based on the general economic conditions of a country and its growth prospects for the next decade.

As part of the joint IFPRI/IRRI/IFDC study on rice policy in Southeast Asia, the Trade Policy Program will focus on the ASEAN countries' domestic trade policies for rice and their interaction with the world rice market.

IFPRI has also begun an analysis of trade policies for agriculture in Colombia, which it is working on in conjunction with the University of Los Andes. Other future work includes study of the relationship between developed country farm policy and developing country food supplies.

v. Agricultural Development Strategy

Agricultural Growth and Economic Growth

Most of the world's population is still living in countries that are largely rural. Economic development of these countries depends on agricultural development which, in turn, depends on agricultural policies that are geared toward development. Because the interdependence of agriculture and the rest of the economy is explicit, IFPRI is analyzing the relationship of agricultural growth to overall economic growth.

The purpose of the analysis is to define empirically the relationships between agriculture and the rest of the economy as development proceeds. Establishing these

relationships makes it possible to trace the quantitative contribution of variables to the growth of the two sectors of the economy, as well as their terms of trade and the factor prices that could be paid in the two sectors. Several of the variables studied include technical change of various forms, saving rates, demand parameters, and rate of population growth.

The model is both empirically and policy oriented. It is possible to fit the model to country data and evaluate quantitatively either the role actually played in economic development by certain variables or the consequences that various policy measures would have had on the development of the economy.

The model is unique in that it takes account of the fact that resource allocation takes time. Furthermore, the rate of allocation is determined within the system by economic variables. This process can be used to describe the migration of labor and the flow of savings from agriculture to the rest of the economy with empirically estimated labor migration and savings flow equations.

Integrated into the model, these equations in turn reflect the way the intersectoral flow of resources shapes growth in agriculture and the rest of the economy. Using Japanese data yields with the model, it was concluded that the flow of savings out of agriculture did not contribute signficantly to Japan's overall growth, in contrast to a view commonly expressed in the literature. Labor migration was found to be far more important.

The model, which was originally written for a closed economy, is being expanded to allow for foreign trade. Because Argentina provides a good historical example of a country that is heavily dependent on trade and that has also alternated its trade policies, the new version will use Argentine data. The comparison should provide some insight into the importance of physical resources in economic growth since Japan, poor in resources, realized a spurt in growth while Argentina, rich in physical resources, has been largely stagnant.

In the future, IFPRI plans to apply the model to other countries to analyze specific policy issues.

Government Expenditures in the Agricultural Sector

A study of government expenditures in the agricultural sector has been recently initiated by IFPRI. The purpose of this research, the need for which became clear as a result of the investment study referred to earlier, is to develop methodology for the analysis of the interaction between total expenditure and expenditure on agriculture. The study, which will be undertaken in nine Latin American countries for the period 1950-70, will measure government expenditures in agriculture for research and extension; irrigation; health, education, and housing; new inputs subsidies; electricity; transportation; marketing; and new lands.

3. Information Services

The major objective of IFPRI's Information Services Program is developing continuing information exchange links with policymakers, administrators, and national and international leaders in and out of government in developed and developing countries and to publicize and increase understanding of food policy alternatives at the national, regional, and international level. In order to accomplish these objectives, the Information Services Program works closely with IFPRI's research programs.

A first priority of the Information Service Program is to identify and reach a core of individuals who, because of their positions, make or influence policy decisions related to food and agriculture. These include national and international leaders and go beyond officials of such government ministries as agriculture, finance, planning, or commerce. The Information Service Program tries to make available relevant information on food policy issues and progress in their solution. IFPRI is accomplishing this goal through its publications and its work with national and international research and technical assistance organizations.

For example, IFPRI's estimates of future food needs have been utilized substantially by the Second Asian Development Survey carried out under the auspices of the Asian Development Bank, by the World Food Council, by the World Bank in its *World Development Report*, and by numerous national and private agencies. The estimates of investment requirements to achieve accelerated food production growth rates have been used to provide support for the World Food Council's statement of resource needs. The food security work has been examined by the World Food Council and the International Wheat Council. At the special session of the TAC of the CGIAR held in Nairobi in June 1978, IFPRI's analysis of research allocations was a central point of discussion. The Institute's analysis played a major role in the 1977 deliberations of the United Nations Protein-Calorie Advisory Group. The food aid study was incorporated in the Brookings Institution's report on foreign assistance to President Carter and in a special PL 480 task force report. IFPRI staff members attend the FAO Food Security and Food Aid Committee meetings, where they are able to report on the Institute's research and obtain insights to guide future research in useful directions. IFPRI is providing extensive analysis to the World Agrarian Reform and Rural Development Conference, on whose Advisory Panel the Director sits. A major paper based on IFPRI's research was prepared for the Brandt Commission, to which the Director made a major presentation on food policy. The Trends Analysis Program is working with FAO and USDA to improve the usefulness of the aggregate data base for food production trends, while the Trade Policy Program is using its model for analysis of trade liberalization in support of FAO's Agriculture Towards 2000 project.

The second priority of the Information Services Program is to develop a continuing seminar and workshop series to bring together policymakers to discuss key issues and policy alternatives and actions. In addition to promoting the overall objectives of the Information Services Program, these meetings encourage feedback from members of the target audience that helps IFPRI analyze and evaluate changing policy issues and alternatives.

During 1978 IFPRI sponsored a series of seminars that were based largely on ongoing research. These included discussions on insuring food security for developing countries; the impact of subsidized food consumption on nutrition in Kerala; Brazil's minimum price policy and the agricultural policy in India and their implications for growth and social justice; research constraints to rice yields in Asia; Indian price policy; a framework analysis for food policy in Nigeria, trade and sectoral growth in Argentina; aspects of agricultural marketing in Thailand; and criteria and approaches to the determination of priorities for agricultural research.

An international conference cosponsored with CIMMYT was held at CIMMYT headquarters in Mexico in November 1978. Food security as a problem of developing, food deficit countries with severe trade constraints was explored on the basis of research conducted by IFPRI's Trade Policy Program. The conference discussed, as the primary objective of food security, holding year-to-year variations in food consumption to acceptable levels while avoiding excessive investments in stocks by countries that can least afford them.

The conference attempted to clarify the issue of food security, identify sources of insecurity, assess the magnitude and nature of the problem in different country situations, and explore possible solutions to the problem within economic and political realities.

Participants included researchers and policy advisors in developing and developed countries, along with individuals involved in formulating policy at the country level and in international organizations.

A further important objective of the Information Services Program is to meet the information needs of IFPRI's own research staff, whose interests and activities are constantly changing and growing. The library resource center is being developed to bring together information from various sources in order to provide up-to-date information largely through periodicals and research reports from other institutions dealing with food policy, economic development, and other related issues. A news clippings service to abstract newsworthy developments on food policy, including coverage of IFPRI's research, was also provided to IFPRI staff in 1977.

To improve internal communication, the Information Services Program publishes *Inside IFPRI,* a weekly newsletter. It will soon publish a news bulletin, *IFPRI Reports,* to inform the members of IFPRI's audience about ongoing and planned research; IFPRI publications, seminar activities, conferences, cooperative relationships between IFPRI and other institutions; matters of interest related to IFPRI's staff and Board of Trustees; and timely food policy issues or other features of broad interest.

In 1977, IFPRI began to develop links with the news media to establish itself as a reliable source for verifying and providing information about food policy and related issues. During the year IFPRI had papers published in the *PAG Bulletin* of the Protein-Calorie Advisory Group of the United Nations System, *Christian Science Monitor, Business Week, New York Times, The Review of Economics and Statistics,*

Economic Development and Cultural Change, American Journal of Agricultural Economics, Journal of Development Economics, and *Ceres.*

In addition, the Information Services Program staff responds to public inquiries, arranges briefing sessions for interested people and groups, and helps establish and maintain information links with other institutions.

4. Statistical Services

For much of its analytical base IFPRI relies on the data collected by FAO, the United Nations Economic and Social Department, the World Bank, IMF, USDA, and other regional and national organizations in developing and developed countries dealing with food and related issues. These statistics, which are acquired in the form of tapes and computer printouts, form the core of IFPRI's data library and are supplemented by data obtainable from the various publications available in IFPRI's regular library facilities. They will continue to provide a major input to the Institute's projections work and research programs.

FAO country data on agricultural production, trade, and food balances constitute a major part of IFPRI's data library. The production series starts from 1961, while the trade series begins with 1970. FAO food balance sheets include the 1972-1974 averages on the consumption of calories, protein, and fats from different food items. USDA time series data form another large component of IFPRI's data collection. The country statistics on production and supply are complemented by data on supply utilization, which has made the USDA data set convenient for purposes of production and consumption projections. However, the commodity coverage of USDA data is limited to cereals and a few selected export crops. Among other items of country information in IFPRI's data library are U.N. population estimates and projections, GNP estimates and balance of payments statistics from the World Bank and the IMF, and fertilizer data from the Tennessee Valley Authority and IFDC. As a service to the research community, IFPRI has been sharing these data with other research institutions and individuals.

In support of studies on specific countries and groups of countries that are planned by IFPRI's research programs, the data library has country-specific information which IFPRI research staff members brought when they joined the organization. This will continue to be expanded to include more detailed data on developing countries acquired from national and regional sources. IFPRI's cooperative research programs with the International Agricultural Research Centres, and national research and development institutions and universities can be expected to provide a growing volume of up-to-date primary information to supplement that entering the data library from its present sources.

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Valdes, A. and Huddleston, B., "Assessing Food Insecurity in Developing Countries"; presented at IFPRI/CIMMYT International Food Security Conference, Mexico, November 1978; to be published in forthcoming conference proceedings.

—and Nores, G., "Growth Potential of the Beef Sector in the Economic Context in Latin America"; Fourth World Conference on Animal Production, Buenos Aires, August 1978.

Personnel

(As of December 1978)

Administration

J. W. Mellor	Director	P. Critchlow	Secretary to Director
P. Oram	Deputy Director		
M. P. Rafferty	Director for Administration	S. Bunjun	Research Assistant
		K. Michael	Research Assistant

Research

Trends and Statistics

L. Paulino	Program Director	R. Donaldson	Senior Programmer
K. Bachman	Consultant		
B. Stone	Visiting Researcher	V. Bindlish	Research Assistant
P. Tillman	Coordinator of Statistical Services	P. Tseng	Research Assistant

Distribution

J. Gavan	Program Director	S. Kumar	Research Associate
P. S. George	Research Fellow	R. Fox	Visiting Researcher
I. Sri Chandrasekera	Research Associate	S. Stefanou	Research Assistant

Production

D. Narain	Program Director	V. Elias	Visiting Researcher
R. Ahmed	Research Fellow	F. Idachaba	Visiting Researcher
G. Desai	Research Fellow	Y. Mundlak	Visiting Researcher
G. Alibaruho	Research Associate	J. S. Sarma	Visiting Researcher
S. Roy	Research Associate	S. Mehra	Visiting Researcher
J. Zapata	Research Associate	K. Nguyen	Research Assistant

Trade

A. Valdes	Program Director	J. McIntire	Research Associate
B. Huddleston	Research Fellow	V. Ramangkura	Research Associate
A. Siamwalla	Research Fellow	E. Harris	Research Assistant
J. Garcia	Visiting Researcher	J. Hayssen	Research Assistant
P. Konandreas	Research Associate	T. Hobgood	Research Assistant

Information Services

C. McVicker	Director of Communications	B. Barbiero	Editor
		J. Voorhees	Research Assistant
P. Klosky	Librarian		

Financial Statements

RAYMOND E. LANG & COMPANY
CERTIFIED PUBLIC ACCOUNTANTS

904 CHEVY CHASE LAKE BUILDING
8401 CONNECTICUT AVENUE
WASHINGTON, D. C. 20015
(301) 654-4900

February 3, 1978

Officers and Trustees
International Food Policy Research Institute
1776 Massachusetts Avenue, N. W.
Washington, D. C. 20036

We have examined the accompanying statement of assets, liabilities and fund balance of INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE as at December 31, 1977 and the comparative statement of revenue and expenses for the years ended December 31, 1977 and 1976 arising from cash transactions (as adjusted for depreciation).

Our examination was made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the statements mentioned above present fairly the assets, liabilities and fund balance of INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE as at December 31, 1977 and the revenue and expenses arising from cash transactions (as adjusted for depreciation) for the years ended December 31, 1977 and 1976.

R E Lang & Co

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
STATEMENT OF ASSETS, LIABILITIES AND FUND BALANCE
as at December 31, 1977
(arising from cash transactions adjusted for depreciation)

ASSETS

Current Assets:		
American Security & Trust:		
Checking account	$380,340	
Savings account	36,525	
Petty cash	134	
		$416,999
Fixed Assets:		
Furniture and equipment	$111,081	
Leasehold improvements	6,359	
Library	2,080	
	$119,520	
Less—accumulated depreciation	44,149	
		75,371
Other Assets:		
Miscellaneous advances		5,343
TOTAL ASSETS		$497,713

LIABILITIES AND FUND BALANCE

Liabilities:		
Employees' tax withholding		$ 1,222
Fund Balance:		
Balance January 1, 1977	$604,273	
Less—excess of expenses over revenue for the year ended December 31, 1977	(107,782)	
		496,491
TOTAL LIABILITIES AND FUND BALANCE		$497,713

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
COMPARATIVE STATEMENT OF REVENUES AND EXPENSES
For the Years ended December 31, 1977 and 1976
(arising from cash transactions as adjusted for depreciation)

	1977	1976
Revenues:		
Grants	$ 950,929	$1,155,246
Reimbursement of expenses	99,978	4,980
Investment income	23,390	30,019
Contributions	1,350	3,523
	$1,075,647	$1,193,768
Expenses:		
Salaries	$ 606,412	$ 311,996
Employee Related Costs:		
Employee benefits	$ 139,576	$ 70,182
Staff travel	34,626	21,534
Recruitment and relocation	18,071	76,947
	$ 192,273	$ 168,663
Consulting Services and Contracts:		
Outside consultants	$ 97,116	$ 59,183
Contract research and individual awards	34,203	22,399
Trustee meetings	32,096	38,088
	$ 163,415	$ 119,670
Office Operation:		
Rent	$ 71,308	$ 58,095
Equipment rental	45,285	19,712
Office supplies and expenses	25,542	15,811
Telephone and telegraph	16,233	10,425
Professional fees	12,228	13,842
Printing	9,580	2,446
Dues and publications	9,341	6,643
Outside services	5,370	638
Business meals and conferences	3,421	2,031
Insurance	2,008	1,455
	$ 200,316	$ 131,098
Total Cash Expenses	$1,162,416	$ 731,427
Depreciation	21,013	18,068
	$1,183,429	$ 749,495
EXCESS OR (DEFICIT) OF REVENUE OVER EXPENSES	$(107,782)	$ 444,273

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
NOTES TO AUDIT REPORT
December 31, 1977

NOTE A. Organization and Summary of Significant Accounting Policies:

The International Food Policy Research Institute was organized as a District of Columbia non-profit, non-stock corporation on March 5, 1975. As of May 27, 1977, it received a ruling from the Federal Internal Revenue Service that it is an organization exempt from Federal Income Tax under Sec. 501(c) (3) of the Internal Revenue Code and that it is a publicly supported organization to which contributions are deductible by other individuals and organizations.

During 1977, the Institute received from International Development Research Centre, Ottawa, Canada, the amount of Can. $525,000—U.S. $484,315, bringing the total received to date of Can. $1,650,000 of Can. $2,250,000. A grant of $230,000 was received from the Rockefeller Foundation, New York City for general support in 1977 and a grant of $300,000 for support in 1978 is forthcoming. A Ford Foundation grant of $230,000 for core budget support was made during the year.

NOTE B. The Institute occupies office space under a lease expiring August 31, 1982 at an annual rental of $67,230 plus pro-rata share of increases in building operating costs. Additional space was acquired under a sublease for $21,438 annually which expires September 30, 1980.

NOTE C. Depreciation is provided at the rate of 20% per annum on the furniture and equipment and over the life of the lease for the leasehold improvements.

NOTE D. The Institute is purchasing retirement annuity contracts for employees under agreement with the Teachers Insurance and Annuity Association and the College Retirement Equities Fund. The cost was $72,283 for 1977.

IFPRI Financial Summary – 1978

Revenue	Estimated 1978
IDRC	$ 854,204
Rockefeller Found.	307,084
Ford Foundation	307,084
Contracts, Investment Income, etc.	117,882
Total	$1,586,254
Expenditures	
Personnel Costs	$1,178,490
Staff Travel	38,550
Publications, Conferences, Library	63,578
Statistical Serv.	69,681
Capital Expenditures	29,046
Space Rental	89,385
Administrative Costs	133,550
Payment to Working Capital Funds	—
Total	$1,602,280
Surplus (deficit)	($ 16,026)
Working Capital Fund Balance	$ 160,252*

*Balance in working capital fund as of December 31, 1977 was $176,278.

International Food Policy Research Institute
1776 Massachusetts Avenue, N.W., Washington, D.C. 20036

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

IFPRI

REPORT 1979

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John W. Mellor, Director
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*Retired September 1979

†Elected January 1980

IFPRI REPORT 1979

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

CONTENTS

INTRODUCTION

The International Food Policy Research Institute's (IFPRI's) induction into the Consultative Group on International Agricultural Research (CGIAR) in November 1979 was a significant milestone in its development. It reinforces IFPRI's interaction with institutions at the forefront of the technological change so vital to food production growth. In addition, it formalizes the international status of IFPRI—already evident in the large Third World representation on our Board of Trustees and senior research staff—and stabilizes and broadens the financial base of the Institute. We were particularly grateful that our first financial year as a member of this consortium coincided with the initial contribution of the government of the Philippines to the CGIAR, permitting IFPRI to become one of the first recipients.

In 1979 the flow of research results began to reach full force, with nine Research Reports published compared to two in each of the preceding two years. The flow was particularly substantial on problems of food distribution, consumption, and nutrition. 1980 should see a surge of published results from the rapidly expanding production program.

As the pace of research accelerated, the task of integrating specialized research into an effective set of policy recommendations became a primary concern, leading the Institute staff to examine carefully the relationships between research and policy. Four major policy thrusts were delineated, focusing on overall food balances, food security, development strategy, and production policy. In addition, a regional thrust on rice policy in Southeast Asia was undertaken in cooperation with the International Rice Research Institute (IRRI), the International Fertilizer Development Center (IFDC), and several national institutions.

The objective of the thrust on **national and international food imbalances** is to identify major food policy issues affecting food supplies in developing countries and to suggest the roles domestic food production and consumption policies, trade, and foreign assistance should play in dealing with those problems.

As accelerated economic growth and high population growth rates increase food demand in developing countries, the food situation will tighten. Some countries will be able to import large quantities of food, making supplies less available for countries with poor export performance. This will divert income away from the poorest people, adversely affecting their nutritional status, unless countered by deliberate measures at national and international levels. The increased demand for livestock products and the derived demand for grain are a part of this problem.

The four major questions that arise from this situation are reflected in most of the Institute's research projects. First, how large will the gap between domestic production and consumption be and which countries will face the most serious shortages? IFPRI's prior work on projections is being extended in time, the country and commodity coverage enlarged, and particular attention is now being given to the livestock and feedgrain components.

Second, how much will growth rates in agricultural production increase? Research to measure the potentials for production growth is under way, using statistical analysis to detect early changes in production trends.

Third, to what extent can commercial trade and foreign aid close the expected gaps in food supplies? IFPRI seeks to determine what domestic steps may be taken to lessen the food deficit for various classes of countries and what amounts and kinds of external aid will be needed.

Finally, given the likely changes in production and trade, what adjustments in consumption patterns may be expected? This involves analysis of the relationships between income, prices of food, and nutritional status.

In view of the broad scope of the work of FAO and other international organizations, IFPRI's research is concentrated on specific, narrowly defined aspects of these problems.

The aim of the **food security** thrust is to define the short- and long-run policies needed to ensure secure, adequate, and stable food consumption for all people, recognizing that although lack of income and fluctuating supplies make this primarily a problem of poor people, it also has broad implications for overall political and economic stability and growth.

Projects directed to policies for food security include research to examine the means of channeling food supplies to the malnourished, including food and employment subsidies and various employment linkages. Researchers are studying the actual effects on nutrition of different interventions. Various international schemes for increasing food supplies and subsidizing costs are being examined, and research has begun on the extent of supply instability, the effect of technological change on stability, and various mechanisms for reducing supply fluctuations.

The **development strategy** thrust studies ways to attain food policy objectives. It considers the impact of growth in agricultural productivity on overall economic growth, the nature of the linkages between agriculture and other sectors, and the regional income and employment effects. This analysis will point to appropriate strategies for agricultural growth, employment, and food consumption.

IFPRI's research on development strategies has taken four directions: to model processes of growth to emphasize linkages between sectors so that the stimulus of one sector on another can be more clearly understood; to determine what portion of national budgets should be directed to increasing agricultural productivity; to examine how spending patterns influence the employment and food consumption linkages and how policy may affect those patterns; and to understand the role that production growth plays in the growth of employment and the transfer of income from one sector to another.

The **agricultural production policy** thrust, in seeking alternatives for accelerating agricultural growth, will diagnose policy needs for gearing institutions and infrastructure in such a way that essential inputs are provided, and the benefits are reaped by the poorer segments of the population. Large increases in purchased inputs, particularly fertilizer and irrigation, are generally necessary to increase production substantially.

Our research in this area addresses three problems. How best can agricultural research resources be allocated to foster technological change? What encourages the use of fertilizer? What investments in water resources are most effective?

In the area of regional and national policies, the rice policy research project is examining a number of policy measures as they affect the demand, supply, and trade of the most important food commodity in the four Southeast Asian countries comprising (with Singapore) the Association of Southeast Asian Nations (ASEAN): Indonesia, Malaysia, the Philippines, and Thailand. The questions raised are: What are the costs and benefits to the country and to various groups within it of alternative policy measures designed to achieve a given shift in the demand or supply of rice? What are the effects of various measures on the variability of rice supplies in the country? What is the nature and magnitude of the resource

flow between the rice and nonrice sectors?

The first phase of the rice research project was largely completed in 1979. Work on the second phase has begun. Activity for both phases has relied extensively on a network of scholars from within the region as well as researchers from IFPRI, IRRI, and IFDC, who are the cosponsors of the project. The cost in finances, time of senior IFPRI staff, and of researchers and administrators in the ASEAN countries has been considerable, but the research is already proving highly productive, both in its own right, and as a model for IFPRI research elsewhere.

The capacity of IFPRI's researchers to examine problems of agricultural development through a wide-angle lens is utilized from time to time by other international agencies. The Brandt Commission Report for which IFPRI provided the major effort on agriculture was published in 1979. Also, IFPRI provided leadership in the International Fund for Agricultural Development's broad analysis of Nepal. Both activities illustrated the importance of conceptualizing operational problems as a basis for policy recommendations.

IFPRI also made a substantial contribution to the International Conference on Agricultural Production, Research, and Development Strategies for the 1980s in Bonn, sponsored by a number of West German government agencies. IFPRI's input consisted of providing, in conjunction with the Water Resources and Marine Sciences Center of Cornell University, a state-of-knowledge paper on water resource development. IFPRI also provided the rapporteur for the water resources discussions and a plenary paper for the conference.

Thus IFPRI has built solidly in five areas in 1979—finances, research project output, orientation to policy, productive collaboration with colleagues in developing countries, and application of its research to contemporary problems. 1980 should see the senior research staff expanded, the policy thrusts delineated more fully, and initial results from collaborative research published. With each successive year we embark on the next with an increased enthusiasm derived from a growing understanding of the key food policy problems and the world's capacity to meet those problems.

John W. Mellor

TRENDS AND STATISTICS PROGRAM

IFPRI's Trends and Statistics Program conducts research to determine the potential size of the food problem in the decades ahead. By analyzing and projecting the historical trends of food production and consumption in the developing countries, it is possible to determine where and to what extent serious food gaps are likely to occur, thus providing policymakers in developing and industrialized countries with advance indications to guide them in dealing with these impending problems.

FOODGRAIN AND LIVESTOCK PROJECTIONS

The major activity of the Trends and Statistics Program has been to analyze past trends and to formulate long-term projections of production and requirements for cereals and other major staple food crops in Third World countries. The program's present effort is the third in a continuing and progressively expanding series of such studies. It will extend the projections of the previous studies from 1985 and 1990 to the year 2000. In addition, the current analysis differs from the earlier ones in several ways. The number of developing countries in the analysis has been increased to include those other than the market economies, specifically the People's Republic of China and centrally planned economy countries of Southeast Asia. Plantains and bananas have been added to the commodity coverage. Because the Food and Agriculture Organization of the United Nations (FAO) supplies more complete coverage of noncereal staples, the data source has been changed from the U.S. Department of Agriculture (USDA) to FAO.

In order to produce a more comprehensive assessment of future food needs in the developing countries, the People's Republic of China has been included in this study. The Chinese data was provided through two separate studies, one examining China's past food production and consumption trends and the current projection for the year 2000, and another exploring the likelihood of the country's achieving its medium-term grain targets. The first study "Food and Agriculture in China: Trends and Projections, 1952-77 and 2000," reviews China's overall development strategy and the role the Chinese agricultural sector had in that strategy from 1952 to 1977. Based on this review, the study projects the aggregate food supply/demand balance for the year 2000. Assuming that the present pragmatic agricultural policies continue, it suggests that expected increases in food production and planned levels of food imports will meet the elemental nutritional needs of the Chinese people through the year 2000. The second study, "China's 1985 Foodgrain Production Target: Issues and Prospects," analyzes China's foodgrain goals in light of past performance, production and input growth, and current policies. It also discusses the policies needed to assure the achievement of the 1985 goal. It concludes that the 1985 target to produce about 400 million metric tons of grain is possible, but indicates clearly the immense effort necessary to accomplish that objective.

Another supporting study under way in the Trends and Statistics Program will project the production and consumption of meat and other livestock products in the

developing countries. This analysis will link trends in the growth of livestock production with those shown by the growth in demand for livestock and poultry feed. The first phase of the study will analyze the production and consumption trends for beef, poultry, and other livestock products. The second phase, part of which may continue into 1982, will deal with the relationships between the demand for feed and livestock production levels.

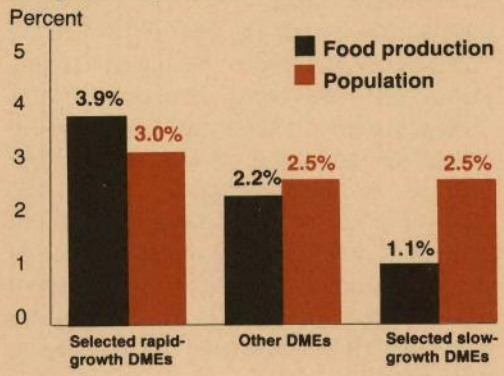
ANALYZING PRODUCTION GROWTH

The Trends and Statistics Program is not only concerned with existing and potential food problems, but with the sources of growth in food production as well. During 1979 IFPRI published the report of a completed study of the developing countries that had high food output growth rates between 1961 and 1976. *Rapid Food Production Growth in Selected Developing Countries: A Comparative Analysis of Underlying Trends, 1961-76,* Research Report 11, by Kenneth Bachman and Leonardo Paulino, identifies 16 developing countries with growth rates of 3.3 percent or more a year that substantially exceeded their average population increase of 3.0 percent a year and the production increase in the developing countries as a whole of 2.6 percent a year (see Figure 1). In most cases, the dominant staple food crops contributed the major increases of food output in the countries studied. Specifically, maize accounted for 28 percent; wheat, 24 percent; and rice, 19 percent. Although the growth of food production in these countries was rapid, their food imports increased at a much faster rate. While staple food crop production increased by 58 percent between 1961-65 and 1974-76, net staple food imports rose by 133 percent. (A comparison of changes in food imports and exports is shown in Figure 2.)

In more than one-third of the 16 countries, food production increased primarily because of the gains made in crop yields per hectare, whereas in another third of the group, more harvested land was the major cause of increases in food output. Higher yields and more harvest area, in about equal measure, spurred the growth of food production in the remaining countries. According to the study, improvements in crop yields were achieved through different combinations of new technology, including the increased use of improved seeds, fertilizers, irrigation, and farm machinery. Increases in harvest area occurred with the opening of new lands, more intensive use of cultivated areas through multiple cropping, and by mechanizing farm operations. "The experiences of the rapid-growth countries clearly indicate that no single factor or small group of factors can be specifically prescribed to attain rapid growth in food production," the study concludes.

Figure 1

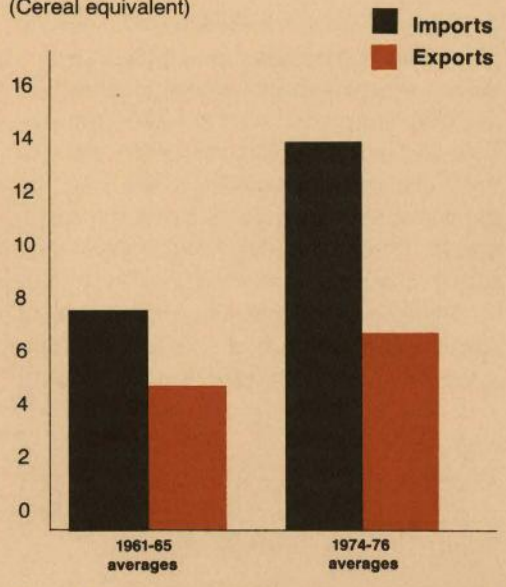
Percent increase in food production and population growth rates in selected developing market economy (DME) countries, 1961-76



Source: Based on data in Kenneth L. Bachman and Leonardo A. Paulino, *Rapid Food Production Growth in Selected Developing Countries: A Comparative Analysis of Underlying Trends, 1961-76,* Research Report 11. (Washington, D.C.: IFPRI, 1979), p. 39.

Figure 2

Imports and exports of major staple foods in 16 rapid-growth countries, 1961-65 and 1974-76 averages



Source: Based on data in Kenneth L. Bachman and Leonardo A. Paulino, *Rapid Food Production Growth in Selected Developing Countries: A Comparative Analysis of Underlying Trends, 1961-76,* Research Report 11 (Washington, D.C.: IFPRI, 1979), p. 39.

COLLECTING AND COMPARING DATA

The Trends and Statistics Program undertook two other projects during 1979. In the program's 1977 assessment of the world food situation, differences were observed in the crop production and trade estimates published by USDA and FAO. A study examined these differences as part of the program's continuing effort to improve the data base used in IFPRI's gap analysis. The comparative study, which included production data of the major staple food crops covered in the gap analysis and data on traded cereals, calculated the relative differences between the country figures and their aggregates, using the FAO estimates as a basis. The results of this work, which will be published in 1980, will be helpful to researchers who use these two major sources of international agricultural data.

Over the years IFPRI has collected and generated data related to food policy. During 1979 the Trends and Statistics Program began to compile and organize these data on a country basis for the use of the IFPRI research staff. Trends and relationships between variables, derived from the data, will be presented in a "facts book" to be published in 1980.

PRODUCTION PROGRAM

Policies designed to increase food production need to be viewed in the wider setting of overall development strategies. Research in the Production Program has expanded from initial efforts to estimate the investment and input requirements needed to increase food production in low-income countries to recent efforts that take into account the scarcity of available resources and the conflicts that can result when attempting to increase production, reduce instability, and promote equity simultaneously. Work in the program covers three broad areas: specific production policies focused on key inputs for accelerating production growth, production strategies, and linkages between agriculture and the rest of the economy in the process of growth.

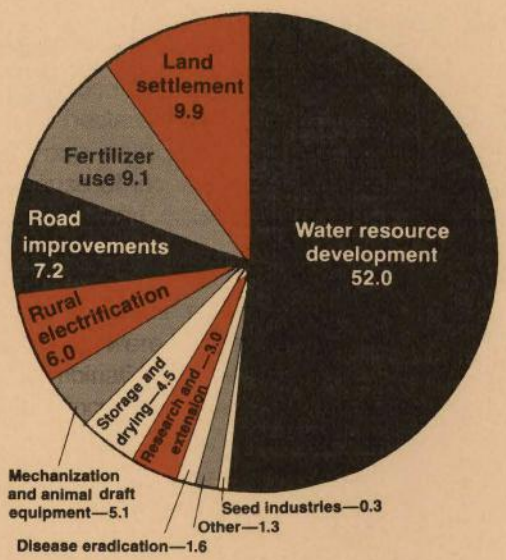
PRODUCTION GROWTH

The initial effort, a major study delineating the requirements for accelerating food production in 36 developing countries during the next decade, was completed and published in 1979. The study *Investment and Input Requirements for Accelerating Food Production in Low-Income Countries by 1990,* Research Report 10, by Peter Oram, Juan Zapata, George Alibaruho, and Shyamal Roy, found that a $100 billion investment would be needed to boost food production to a 4 percent annual rate of growth in 36 developing countries. As Figure 3 indicates, almost half of this investment would go for water resource development. The study points out that meeting increased food demand will require measures tailored to the specific needs of each country. Few countries will be able to meet production needs simply by expanding cultivated areas. Therefore, most will need to increase yields and cropping intensities on areas already under cultivation.

Because the developing countries do not have the resources for such a massive increase in investments in irrigation, fertilizers, and improved seed, as well as transportation, rural electrification, and disease control, a significant portion of the resource requirements will have to be met through greater financial assistance by developed countries.

In addition to highlighting the need for a sizable increase in aid, this study raises the question of what efforts the developing

Figure 3
Capital costs of increasing food crop production in 36 developing countries by 1990 ($ billion)



Source: Based on data in Peter Oram, Juan Zapata, George Alibaruho, and Shyamal Roy, *Investment and Input Requirements for Accelerating Food Production in Low-Income Countries by 1990,* Research Report 10 (Washington, D.C.: IFPRI, 1979) p. 15.

countries themselves are making to step up agricultural growth. In response to this, the Production Program initiated research on the developing countries' budgetary allocations to agriculture. Work in the first phase of the study is focused on nine South American countries. Subsequently, it will be expanded to other regions.

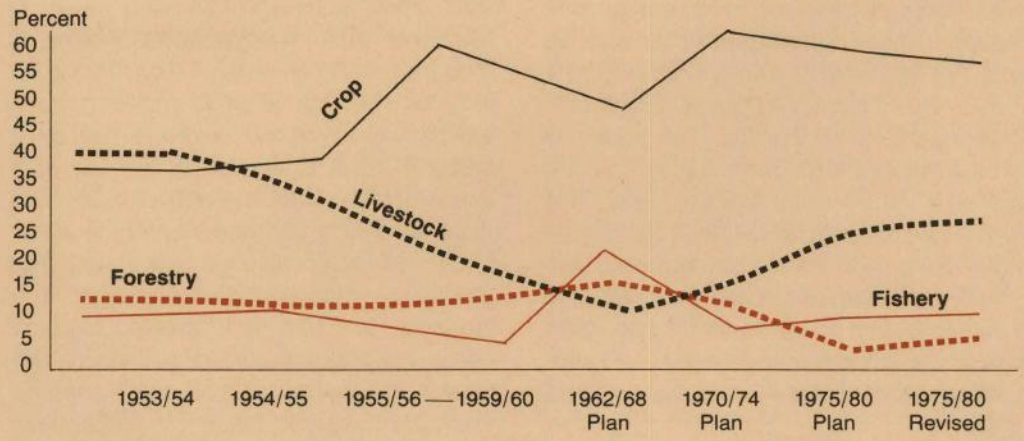
The investment study also pointed to the need to intensify research in three inputs vital to increasing production: agricultral research, crucial for shifting the production functions upward; irrigation, the most important item of fixed investment; and fertilizer use, which must be greatly increased if production growth is to be speeded up.

AGRICULTURAL RESEARCH

In papers prepared for the 1977 and 1978 meetings of the CGIAR, IFPRI identified future research and training needs in developing countries and the national and international centers most appropriate for carrying out the work. These studies are being expanded to include a discussion of the areas with major research problems, the resources that have been committed by developing countries for research, the amount of aid international organizations need to donate to national research groups, and the work that needs to be initiated or continued by international organizations. More detailed analyses of national systems in selected developing countries are planned to supplement this work. For example, agricultural research policies in Nigeria were examined at length in a study completed this year. Nigeria, whose problems are common to other developing countries, is plagued with soaring food imports and an inability to grow enough food to meet demand, despite an apparently good resource base for doing so. Although it has an established research network, production growth has been slow.

The study reviews the history and achievements of agricultural research in Nigeria and the allocation of research resources regionally; among food and export crops, livestock, forestry, and fishery activities (see Figure 4); and between rainfed and irrigated agriculture. It identifies

Figure 4
Share of federal allocation for agricultural research, Nigeria, selected years



Source: Based on data in Francis Sulemanu Idachaba, "Agricultural Research Policy in Nigeria," Research Report 17 (Washington, D.C.: IFPRI, forthcoming.)

Nigeria's major research needs—funding, staff, and equipment—and compares these to available capabilities, outlining Nigerian political and economic policies that affect the research effort. It points out that, although the agricultural sector is of major importance in Nigeria's national economy, allocations to agricultural research have been reduced drastically in the last 20 years. The study makes several policy recommendations that may be useful to other countries. It suggests that funding for agricultural research should be a joint federal and state responsibility, that new initiatives be made in such areas as farm labor and mechanization, and that institute and university research be integrated.

IRRIGATION AND FERTILIZER

A study primarily concerned with irrigation was begun as a part of the collaborative Southeast Asian rice policy project described in the Collaborative Research Projects section. When complete, the work will indicate the extent to which irrigation influences rice production in the area, what resources may need to be allocated to irrigation in order to increase production, and what types of irrigation should be stressed.

Greater use of another input, fertilizer, is a necessary condition to increasing production. However, the reasons farmers do or do not use fertilizers vary. During 1979 a project was begun that takes a nontraditional approach to the study of growth in fertilizer use by examining all of the factors that are involved in the process. The hypothesis of the study is that the pace and pattern of growth in fertilizer use are determined by interactions among the potential benefits of increased fertilizer use, total supply, distribution arrangements, and supportive systems of research, extension, and credit.

To date, the work has entailed an in-depth examination of growth in use in the United States and India, a review of the econometric models of demand for fertilizer, and a survey of literature on fertilizer use in selected countries.

PRODUCTION STRATEGIES

Efforts to increase food production have at times produced consequences that run counter to other objectives of developing countries. For example, most developing countries need to increase food production, but they also need more foreign exchange to pay for such imports as fertilizers and pesticides, essential to food production. In many countries agricultural exports are a principal source of foreign exchange earnings, but efforts to meet both domestic food and export needs are sometimes in conflict. In West Africa, for example, increased millet production has resulted in a reduction of area planted in groundnuts, an important export crop. Similarly, an increase in maize production in Tanzania appears to have been at the expense of cotton production, a leading foreign exchange earner for that country. Livestock production may compete for land with crops or vice versa, and in marginal areas such competition is an important cause of soil erosion and desertification.

In an effort to find alternatives to minimize these conflicts, the Production Program is researching production strategies in the Sahel where it appears that increased food production and export crop production may be met by adopting mixed farming techniques. In the rice- and cotton-growing areas in Mali, a system of plowing with oxen, using manure as fertilizer, and using the by-products of these crops to feed the oxen, has increased food and export crop production. However, similar programs in the millet- and groundnut-growing areas of Upper Volta have not been successful. Research into the successes and failures in these two Sahelian countries will continue through 1980.

The Production Program is also studying the possible conflict between growth

and stability in agricultural production. Some evidence suggests that although the adoption of seed-fertilizer technology has led to agricultural production growth, it has also led to increased instability. Using data collected before and after the introduction of new seed varieties in India, an analysis of year-to-year variations in production is under way.

A production strategy that is being used increasingly when there is little or no new land available for cultivation is multiple cropping. In India the use of multiple cropping practices varies widely among and within its states. These variations were subjected to analysis in a study begun this year. Results indicate that most of the variations reflect the extent and quality of irrigation and labor available. Tubewell irrigation was found to have a greater impact on cropping intensity than other irrigation sources. The study concludes that the irrigation expansion contemplated in India's current Five-Year Plan can significantly increase its multiple cropping capabilities and thus its agricultural production.

GROWTH AND EQUITY

During the 1970s one of the more discussed conflicts in development objectives has been that between economic growth and equity. A disproportionate share of the benefits of economic growth seems to have gone to the higher-income groups within many developing countries. Agricultural progress has not improved the diets of most of the hungry. The dominant view today in developing and industrialized countries and in international organizations seems to be that agricultural growth, and economic growth in general, should benefit the poorest people by improving their incomes. Consequently the Production Program is exploring strategies that would ensure production growth as well as a more equitable distribution of income.

A study devoted to this task is analyzing the changes in Indian development objectives, policy measures, and institutions since the end of World War II to see how they have affected growth and equity. There may be some clues in the considerable Indian effort to modernize on how to modify policies and procedures to reconcile the two goals.

GROWTH LINKAGES

Finally, the Production Program is investigating the linkages between agricultural production and economic growth. The first report in this area was published this year. *Intersectoral Factor Mobility and Agricultural Growth,* Research Report 6, by Yair Mundlak, takes an econometric approach to the study of the relationship of Japan's economy and agricultural sector. The econometric model built for the study is now being tested on the Argentine data.

Another major effort concerning linkages is designed to study the effects on income and employment of agricultural growth. Most research efforts during the last several years have concentrated on determining the direct effects of agricultural growth on employment and the distribution of income. This project, however, analyzes the indirect effects on poor people of increased food production. These indirect affects arise when increased production leads to increased marketing and the resulting cash incomes are spent on other goods and services. The more expenditures are made on labor-intensive commodities, the more they expand the income-employment opportunities for the poor. However, unless the incomes of the poor increase commensurately, the effective demand for foodgrains will lag behind supply, thus making it difficult to sustain high rates of food output growth. These so-called multiplier effects will be examined in the Punjab of India, where the "green revolution" had its greatest success, and in Bangladesh, where the new agricultural technology has spread much less widely and deeply.

TRADE PROGRAM

An intricate relationship exists between a country's trade policy, its food and agricultural strategies, and world market conditions. The export/import policies adopted by a developing country affect its general agricultural development strategies, which in turn are influenced by conditions in the world market. Research in the Trade Program is undertaken with this premise in mind—that national production and trade strategies in developing countries must be viewed in conjunction with world trade conditions.

The program evaluates the relative merits of various worldwide policy strategies as well as national trade strategies in the context of Third World countries. The overriding objective of attaining stability of food supplies at low costs to the developing countries is examined in light of some basic conditions, the most important of which is that each country has a choice of an optimal mix of internal and external sources for its food supply. As they attempt to alleviate food shortages, developing countries have the option of increasing domestic production, and in so doing possibly reducing the production level of cash crops and the export revenue they bring, or increasing reliance on external sources through imports, which may necessitate increased production for export purposes.

INTERNATIONAL POLICY ISSUES

Research on global issues deals with the external factors influencing a country's choices in determining its trade strategies. It is concentrated in three broad areas. The program examines food security for food-deficit, developing countries (with emphasis on reducing instability in world markets), and international approaches for financing food imports during short-term increases in import prices or production shortfalls. It also examines trade reform, its potential for improving agricultural exports of developing countries, and its implications for allowing those countries to purchase more food; and the use of food aid and foreign assistance to help reduce balance-of-payments deficits caused by imports as well as to achieve other development objectives.

FOOD SECURITY

The food security project focuses on assessing the nature and magnitudes of food insecurity in developing countries and the role international approaches have in alleviating it. Measures aimed at improving food security are designed both to reduce annual fluctuations of food supplies in developing countries and to assure food supplies to the poor at stable prices. As a result of domestic production shortfalls and fluctuations in world prices of food, many food-deficit countries face extraordinary and unanticipated pressures on their balance of payments in some years that prevents them from importing adequate additional food to maintain consumption.

Moreover, there is mounting concern that, in the absence of an assurance of continuing support from the international community, a number of developing countries are committing resources to strategies intended to relieve the impact of these fluctuations, such as building buffer stocks and implementing trade policies and investment projects that may be extremely costly and may substantially lower long-run economic growth.

During 1979 a book-length manuscript entitled "Food Security for Developing Countries" was completed at IFPRI. It was

written in an attempt to clarify the issue of food security; to identify the sources of insecurity; to assess the magnitude of the problem in specific country situations in Asia, Africa, the Middle East, and Latin America; and to explore possible solutions at both national and multilateral levels. This book is the outcome of an international conference on the subject jointly sponsored by IFPRI and the International Maize and Wheat Improvement Center (CIMMYT). It includes six chapters authored by IFPRI staff.

One of the book's chapters presents an assessment of the dimensions of food insecurity for 24 developing countries based on national aggregates for the 1961-76 period and showing the degree of variability in food consumption, production, and the food import bill. As an indicator of the extent to which food imports burden the balance of trade, the ratio of imports to total export revenues and the upper limit of this ratio are presented in Table 1. Another chapter deals with Colombia, which has adequate foreign exchange resources, abundant crop land for its population, and a relatively low variability in production. Nevertheless, even minor fluctuations in food supplies have resulted in a significant reduction in real income and food consumption among the poor. In a discussion of rice in Southeast Asia, it is pointed out that trade has had a more strategic role in domestic stabilization policies in the region than stocks. In analyzing the merits of a regional food security scheme for the ASEAN group, it concludes that some form of jointly controlled stocks, if accompanied by security of rice trade among participants, is attractive and has possibilities for implementation.

The section of the book on international approaches presents a framework and parameters for analyzing the potential contribution to world price stability of an international buffer stock system for wheat in the context of the Wheat Trade Convention negotiations held from 1977 through February 1979. It also documents the lack of correspondence between past food aid flows and import needs in developing countries, which aggravated the burden of imports, particularly in years of high world prices. A different orientation of food aid is required to reduce food insecurity—one that could be achieved without increasing the

Table 1
Ratio of food import expenditures to total export revenue, varying periods based on available data, 1965-76

Country	Mean	Maximum
Asia		
Bangladesh	88.4	119.4
India	22.4	44.5
Indonesia	9.5	19.9
Korea, Rep. of	13.5	21.4
Philippines	4.9	9.1
Sri Lanka	27.2	49.2
North Africa/ Middle East		
Algeria	6.0	9.3
Egypt	14.0	27.0
Jordan	10.6	15.4
Libya	1.4	2.3
Morocco	7.0	13.4
Syria	5.7	18.4
Sub-Saharan Africa		
Ghana	3.7	5.4
Nigeria	1.9	2.5
Senegal	12.2	17.8
Tanzania	5.5	22.2
Upper Volta	7.4	13.0
Zaire	3.1	6.9
Latin America		
Brazil	3.9	8.5
Chile	5.3	13.9
Colombia	2.8	4.9
Guatemala	2.4	3.3
Mexico	0.4	9.3
Peru	6.6	10.5

Source: Alberto Valdés and Panos Konandreas, "Assessing Food Insecurity Based on National Aggregates in Developing Countries," in *Food Security for Developing Countries*, Alberto Valdés, ed. (Boulder, Colorado: Westview Press, forthcoming).

average annual level of such aid by providing minimum quantity guarantees, particularly for years when prices are high. This section also includes chapters on a grain insurance program and on an assessment of the cost of establishing a food financial facility designed to alleviate the foreign exchange problem.

In addition, the book includes chapters on new food production technology and production instability; the nature and magnitude of food security problems in Egypt and East Africa; the issue of domestic reserves and stabilizing trade policies in developing countries in the context of India.

A number of other projects were completed or undertaken in the Trade Program in 1979. The economics of the international stockholding of wheat was analyzed. The study examines the behavior of stockholding and price variability in the world wheat economy since 1960 in order to predict the behavior for the near future, and to evaluate the proposal for a new international system of reserve stocks within an international wheat agreement. It is predicted that, for the near future, world stockholding of wheat will be slightly above financially profitable levels but somewhat below levels which would be considered socially optimal. A proposed Wheat Trade Convention as outlined in the study would be a realistic mechanism for international cooperation to bring about the desired modest increase in world stockholding and reduction in price variability. For the Wheat Trade Convention, it would be reasonable to establish accumulation and release prices of $140 per metric ton and $210 per metric ton respectively (in 1978 prices) and a maximum reserve stock obligation of 25 million metric tons.

The Trade Program also finished a study on developed-country agricultural policies and their effect on developing-country food supply. In this study wheat is used to make a quantitative assessment of the impact of the policies in developed countries (including the U.S.S.R.) on the price and availability of grain to developing countries. The study identifies those policy elements that appear to have particular significance in world markets. The aim is to assist food-deficit developing countries to understand and to monitor the most significant features of developed-country policy as they relate to grain supplies.

The study concludes that production fluctuations themselves in developed countries are a major potential problem for developing countries. It suggests that policies designed to increase stability of production would have more of an impact than the various stocks and trade policies more commonly discussed at international gatherings.

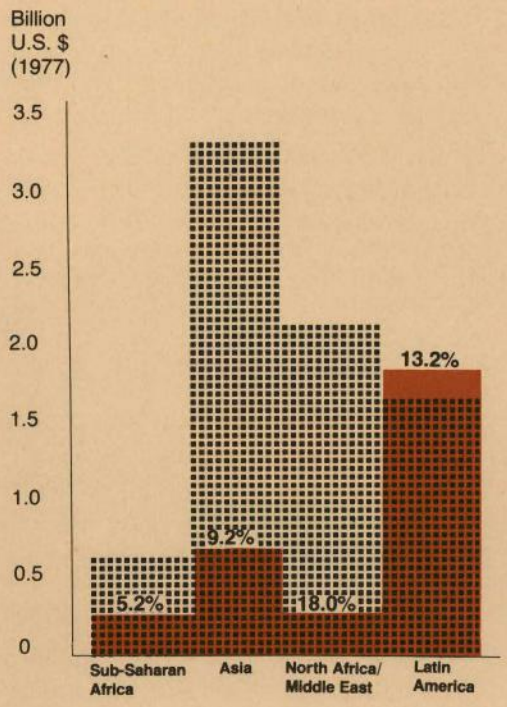
The study also indicates that flexibility of domestic prices is a necessity if stock changes are to play a major role in stabilizing world markets. Without such price flexibility, stock changes will have to be greater even than in the past decade. This implies a higher average level of stocks as well as a greater response to price changes. Some of the developed countries, notably the European Economic Community and Japan, have not followed price-responsive stocks policies.

TRADE REFORM AND EXPORT POTENTIAL OF DEVELOPING COUNTRIES

In the field of agricultural export potential, a report was completed at the request of FAO. Entitled "Trade Liberalization in Agricultural Commodities in the OECD and the Potential Benefits to Developing Countries," it concludes that if trade policies were liberalized the developing countries' export earnings would increase approximately $3 billion a year (in 1977 values using 1970-74 as a base) over and above the natural growth in exports likely to occur independently of liberalization (see Figure 5). The study analyzes the geographic distribution

Figure 5

Trade liberalization effects for sample developing countries by region: absolute and percent increase in export revenue compared to cereal import costs using 1975-77 as the base period



Source: Based on data in Alberto Valdés, "Benefits to LDCs from Trade Liberalization," (Washington, D.C.; IFPRI, 1979.)

of these benefits and identifies the products with significant potentials for Asia, Sub-Saharan Africa, North Africa and the Middle East, and Latin America. Sugar, beef, and veal are the most important commodities, but the study identifies many other products with significant potential for export growth which could enable developing countries to buy more food.

FOOD AID

In the food aid area, a project is under way in collaboration with the Trends and Statistics Program to assess food aid requirements for low-income, food-deficit countries. This work will project the financial magnitude of the food gap and the portion of it that can be paid for on commercial terms. The residual constitutes the stable food aid requirement.

Also during 1979 the Trade Program completed a data file for all cereal food aid flows from all donors to all recipients since 1954 and matched it against trade data series to determine the proportion of past imports that have been concessionally financed. Data series relating to gross national product (GNP) growth rates, growth rates of the export sector, foreign exchange reserves, and external debt burden were compiled and are ready for analysis.

DOMESTIC TRADE POLICY ANALYSIS

When examining trade policy decisions on an individual country basis, there are a number of options to consider. The decision to promote national self-sufficiency in food through total reliance on domestic production may result in food insecurity. However, promoting food security by strong reliance on imports is often constrained by the supply of foreign exchange. Thus, providing food security at minimum cost requires striking the right balance between domestic sources and a country's import/export sector.

The Trade Program analysis of the various national options is conducted with a number of premises in mind. One is that the link between food and nonfood markets is particularly strong in Third World countries because of the large share that agriculture has in their national economies. As a result,

policy interventions in one market affect the others. Another is that in many developing countries general foreign trade policies, often unintentionally, induce major resource allocations affecting food production and income distribution.

FOOD SECURITY AND SELF-SUFFICIENCY

As part of the domestic trade policy analysis on self-sufficiency and food security, the Trade Program is working on approaches to short-run food supply management for food security in the Sahel and in Southeast Asia. The Sahel project, which was partially funded by the U.S. Agency for International Development and the USDA will provide a comprehensive evaluation of costs and benefits of a set of policies—trade, storage, and food insurance—to reduce consumption instability in that region.

Tentative findings suggest that establishing grain reserves as buffer stocks in the Sahel is likely to be much more expensive than a food insurance system (keeping in mind, however, that no such scheme exists and the prospects for one do not appear very bright at the moment) and that regional grain reserve programs are probably more expensive than individual country programs unless the region is completely isolated from world trade. Also, consumption variability in the region is one of the highest in the world, and foreign exchange availability in the region is a serious constraint, increasing pressure on government to seek foreign aid. The findings also suggest that the isolation of the region from world trade makes food insurance schemes less effective because of high transport costs, thus calling for more investment in transportation.

For rice in Southeast Asia, a study began on approaches to short-run supply management to measure how far consumption of rice in the region can be ensured through trade policies and changes in stocks. Countries included in the study are Indonesia, Malaysia, the Philippines, and Thailand.

Tentative findings include estimates of demand, supply, and trade of rice for the four Southeast Asian countries, which can be used as by-products for projection work in IFPRI's collaborative Rice Policy Project. Ongoing work is analyzing the structure of the world rice market by focusing on the trading behavior of the various countries. These results would enable individual countries to understand their trading environment better, which is essential for working out their stockholding strategies.

TRADE POLICIES AND AGRICULTURAL DEVELOPMENT

A special project on the effects of trade and agricultural policy on food production, consumption, foreign exchange earnings, and income distribution in Colombia was also begun in 1979. This project, which is partially funded by the Rockefeller and Ford Foundations, is part of IFPRI's effort to develop an analytical framework for the analysis of food self-sufficiency, food security, and the social cost of food supplies in developing countries.

The most significant finding up to now has been the measurement of the degree of economic discrimination against the agricultural sector in Colombia resulting from the trade restrictions and exchange rate policy since 1966. The effect of this has been that the sector with the greatest production and export potential was discouraged, and the heavy initial dependence on coffee exports as a source of foreign exchange continued. Important empirical results include the estimation of the demand for imports in Colombia, an estimation of a parameter measuring the incidence of export subsidies and import duties on the export sector, which is basically the agricultural sector. The analysis suggests that in Colombia import duties on manufactured goods are fully shifted to an (equivalent) export tax on agricultural exports, which in Colombia represent approximately 70 percent of export revenues.

CONSUMPTION AND DISTRIBUTION PROGRAM

In one of its first published studies, IFPRI reported that almost one billion people have diets of less than 90 percent of daily calorie requirements based on FAO and World Health Organization standards. Today there is no immediate prospect of a significant reduction in this number, and there is little indication that per capita consumption will increase significantly in many low-income developing countries.

In addition, although increased food production is a necessary condition for long-term improvement in food consumption in most developing countries, it is by no means sufficient by itself. The so-called trickle-down effect of growth sometimes fails to benefit the poorest people proportionately and often is inadequate to compensate for rapid population growth.

With these issues in mind, the Consumption and Distribution Program conducts research on how to better provide the needy with adequate food supplies. In 1979 the program's research activities focused on food distribution policies and consumption patterns and began to analyze the impact of price policy on income distribution.

A number of studies were published dealing with various aspects of food consumption and distribution. In *Two Analyses of Indian Foodgrain Production and Consumption Data,* Research Report 12, by J. S. Sarma and Shyamal Roy, and by P. S. George, the research documents the weakness of a system in which it is assumed that the benefits of growth will result in increased food consumption in the lower-income groups of India. The first analysis shows that consumption of foodgrains declined steadily from 220.7 pounds per capita in 1961/62 to 185.3 pounds per capita in 1973/74. This decline took place despite a rising average per capita income. Production per capita declined by about 1 percent during the same period. The second analysis confirms this decline in foodgrain consumption, pointing out that the decline in consumption was less severe among low-income urban groups than among the rural poor.

DISTRIBUTION SYSTEMS

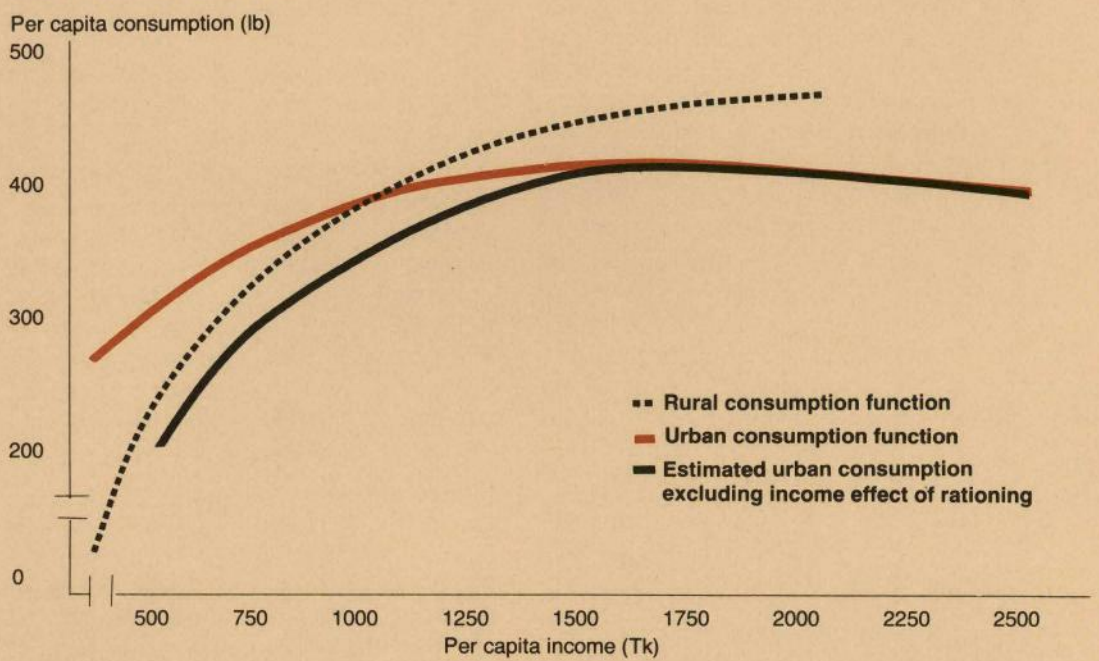
If food consumption is to rise among those who need it most, special policy measures are needed to raise income levels and purchasing power. Two important determinants of consumption are prices and the structure of food markets, areas in which many developing-country governments intervene. Consumption and distribution research on four South Asian countries indicates that they have taken ambitious initiatives in this area by using systems that distribute food through ration or fair-price shops, where fixed quantities of food are given at reduced prices, or, occasionally, free of charge. Such programs reach large populations and have been in existence for years, which makes them ideal for study.

Analysis of public food distribution policies was undertaken on a country-by-country basis to provide a base for comparisons and recommendations to policymakers on the costs and benefits of different kinds of programs. Studies on Bangladesh, Sri Lanka, and India were published in 1979. In these case studies the effects of the public distribution system on

the price of food, on the demand for various foods by different income groups, on the caloric intake of various urban and rural income classes, and the costs of each program are examined.

BANGLADESH *Food Supply, Distribution, and Consumption Policies Within A Dual Pricing Mechanism: A Case Study of Bangladesh,* Research Report 8, by Raisuddin Ahmed, analyzes the public food distribution system in a country where poverty and malnutrition are widespread and seem to be growing. The subsidy for food, which occurs when the government sells grain at a lower price than it paid for it, absorbed from 7 to 13 percent of the total budget. The data for 1973 and 1974 indicate that two-thirds of the subsidized grain was distributed to urban areas even though a large majority of the poorest people lived in rural areas. The effect was to give low-income urban groups a food advantage over their rural counterparts (see Figure 6). However, the study concludes that extending the rationing program to large areas of the countryside could be enormously expensive and that, if foreign aid in the form of grains were used for this purpose, domestic prices would decline 10 to 27 percent. Therefore, local production would be discouraged. The study indicates that it would be possible to reduce seasonal fluctuations in prices while maintaining production incentives for farmers. Furthermore, to increase rice production, it would be more

Figure 6
Estimated urban and rural consumption functions for foodgrains in Bangladesh, 1973-74



Source: Raisuddin Ahmed, *Foodgrain Supply, Distribution, and Consumption Policies within a Dual Pricing Mechanism: A Case Study of Bangladesh,* Research Report 8 (Washington, D.C.: IFPRI, 1979) p.39.

Note: Based on the double log inverse function using 1973-74 household survey data.

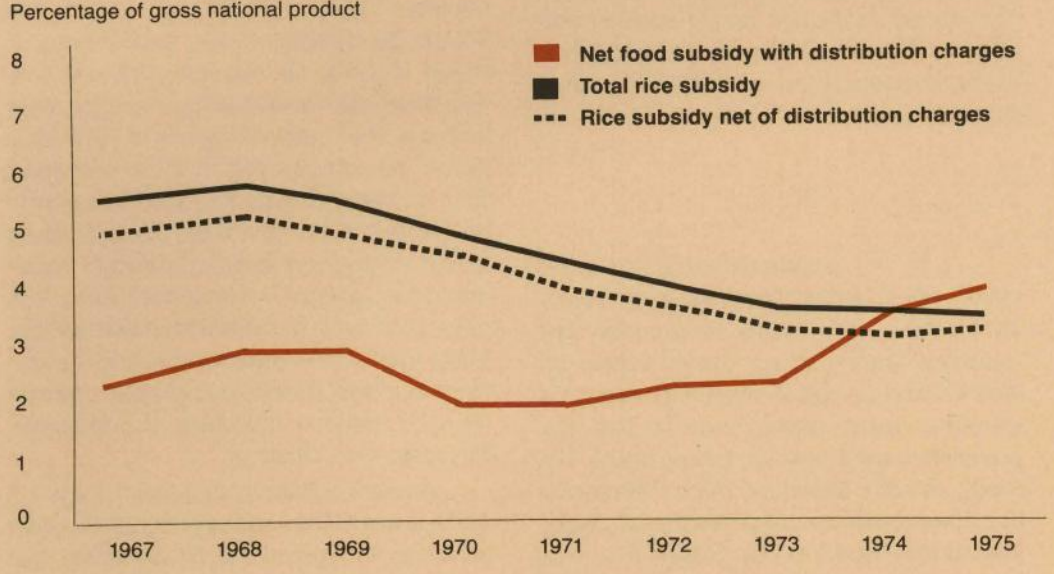
efficient for the government to subsidize the price of fertilizers to farmers than to provide them with price supports for their crops.

SRI LANKA *The Impact of Public Foodgrain Distribution on Food Consumption and Welfare in Sri Lanka,* Research Report 13, by James Gavan and Indrani Sri Chandrasekera, looks at Sri Lanka, which until late 1979 had a system that included free rations of rice. The Sri Lanka study indicates that the program contributed to a better standard of living among low-income groups and a more even pattern of consumption throughout the society, although there is still a substantial amount of malnutrition. At its peak, the ration subsidy contributed the equivalent of 16 percent to the purchasing power of low-income families in Sri Lanka. A significant portion of the additional income went to increased food expenditure — much of it to the purchase of more expensive calories and proteins, thereby contributing to diversification of the diet. At the same time, purchases of rice and wheat on the open market declined markedly.

Under this system, the government purchased food to supply the ration system at prices high enough to stimulate farmers to expand rice output rapidly in the 1950s and 1960s. Because paddy holdings tend to be small and rice farming methods labor intensive, the rice sector was responsible for a major share of employment growth during this period. Even though the cost of the rationing system was high and therefore a drain on public investment (see Figure 7), Sri Lanka's 4 to 5 percent annual rate of growth of GNP in the late 1960s was better than that of most other low-income countries.

The importance of rationing to the overall food economy of Sri Lanka is starkly

Figure 7
Gross and net fiscal food subsidies as a proportion of Sri Lanka's gross national product, 1967-75



Source: Based on data in James D. Gavan and Indrani Sri Chandrasekera, *The Impact of Public Foodgrain Distribution on Food Consumption and Welfare in Sri Lanka* (Washington, D.C.: IFPRI, 1979) p. 43.

illustrated by the fact that nutrition standards dropped in 1974 and 1975 when rations were cut back, harvests were poor, and prices for rice, wheat, and sugar increased. In addition, mortality rates rose.

INDIA There are a number of public distribution programs in India. The program used in Kerala, a southwestern state, was examined in two studies: *Impact of Subsidized Rice On Food Consumption and Nutrition in Kerala,* Research Report 5, by Shubh K. Kumar and *Public Distribution of Foodgrains in Kerala—Income Distribution Implications and Effectiveness,* Research Report 7, by P. S. George. The George study shows that rations supplied the bulk of rice eaten by low-income groups in the state of Kerala. Thus the public system greatly improved the distribution of income in the state. The study also indicates that it was more cost efficient and politically palatable to increase consumption among the poor by ration systems than by giving them cash grants. The results of the Kumar report on Kerala also suggest that a public system can substantially raise nutrition and consumption levels of the poorest households. The report concludes that a subsidy program is more effective in accomplishing these twin goals than would be other forms of direct resource transfers.

PRICE POLICY Another study published in 1979 evaluates Brazil's minimum price policy for rice, corn, beans, and cotton and analyzes whether or not the two basic objectives of price stabilization and output expansion were being met in the impoverished northeast section of Brazil. The study, *Brazil's Minimum Price Policy and the Agricultural Sector of Northeast Brazil,* Research Report 9, by Roger Fox was sponsored by the Institute and the Bank of Northeast Brazil.

The study shows that although farmers and cooperatives were to be the beneficiaries of the support program, most benefits went to food processors and handlers. Furthermore, the benefits that did accrue to farmers went disproportionately to a few large ones. Although the support prices were high enough to lead one to expect greater participation by farmers in the scheme, participation was low. As for the program's two major aims, the study concludes that there was "little evidence . . . that annual price and income instability had been reduced," and there was "no empirical support . . . that minimum prices influenced the output of the individual crops." Fox cautions, however, that measurement of this second effect was plagued by many statistical and data problems.

In addition to these completed studies, the Consumption and Distribution Program began work in 1979 on a project to compare the public distribution systems of Bangladesh, India, and Sri Lanka to determine the conditions under which ration systems were most successfully used. The three distribution systems are being analyzed to determine the implications of universal versus selective distribution, free versus purchased rations, and the use of ration systems to stabilize consumption. Two other studies initiated by the Consumption and Distribution Program in 1979 form part of the collaborative Rice Policy Project. One of these studies attempts to quantify the impact of changes in the price of rice on food consumption levels of different socioeconomic groups in Southeast Asia. The other is a study of the shifts in demand for major staple food commodities and the factors that affect the choice between rice and cheaper calorie substitutes in Indonesia, Malaysia, and Thailand.

Another collaborative project, begun in 1979, is analyzing various public distribution schemes in light of the relationships that exist between income, food consumption, and malnutrition.

COLLABORATIVE RESEARCH PROJECTS

Two projects are treated separately in this report because of their size, complexity, and degree of collaboration with outside institutions. Increasingly, the Institute has been working with other national and international research organizations to share the workload in areas of mutual interest and to help build in-depth analytical capabilities on policy issues.

RICE POLICIES IN SOUTHEAST ASIA

Rice is the most important commodity in Indonesia, Malaysia, the Philippines, and Thailand. The governments of those countries have adopted various policies over many years that influence its production, consumption, price, and trade. Early this year IFDC, IRRI, and IFPRI decided that a broad study of government rice policies is needed and that only a joint effort by researchers located at these centers in collaboration with national researchers from countries of the region could do justice to the complexity and importance of the subject.

The study is examining the costs and benefits of these government policies, their impact on the level and variability of rice production and consumption, and their relationships to the rest of the economies of the four countries. The goal is to design, evaluate, and spell out the implications of a number of specific policies. Furthermore, the project will compare how efficiently these policies reach predefined production, consumption, trade, and stability targets. This last step is an effort to avoid the occasional disconnectedness of government policies.

Another aim is to fashion an analytical framework and research methods that can be adapted by investigators in each country to devise specific policies for particular situations. This will be achieved by creating a network among interested researchers in the three international institutes and in the research centers of each country.

The project involves researchers from three of IFPRI's four program areas. On the production side researchers in the four countries in collaboration with IFPRI researchers are studying the effects of irrigation on production, what resources are needed to make irrigation projects reach production targets, and what kinds of irrigation should be encouraged. Work on fertilizer, the other main source of production increases, is being undertaken on a similar collaborative basis by IFDC.

Work in the Consumption and Distribution Program centers on prices and consumption. In economies where agriculture is a major source of income and employment, such as those of Southeast Asia, the price of farm products, particularly rice, greatly affects the income and consumption levels of poor people. Governments often manipulate prices to meet consumer and farmer demand and policies intended for other purposes often affect the relative price of rice. In addition to looking at the implications of such policies, the study is examining some basic assumptions. For example, it is

generally believed that a price increase harms poor urban families, the landless, and very small farmers. This is sometimes used to justify keeping prices down. However, this argument overlooks the fact that employment and wages may move up in response to price increases and therefore attenuate the effect of price rises on the well-being of poor people. This project is examining these issues by analyzing the theories of wages and rural labor markets in developing countries.

In addition, the effect price policies have on consumption shifts is also being examined. Rising incomes, urbanization, and technology are some of the forces affecting a society's preference for particular foods. As income increases, maize and cassava consumption may drop relative to rice consumption, whereas urban populations increasingly may turn to wheat. Because the size of the consumption shifts will be affected by the price policies that are pursued, research in this area is needed to provide agricultural planners with a better understanding of these processes.

In the Trade area the rice stock programs in Southeast Asia are being studied. Indications are that trade does more to stabilize prices than increasing or decreasing reserves. However, the four countries must maintain some reserves if they are to prevent large price rises in scarce times when they must purchase supplies from the international market. Eventually the study will determine what the optimal stocks for each country should be and the advantages and disadvantages of a reserve held jointly by the four nations.

FOOD SUBSIDIES AND NUTRITION

Widespread malnutrition throughout the world provides an indication of past shortcomings in the development process and a warning of problems in the future. Not only have development activities failed to provide basic food needs for the poor segments of the population in much of the Third World, but because malnutrition affects people's capacity to work, the worsening situation may inhibit future growth efforts. In light of this, governments are feeling pressure to implement programs that will deal quickly with the worst cases of hunger and malnutrition. In addition, during the last few years, international food donors, who have been implementing programs aimed at increasing the nutrition of more vulnerable groups such as children and pregnant women, have begun to seek tangible evidence of their welfare results.

During 1979 IFPRI began work on a joint project to compare the costs and benefits of programs involving food (and income) subsidies or transfers in collaboration with several national research agencies. The project will identify factors influencing whom these programs reach and to what extent consumption and nutrition levels are being increased.

The first phase involves describing the etiology of malnutrition and its relation to levels of consumption, income, and employment based on a survey of existing studies. Preliminary findings suggest that low-income levels and inadequate food consumption are associated with most cases of protein-calorie malnutrition in developing countries. However, the nutritional implications of generalized or targeted economic measures are poorly documented, and there is insufficient basis to predict program impacts. Findings also suggest that the policy prescriptions made in targeted nutrition interventions have generally supported improving the benefits from existing household income and food resources through education and health programs, without explicitly addressing the problem of resource constraints.

The second phase of the project will consist of three country studies to cover a range of possible food program options. During 1979 initial contacts were made with national research centers in Zambia and the Philippines for data collection or existing data analysis to be carried out in 1980. Also to be included in the second phase of this project is a study of income, consumption, and nutrition benefits of the food-for-work program in Bangladesh. This will form a part of a larger IFPRI study on the developmental impact of these programs in Bangladesh.

COMMUNICATIONS SERVICES

The primary concern of Communications Services is to disseminate the results of IFPRI's research efforts to their possible users. This is done through publications; conferences, seminars, and workshops; and the library. During 1979 the flow of publications increased and the library expanded, a number of seminars were held, and the groundwork was laid for future conferences and workshops.

PUBLICATIONS

Publications take the form of Research Reports, "other publications" comprised of papers and reprints of important articles authored by IFPRI researchers, a newsletter entitled *IFPRI Report,* and periodic overviews of IFPRI research in progress.

The kind of research projects undertaken at IFPRI often take two to three years or more to complete. As a result, it was not until the last two years that the Institute began publishing the results of various studies in its Research Report series. During 1979 nine Research Reports were published, more than in the Institute's previous years combined. In addition, seven "other publications" were published. These and the Research Reports were sent to some 3,700 people in government, national research agencies, universities, and international organizations concerned with food and agricultural development.

A new publication, *IFPRI Report,* was begun in 1979. This newsletter is published three times a year and is mailed to a larger list of people and institutions concerned with development. It attempts to highlight major issues for those concerned about food policy and to describe, in a particularly accessible form, the policy work of the Institute's research program. Each issue of *IFPRI Report* includes a commentary, which deals with a food policy issue, written by a member of the senior research staff. The rest of the newsletter summarizes the work completed since the last newsletter and describes the work expected to be completed and published in the coming four months.

CONFERENCES AND SEMINARS

For IFPRI's purposes, conferences are relatively large gatherings at which papers are presented by experts both inside and outside IFPRI. Seminars are smaller meetings at which work being done at IFPRI or that of invited guests from outside the Institute is the focal point of discussion. Workshops are small sessions in which research completed at IFPRI is discussed and passed on to those policymakers, administrators, and others considered most likely to use it.

During 1979, 15 seminars were held, all at IFPRI headquarters. In addition, plans were formulated to hold a conference on economic analysis of food policy and agricultural development in 1980. A series of workshops also is being considered.

LIBRARY SERVICES

IFPRI's library is becoming a major source of printed material on food policy, particularly in the Third World. This year the collection increased from 2,000 to 3,000 volumes, with much of the expansion coming from the number of periodicals and research reports received and through the publication exchange program. Plans to computerize the card catalog were begun.

STATISTICAL SERVICES

Several terminals link the Institute with the large, mainframe computer at the Brookings Institution, greatly increasing the size of the rapidly growing data library at the Institute. A complete set of programs — more than 250—was developed at the Institute in 1979 for use with the FAO data on file and other major data sources. A major portion of the Institute's data library is composed of FAO country details on agricultural production, food consumption, and trade balances dating from 1961.

The USDA data on production and consumption have also been used for making projections and other analyses at the Institute. The tapes and computer printouts from these two sources are supplemented by such data as U.N. population estimates and projections, and GNP and balance-of-payments estimates from the World Bank and the International Monetary Fund.

As the Institute has grown, it has been receiving more statistics from developing-country researchers who come to Washington, from research centers and universities in the Third World, from the International Agricultural Research Centers, and from the expanding analytical work of its own staff.

The statistical services division works with the Institute's researchers as they compile material for their studies. Programming and help with computerized data were given to most of the Institute's projects during 1979. In addition, seven new research assistants were trained by the division.

1979 PUBLICATIONS

RESEARCH REPORTS

Research Report 5
Impact of Subsidized Rice on Food Consumption and Nutrition in Kerala, by Shubh K. Kumar, January 1979.

Research Report 6
Intersectoral Factor Mobility and Agricultural Growth, by Yair Mundlak, February 1979.

Research Report 7
Public Distribution of Foodgrains in Kerala—Income Distribution Implications and Effectiveness, by P. S. George, March 1979.

Research Report 8
Foodgrain Supply, Distribution, and Consumption Policies within a Dual Pricing Mechanism: A Case Study of Bangladesh, by Raisuddin Ahmed, May 1979.

Research Report 9
Brazil's Minimum Price Policy and the Agricultural Sector of Northeast Brazil, by Roger Fox, June 1979.

Research Report 10
Investment and Input Requirements for Accelerating Food Production in Low-Income Countries by 1990, by Peter Oram, Juan Zapata, George Alibaruho, and Shyamal Roy, September 1979.

Research Report 11
Rapid Food Production Growth in Selected Developing Countries: A Comparative Analysis of Underlying Trends, 1961-76, by Kenneth L. Bachman and Leonardo A. Paulino, October 1979.

Research Report 12
Two Analyses of Indian Foodgrain Production and Consumption Data, by J. S. Sarma and Shyamal Roy and by P. S. George, November 1979.

Research Report 13
The Impact of Public Foodgrain Distribution on Food Consumption and Welfare in Sri Lanka, by James D. Gavan and Indrani Sri Chandrasekera, December 1979.

PAPERS

Agricultural and Food Policy Issues Analysis: Some Thoughts from an International Perspective, by Alex F. McCalla (a report prepared under a 1975-1977 grant to Dr. McCalla from The Ford Foundation).

Three Issues of Development Strategy—Food, Population, Trade, by John W. Mellor (two conference papers from 1978 and testimony presented to the United States House of Representatives Select Committee on Population, Washington, D.C., April 19, 1978).

World Food Strategy for the 1980s—Context, Objectives, and Approach, by John W. Mellor (paper presented at the International Conference on Agricultural Production: Research and Development Strategies for the 1980s, Bonn, October 1979).

Growth Potential of the Beef Sector in Latin America—Survey of Issues and Policies, by Alberto Valdés and Gustavo Nores (paper presented at the Fourth World Conference on Animal Production, Buenos Aires, August 1978).

REPRINTS

"Analysis of Trade Flows in the International Wheat Market," by Panos Konandreas and Hernán Hurtado, reprinted from the *Canadian Journal of Agricultural Economics,* Vol. 26 (3), 1978.

"Food Price Policy and Income Distribution to Low-Income Countries," by John W. Mellor, reprinted from *Economic Development and Cultural Change,* Vol. 27, No. 1, October 1978.

"India—A Drive Towards Self-Sufficiency in Food Grains," by J. S. Sarma, reprinted from *American Journal of Agricultural Economics,* Vol. 60, No. 5, December 1978.

PAPERS OF IFPRI RESEARCHERS PUBLISHED ELSEWHERE

Ahmed, Raisuddin. "Price Support Versus Fertilizer Subsidy for Increasing Rice Production in Bangladesh." *Bangladesh Development Studies,* April 1979, pp. 119-138.

_____. "Public Foodgrain Distribution and Poverty in Bangladesh." *The Bangladesh Journal of Agricultural Economics 2* (January 1979): 1-23

Delgado, Christopher L. *The Southern Fulani Farming System in Upper Volta: A Model for the Integration of Crop and Livestock Production in the West African Savannah.* African Rural Economy Paper No. 20. East Lansing: Michigan State University, 1979.

Desai, Gunvant M.; Singh, Gurdev; and Sha, D.C. *Impact of Scarcity on the Farm Economy and Significance of Relief Operations (A Micro-Study in Gujerat).* Ahmedabad: Centre for Management in Agriculture, Indian Institute of Management, 1979.

Hazell, Peter B. R. "Endogenous Input Prices in Linear Programming Models." *American Journal of Agricultural Economics, 61* (August 1979): 476-481.

Huddleston, Barbara and McLin, Jon, eds. *Political Investment in Food Production: National and International Case Studies.* Bloomington: Indiana University Press, 1979.

Mellor, John W., ed. *India: A Rising Middle Power.* Boulder, Colorado: Westview Press, 1979.

_____. Testimony presented to the U.S. Congress in *International Development Assistance Act of 1979, Hearings of the Committee on Foreign Relations, United States Senate, March 14, 15, 21 and 23, 1979.* Washington, D.C.: Government Printing Office, 1979, pp. 195-200.

_____. "The Real Test is Commitment to Development." *Development,* March 1979, pp. 38-39.

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Oram, Peter A. "Crop Production Systems in the Arid and Semi-arid Warm Temperate and Mediterranean Zones." In *Soil, Water and Crop Production,* pp. 193-228. Edited by Wynne and Marlowe Thorne. Westport, Connecticut: AVI Publishing Company, Inc., 1979.

_____. "Development of Appropriate Crop Technology for Irrigated Agriculture in Semi-arid Regions." Paper presented at the International Expert Consultation on Irrigation and Agriculture Development, Baghdad, February 1979.

Siamwalla, Ammar and Valdés, Alberto. "Assessing Food Security in LDCs." Paper presented at the International Association of Agricultural Economists Conference, Banff, Canada, September 1979. Forthcoming in the Proceedings of the Conference.

Valdés, Alberto. "Potential Benefits of Trade Liberalization to LDCs." *Cuadernos de Economia* 16 (December 1979): 323-341.

PERSONNEL

(as of December 1979)

ADMINISTRATION

J. Mellor	Director
P. Oram	Deputy Director
M. Rafferty	Director for Administration
P. Critchlow	Secretary to Director
M. Trentham	Personnel Administrator

RESEARCH

Trends and Statistics

L. Paulino	Program Director
P. Yeung	Research Fellow
K. Bachman	Consultant
B. Stone	Visiting Researcher
P. Tillman	Coordinator of Statistical Services
R. Donaldson	Senior Programmer
V. Bindlish	Research Assistant

Distribution

J. Gavan	Program Director
S. Kumar	Research Associate
B. Baranshamaje	Research Assistant
S. Haykin	Research Assistant

Production

D. Narain	Program Director
R. Ahmed	Research Fellow
G. Desai	Research Fellow
P. Hazell	Research Fellow
C. Delgado	Research Associate
S. Mehra	Visiting Researcher
Y. Mundlak	Visiting Researcher
J. Sarma	Visiting Researcher
P. Chan	Research Assistant
P. Tseng	Research Assistant
P. Woo	Research Assistant

Trade

A. Valdés	Program Director
B. Huddleston	Research Fellow
A. Siamwalla	Research Fellow
J. Garcia	Visiting Researcher
J. McIntire	Visiting Researcher
E. Harris	Research Assistant
J. Zietz	Research Assistant

D. Morrow and C. Rangarajan were visiting researchers during part of 1979.

Communications

C. McVicker	Director of Communications
P. Klosky	Librarian
B. Barbiero	Chief Editor
J. Voorhees	Editorial Assistant

FINANCIAL STATEMENT

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

BALANCE SHEET as at December 31, 1979 and 1978

ASSETS

Current Assets:	1979	1978
Cash	$161,917	$ 67,410
Accounts receivable	11,123	120,754
Employee and other receivables	21,665	22,144
Prepaid expense	2,690	1,786
	197,395	212,094
Property and Equipment:		
Furniture and equipment	174,697	128,553
Leasehold improvements	11,090	11,090
Library	2,080	2,080
	187,867	141,723
Less—accumulated depreciation and amortization	95,734	62,743
	92,133	78,980
TOTAL ASSETS	$289,528	$291,074

LIABILITIES AND FUND BALANCE

Current Liabilities:		
Accounts payable and accrued expenses	$119,425	$100,705
Advance Payment of Grant Funds	145,610	-0-
Fund Balance	24,493	190,369
TOTAL LIABILITIES AND FUND BALANCE	$289,528	$291,074

The accompanying notes are an integral part of these statements.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

STATEMENT OF REVENUE, EXPENSE AND FUND BALANCE
For the Years Ended December 31, 1979 and 1978

		1979		1978
Revenues:				
Grants	$1,667,752		$1,290,818	
Reimbursement of expenses	91,085		96,254	
Investment income	17,633		22,214	
Other income	5,864		246	
		$1,782,334		$1,409,532
Expenses:				
Salaries		927,718		811,644
Employee Related Costs:				
Employee benefits	229,838		162,389	
Recruitment & relocation	52,709		33,190	
Staff travel	104,960		58,034	
		387,507		253,613
Consulting Services & Contracts:				
Outside consultants	139,340		103,828	
Fellowships	11,534		41,142	
Trustee expenses	34,583		34,864	
		185,457		179,834
Communications &Statistical Services		195,583		125,216
Office Operation:				
Depreciation	33,260		25,550	
Dues	619		1,133	
Equipment rental	35,125		16,794	
Insurance	778		1,142	
Office supplies & expenses	31,400		32,821	
Outside services	14,846		12,753	
Professional fees	17,913		20,614	
Rent	90,333		87,599	
Telephone & Telegraph	27,671		26,491	
		251,945		224,897
		1,948,210		1,595,204
Excess of Expenses Over Revenue		(165,876)		(185,672)
FUND BALANCE—BEGINNING		190,369		376,041
FUND BALANCE—ENDING		$ 24,493		$ 190,369

The accompanying notes are an integral part of these statements.

STATEMENT OF CHANGES IN FINANCIAL POSITION
For the Years Ended December 31, 1979 and 1978

	1979	1978
Source of Funds:		
Advance payment of grant funds	$145,610	$(136,924)
Use of Funds:		
Excess of expenses over revenue	165,876	185,672
Less expenses not requiring working capital: depreciation	(33,260)	(25,550)
	132,616	160,122
Additions to property and equipment	46,413	29,159
	179,029	189,281
DECREASE IN WORKING CAPITAL	$(33,419)	$(326,205)
Increase (Decrease) in Working Capital:		
Cash	$ 94,507	$(349,589)
Accounts receivable	(109,631)	49,576
Employee and other receivables	(479)	16,801
Prepaid expenses	904	(1,821)
Accounts payable and accrued expenses	(18,720)	(41,172)
	$(33,419)	$(326,205)

The accompanying notes are an integral part of these statements.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

NOTES TO AUDIT REPORT
December 31, 1979 and 1978

Note 1. Summary of Significant Accounting Policies

The Institute is a non-profit, non-stock corporation qualified as an organization exempt from Federal Income Tax under Sec. 501(c)(3) of the Internal Revenue Code as a publicly supported institution to which contributions are deductible by other individuals and organizations.

Income

Grant income is reported as revenue for the time period the grant is required to cover. Reimbursement of expenses from contracts is included in revenue when services are performed or expenses incurred and the right to reimbursement accrues.

Property and Equipment

Property and equipment is stated at cost. Depreciation is provided over an estimated useful life of 5 years for furniture and equipment and over the life of the lease for leasehold improvements. Expenditures for additions are capitalized and expenditures for maintenance and repairs are charged to earnings as incurred. When properties are retired or otherwise disposed of, the cost thereof and the appreciable accumulated depreciation are removed from the respective accounts and the resulting gain or loss is reflected in earnings.

Note 2. The Institute occupies office space under leases expiring through August 31, 1982. Under the terms of these leases the Institute pays monthly rental of $7,389 and a prorated portion of the increase in building operating costs. Minimum lease payments for all noncancellable operating leases having a remaining term in excess of one at January 1, 1980 are as follows:

1980	$83,308
1981	$67,230
1982	$44,820

Note 3. The Institute is purchasing retirement annuity contracts for employees under agreement with the Teachers Insurance and Annuity Association and the College Retirement Equities Fund. The cost was $131,434 and $101,852 for 1979 and 1978 respectively.

RAYMOND E. LANG & ASSOCIATES, P.A.
CERTIFIED PUBLIC ACCOUNTANTS

8401 CONNECTICUT AVENUE
CHEVY CHASE, MARYLAND 20015
(301) 654-4900

April 24, 1980

Officers and Trustees
International Food Policy Research Institute
1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036

We have examined the balance sheet of the INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE as at December 31, 1979 and 1978, and the related statements of revenue and expense and changes in financial position for the years then ended. Our examination was made in accordance with generally accepted auditing standards and accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion the financial statements present fairly the financial position of the Institute as at December 31, 1979 and 1978 and the results of its operations and the changes in its financial position for the years then ended in conformity with generally accepted accounting principles applied on a consistent basis.

R E Lang & Associates, P.A.

IFPRI 1776 MASSACHUSETTS AVENUE, N.W., WASHINGTON, D.C. 20036

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

REPORT 1980

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IFPRI REPORT 1980

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

CONTENTS

INTRODUCTION

This year the International Food Policy Research Institute (IFPRI) initiates a policy of including in its annual report a statement by the director describing major issues of food policy and how they relate to IFPRI's research program. This year's statement addresses three major dynamic factors that will affect food policy during the next few decades. These are: rising real food prices, the increasing instability of food supplies and prices in the international market, and growing trade in food commodities. These factors provide the direction for IFPRI's research and define the environment within which the policies suggested by the research must operate. They underline the sense of urgency associated with improving food production growth rates and the necessity of linking food production growth to increased employment and incomes of low-income people.

IFPRI has taken an integrated approach to its research, defining the major areas of concern as research thrusts. Although research activities are conducted through its administrative programs, the thrusts pull together elements from the projects within the programs. The four thrusts focus on overall food balances, food security, development strategy, and production policy.

The *national and international food imbalances* thrust examines the current world food supply and demand situation and how it is affected by population growth, rising incomes, production, and the effects of shifting commercial world trade. It attempts to identify how the imbalances are affected by policies of food production, consumption, trade, and foreign assistance.

The *food security* thrust deals with fluctuations in international and national food supplies and the impact these fluctuations have on the food intake and nutrition of the poor. IFPRI is attempting to define short- and long-term policies to ensure secure, adequate, and stable food consumption in low-income countries.

The *development strategy* thrust considers the link between agricultural growth and a country's overall development. Policies are examined in light of how they can contribute to multiple goals of production growth, income distribution, and employment.

The *agricultural production policy* thrust defines the policies needed to accelerate agricultural production in the areas of research, inputs, infrastructure, and price incentives.

Research is also being conducted on a regional basis. The second phase of the Rice Policies in Southeast Asia Project was initiated during 1980. This project, which has been undertaken in conjunction with researchers in the International Rice Research Institute and the International Fertilizer Development Center, is examining policies that affect rice demand, supply, and trade in Indonesia, Malaysia, the Philippines, and Thailand.

Research is administered through four programs. During 1980 the Food Trends Analysis, Food Production and Development Strategy, Food Trade and Security, and Food Consumption and Nutrition Programs initiated, continued, and/or completed work on more than 35 projects. Results were reported in eight Research Reports and a new abstract series, *IFPRI Abstract.* Five abstracts, which summarize the results and highlight the policy implications of the Research Reports, were published.

In addition to the research efforts initiated at IFPRI, during the year members of the IFPRI staff were called upon by international agencies and national institutions to participate in the examination of specific agricultural development problems. Among others, researchers worked with the Food and Agriculture Organization of the United Nations (FAO), the United Nations Conference on Trade and Development (UNCTAD), the World

Bank, the Rockefeller Foundation, the United States Agency for International Development (USAID), the Inter-American Institute of Agricultural Sciences, and the governments of Mexico and Bangladesh. The activities in the areas of research and consultation are reported in the research program sections of this report.

In February of 1980 IFPRI held its annual Board of Trustees meeting for program review in New Delhi, India, initiating a policy to hold all future program meetings of the Board in a Third World country and thereby using the opportunity to discuss the particular food needs of that country or region. IFPRI's research efforts continue to be directed at the objective of contributing to the reduction of hunger and malnutrition through the analysis of alternative national and international strategies for meeting world food needs, particularly in low-income countries.

FOOD TRENDS AND THE RESEARCH AGENDA

The global food situation will be unusually dynamic in the coming years. Powerful developmental forces are likely to substantially raise the real price of food. Those same forces will lead to extensive changes in the composition of diets and hence in production patterns. Measures taken by some nations to stabilize their food supplies will further destabilize international supplies and prices. And increased fluctuations in production are likely to result from more variable weather patterns than the unusually stable patterns of the past two decades. The relative wealth of countries is likely to shift, creating a more active agricultural trade environment, which may have repercussions on domestic food production and availability.

These forces will reduce the availability of food to the countries with the most laggard development and to the poor in all countries. Even more than in the past, policies are urgently needed that will improve the growth rates of production, increase the stability of food supplies, facilitate trade, and perhaps most of all, protect the disadvantaged from lack of food and nutritional deficiencies.

THE GROWTH OF DEMAND

A surge in demand for food will be driven by several sources, inducing global food prices to rise. First, some populous Third World countries are now experiencing rapid growth in per capita income. Second, political pressures for an increase in per capita food consumption are growing stronger in centrally planned economies. And third, although some of this rapid growth represents a shift of income from developed countries, little or no decline in per capita food consumption can be expected in these countries.

Eight of the major oil-exporting Third World countries (Algeria, Indonesia, Iran, Iraq, Mexico, Nigeria, Saudi Arabia, and Venezuela) had an aggregate 1977 population of approximately 361 million people. A simple average of per capita income growth rates (1970-77) for these countries is 5.6 percent per year, and the average per capita income in 1977 was $2,078. Food imports have risen in real terms an average of 19 percent a year. Even if real energy prices were to stabilize, an increasing proportion of income in the future is likely to be allocated to consumption; thus the demand for food will continue to increase. Expected growth in population and per capita income will lead to a rise in the real expenditure for food of more than 6 percent per year. Agricultural production has rarely achieved such a rate and, given the early stage of development of many of these countries, certainly will not do so in the near future.

Turning to the data for 12 selected rapid-growth Third World countries that are not major exporters of oil, it can be seen that their aggregate average growth rate of per capita income is also 5.6 percent for the period 1970-77. This represents an average income in 1977 of $800 per year. The countries included are Brazil, Hong Kong, the Democratic People's Republic of Korea, the Republic of Korea, Malaysia, the Philippines, Singapore, Syria, Taiwan, Thailand, Tunisia, and Turkey. Taken together they had a 1977 population of 349 million people and an average population increase of 2.4 percent a year in the 1970-77 period. The demand for food rose by well over 5 percent per year. If these

growth rates continue, as is likely for at least the group aggregate, it will be difficult for production growth to keep pace. But given the dynamic nature of these countries, it is possible that some will do so. On the other hand, the historical record shows that developing countries experiencing rapid agricultural growth tend to increase their food imports. Productivity growth in these countries will in general be sufficient to sustain high growth rates despite the slow growth in their traditional OECD trade partners.

Thus an aggregate population of more than 710 million people in Third World countries will be experiencing growth in demand for food at rates rarely matched in the past by growth in food production. The resultant pressure to import is clearly presaged by the doubling of food imports, in real terms, by the developing countries from 1970 to 1977.

India, which also has a population of about 700 million, is not included here. India has probably developed the institutional basis to sustain a 3.5 percent growth rate in foodgrain production and overall growth rates in gross national product of about 6 percent. Planning failures, particularly for the growth of power and transport, account for the peculiar phenomenon of industrial growth rates that are only slightly higher than those of agricultural growth, whereas the norm is for industrial growth rates to be some three times higher than agricultural growth rates for countries at India's stage of development.

India's success in agriculture and unusually low growth in demand for food has resulted in a shift from being an importer of 4-6 million metric tons of foodgrains to being a slight exporter—a trade shift at present grain prices of about $1 billion. However, India has moved from being a net exporter of vegetable oil to a $1 billion-a-year importer. So even this story of relative success in agriculture has served more to shift the composition of agricultural imports than to eliminate them. Once India adopts policies designed to accelerate industrial growth and employment, demand for food will rise sharply and be difficult to meet with domestic production alone. The precise effects on food imports will depend on complex price and trade policies and hence are difficult to predict. For rapid overall growth it would probably be better to return to importing foodgrains, even in a situation of rising real food prices, in addition to accelerating domestic grain production to sustain the growth of employment and the accompanying increased demand for food.

Particular note should be made of the growth in demand for livestock commodities in developing countries. Overall livestock consumption has been growing rapidly at 3.3 percent per year between 1961-65 and 1973-77. But consumption of poultry and pork has been growing even faster at 4.5 percent. Increments in these products are produced largely from concentrate feeds, which again places a drain on grain supplies.

The development strategy of the centrally planned economies has usually been to constrain food consumption below what would be expected in a market economy at the same level of income. The Soviet Union, however, now is clearly attempting to increase and stabilize the availability of livestock products. The result has been a major expansion of grain imports, a tendency that is likely to increase. Recent IFPRI research predicts that the Soviet Union will import 15-18 million metric tons of cereal grains annually during the next five years, and there is a 60 percent probability that the Soviets will import as much as 30 million metric tons in any given year. The Soviet Union is expected to maintain consumption even if production is highly unstable. These figures are based on a conservative estimate of 3 percent projected growth in livestock and livestock product consumption per year.

It may well be that recent sharp increases in food imports by the People's Republic of China can also be explained

by political pressures for an increase in food consumption, although occurring at an earlier development stage and at lower per capita income than in the Soviet Union. The U.S. Department of Agriculture expects net grain imports into the People's Republic of China to reach 15.5 million metric tons in 1980/81. They averaged 4-5 million metric tons from 1961 to 1977, then rose rapidly to 8.7 million metric tons in 1977/78 and to about 11 million metric tons in the following two years. Although oil exports from the People's Republic of China represent only about 1 percent of GNP, they do ease the foreign exchange situation, making it feasible to import grain if political conditions so demand. Political decisions to allow more rapid urban growth, to increase incomes in the countryside, and to increase worker incentives in nonagricultural sectors would all serve to encourage increased food imports, particularly if efforts to accelerate traditionally low growth rates in domestic food production fail to produce results in the near future.

The large increases in oil prices that are so important to the increase in demand for food in the major oil-exporting Third World countries retard or even depress income growth in the OECD countries. (For comparison, the OECD countries have an aggregate population of 758 million.) Some, such as Japan, may increase labor productivity and overall efficiency sufficiently to maintain significant growth in per capita income. But even in those high-income countries that are dealing with the problem less satisfactorily, food consumption responds so little to either high prices or stagnating income that food consumption growth rates are likely to be depressed only slightly.

Thus unprecedented growth in demand for food seems inevitable in the next few decades. That growth arises from the rapid increase in per capita income for extraordinarily large populations and at a stage in the development of countries in which population growth rates are still rising rapidly and in which people tend to spend a large proportion of income increments on food. It is also a stage in which growth in agricultural production leads to increases in employment in other sectors, which in turn accelerates growth in demand for food. Again, note that the developing countries with the fastest growth of agricultural production have substantially increased their net food imports.

The United States met 44 percent of the expanded demand for world exports of cereals in the 1970s. It was able to do so because of the stocks and acreage reserves it had built up in the 1960s. Those reserves are now drawn down. Moreover, increases in yield could well be slowing because research for increasing production was reduced during the surplus years of the 1960s. As a partial offset, some Third World countries could increase their exports sharply. These include Argentina and perhaps Brazil (despite rapid growth in domestic demand).

FLUCTUATIONS IN FOOD SUPPLIES

Although food intake will gradually improve in many Third World countries, the rising real price of food will continually squeeze the poor, and increased fluctuations of food supplies and prices will exert extreme pressure on them in some years.

From the 1960s to the 1970s the fluctuations (coefficients of variation) in wheat and rice prices increased from 4 percent to 30 percent and from 18 to 40 percent, respectively. In addition, much of the increase in production, particularly in the Soviet Union, has been in areas where weather extremes cause frequent production fluctuations. Although the debate on whether the climate is changing is unresolved, it is clear that weather has been unusually consistent and favorable for the past few decades. At least one should not be surprised if climatic

fluctuations are somewhat greater in the future.

The People's Republic of China has recently shown indications of smoothing fluctuations in domestic supplies through imports. Historically, China has been a major stabilizing influence on world rice markets, exporting in years of relatively high prices and importing in low price years.

If the United States, the supplier of 39 percent of world grain exports during the 1970s, were to stabilize domestic food prices in a time of global shortage by embargoing exports, there would be a sharp upsurge in international prices. In response to the substantial increase in food price instability a number of countries—most notably the European Community—have successfully insulated themselves from domestic and global fluctuations in supplies. The effects on world markets have been exacerbated by reduced stockholding by major surplus producers, particularly the United States. As a result fluctuations in the remaining markets are magnified.

THE NEW DYNAMICS OF TRADE

Rapid increases in oil prices in some developing countries and in productivity in others have introduced a major new dynamic to the world food situation. On the one hand, foreign exchange requirements, particularly for fuel and to some extent fertilizers, have increased greatly. On the other hand, much income has been transferred to countries with elastic demand for food. Thus the incentive for trading food for fuel and fertilizer has increased greatly. These tendencies are reinforced by the Soviet Union's emergence as a major supplier of fertilizer at the same time that its demand for food imports is rising sharply.

It is attractive for low-wage developing countries to expand their production and export of commodities that require labor-intensive cultivation such as livestock, fruits, and vegetables. Although increased employment will add to the purchasing power of low-income people, it will further tighten global grain supplies, as livestock feed is imported, land is diverted from cereals, and more grain is consumed by the newly employed.

If low-income countries become grain exporters themselves, it will adversely affect the poor in two ways. First, domestic grain prices will rise and thus the basic cost of subsistence will rise. Second, this increase in the cost of living will cause nominal wages to rise, making labor more expensive, and consequently employment opportunities will be reduced.

As the potential for expanding agricultural trade grows, domestic production decisions become more complex. The net food importers must make realistic judgments about which foods to import and what constitutes an optimal composition of imports and domestic production.

For the developing countries that are net food exporters, it may be more profitable to increase imports of certain agricultural commodities in order to allow exports of others to expand. It is urgent that domestic production allocations, including agricultural research emphases, be made in light of the increasing trade opportunities.

POPULATION GROWTH

Although income growth will be the major cause of rising food demand in the next decade, population growth will play an indirect role in forcing transfer payments and in interacting with other growth processes. (It will also enlarge the number of those who will experience a lack of real income.)

It is not accidental that food production growth in low-income countries usually keeps pace with population growth. In such countries population growth en-

larges the rural labor force and the capacity to produce food. If mounting pressure on land resources reduces labor productivity, per capita income declines, and per capita food consumption decreases by roughly the same amount. These effects may be reduced by working longer hours or by cutting back on production and consumption of nonfood goods and services.

Population growth may push more rural youth into urban areas, bringing about increased unemployment and depression of wage rates. The resulting national political pressures may then cause governments to provide transfer payments to lower-income people through food subsidy and distribution programs. Foreign assistance programs, motivated by concerns for equity or stability, may help to relieve the foreign exchange burden of consequent food imports. These programs, interacting with rapid population growth, may be important sources of growth in demand for food in the next decade in low-income countries still not experiencing rapid growth in productivity and income.

When an economy undergoes a transformation, with capital formation and technological change occurring rapidly in the nonagricultural sector, rapid population growth fuels that process. Consequently difficult-to-match growth in the demand for food takes place. Unless rapid technological change in agriculture accompanies it, the growth momentum will be difficult to sustain. If technological advances occur, the pressure on real food prices to rise is then the product of complex relations between the rate and nature of technological change in agriculture and the rate of growth in nonagricultural employment and income. Rapid application of modern high-yield agricultural technology will in itself restrain the rise in agricultural prices; large capital transfers, including higher oil revenues, will have the opposite effect.

There should, of course, be no misunderstanding about the deleterious economic effects of rapid population growth simply because the effective demand for food keeps roughly in pace with supply or eventually encourages faster overall economic growth. Rapid population growth tends to decrease labor productivity in agriculture, reduce the pace of transformation of the economy from agricultural to nonagricultural, and hence discourage growth in per capita income, in food intake, and in nutritional status. Its burden falls on the poor, whose income is derived solely from labor.

OUTLOOK FOR INCOME DISTRIBUTION

The burden of rising real prices of food and increased instability of supplies and prices falls largely on low-income people, especially in countries that are dependent on imports. The poor already spend the bulk of their income for an inadequate diet; they have few alternatives for reducing consumption. Thus for a given increase in grain prices in a low-income country, India for example, those who are in the lowest quintile on the income distribution scale reduce their grain consumption 10 times as much as those in the top 5 percent of the income distribution.

In the developing countries experiencing large increases in income, the impoverishing effect of rising food prices can be averted by expanding employment, accelerating domestic agricultural production, and allocating foreign exchange to food imports. Increased international financing and stocking may be important to these countries. For the portion of their populations that have still not benefited from the growth process, food and employment subsidies may be needed.

The problem is much more serious for those developing countries that have not yet experienced major increases in productivity or in the real prices of their export commodities. Countries where poverty is increasing and nutritional status

declining include the bulk of the nonoil-exporting countries of Sub-Saharan Africa. For these countries population has been growing faster than food consumption. Considerable shortfalls in domestic agricultural production growth have been made up by increasing imports that have already become difficult, perhaps impossible, to finance.

Since most of these countries are at an early stage of economic development and they are short of trained people, developmental institutions, and physical infrastructure, it is not likely that currently slow growth rates in agriculture can be greatly accelerated in the near future. Area expansion is slow and yields are increasing only one tenth as fast as in the more successful Asian countries. The long-term potential is great, but it will take complex research, education, input delivery, and policy analysis systems to achieve it. For now the relevant tasks are to lay the groundwork for future rapid growth and to find means of mitigating the short-run problems of declining real income and nutritional status of the poor. The international community will be under pressure to assist in these tasks.

IMPLICATIONS FOR DEVELOPMENT STRATEGY

The incentive to emphasize food production in development strategies will rise sharply over the next few decades, most obviously because of higher real food prices. But from a more sophisticated view, labor in the next decade will be relatively cheaper except when higher food prices occur. Thus increased food production raises income directly and relaxes a labor constraint more than in earlier periods.

The current plight of low-income people only serves to reinforce the need for expanded food supplies. Without increased food supplies, any effort to raise the incomes of the poor, whether through redistribution or employment, is cancelled out by further increases in food prices. Because the principal means of increasing food production also raises labor productivity, there is both an opportunity and a need to increase employment in other sectors. The more food production is accelerated, the greater is the need and the opportunity to increase employment.

Thus, the appropriate development strategy for the coming decades will be to emphasize agricultural production more than ever before and to utilize the resulting increase in farm income to stimulate other sectors, thereby increasing employment, the incomes of low-income families, and hence their effective demand for food.

IFPRI'S RESEARCH PROGRAM

Research at the International Food Policy Research Institute is conditioned by this analysis and much of the foregoing data is drawn from recent IFPRI research. The details of the research effort are discussed in succeeding sections of this report.

To summarize briefly, a series of research projects are investigating the causes and geographic distribution of the food problems foreseen for the near future. The effect of rapid growth in consumption of livestock products is emphasized because of its influence on general food availability. The dynamic food situations in the Middle East and in the People's Republic of China are also being studied. These analyses will provide an improved diagnostic framework for the rest of IFPRI's programs.

IFPRI researchers are increasingly concerned about the potential for severe cyclical crises and continuing unrelenting deterioration in the nutritional status of low-income people in the face of rising real food prices. IFPRI's research on food consumption has two focuses. First, analysis is under way on the range of national policies that either directly through food subsidies and other inter-

ventions or indirectly through growth and commercialization affect income distribution and nutritional status. Second, IFPRI researchers are continuing to study international schemes for stabilizing food supplies and meeting emergency needs. These efforts will be even more important for the poor in coming decades than they were in the past.

Because of IFPRI's concern for the increasingly difficult food production problem, much research is concentrated on analysis of agricultural research resources, inputs such as fertilizer and irrigation, the effect of changing trade relations on the kinds of agricultural commodities produced, and price policy. In all this work participation of small farmers and the inclusion of poor resource areas receive attention, although it is clearly recognized that the bulk of improvement for the poor must be from other directions.

A substantial portion of IFPRI research deals with development strategy as it relates to food policy and food availability. Although agriculture plays a dominant role in the economies of low-income countries, it still must compete for resources with other sectors. Thus solutions to rural poverty should be sought by examining the interactions of agriculture with other sectors, not by considering agriculture as an isolated entity. IFPRI's largest effort on development strategy therefore concerns linkages—how vigorous agricultural growth stimulates employment and growth in other areas.

IFPRI research reveals a wide range of options to policymakers. The pressures of conflicting objectives bring growing recognition by policymakers of the value of policy research if it is defined in terms relevant to their needs. Such recognition leads to increasing application of the Institute's work.

John W. Mellor

April 1981
Washington, D.C.

RESEARCH RESULTS

FOOD TRENDS ANALYSIS PROGRAM

The Food Trends Analysis Program conducts research to determine the size, composition, and dynamics of the food problem in the Third World both at present and in the future. It derives general indications of the possible extent and locations of serious food gaps in the coming decades from the analysis and projection of the historical trends of food production and consumption in the developing countries. The analysis of food trends forms the basis for research in IFPRI's other programs and highlights the problems that need to be addressed through national and international action.

FOOD GAP ANALYSIS FOR THIRD WORLD COUNTRIES

The core project of the Food Trends Analysis Program has been the periodic assessment of the current and future food situation in developing countries. The ongoing effort is the third assessment. The first, in 1976, analyzed and projected cereal production and consumption to 1985; the second expanded the analysis to include important noncereal food crops and viewed food gaps in 1990; and the present anaysis, which includes livestock and poultry products, makes projections to 2000. The coverage of Third World countries has expanded from about 80 to more than 100 developing countries, including the People's Republic of China.

The present study, which primarily uses data from the Food and Agriculture Organization of the United Nations (FAO), examines the 1961-77 trends of food production, consumption, and trade in the developing countries and, using trend-based projections, develops a scenario of their food situation in the year 2000. In projecting future consumption, it uses United Nations population data and the historical series of income estimates developed by the World Bank.

The work on livestock and poultry products represents IFPRI's first attempt to analyze and project the production and consumption of these commodities for all developing countries. The analysis attempts to relate the growth of livestock and poultry production with the growth in the demand for animal feeds. With rapidly rising incomes in a number of Third World countries, the increasing use of major food crops, especially grains, as animal feed necessarily competes with their demand for direct human consumption by the poorer segment of the population in these countries.

In projecting livestock and poultry output, there was initial concern that the possible existence of livestock cycles in developing countries might disturb the estimation of long-term trends in livestock products from small sample historical time-series data. A method devised for calculating the trend equation with major cyclical influences removed gave findings leading to the tentative conclusion that, where cycles appear to exist, their effects on trend-based projections of ruminant meat output in developing countries for the period 1961-77 are generally minimal.

During 1980 data analysis was completed for 40 countries in Sub-Saharan Africa. Analysis of developing countries of Asia, North Africa/Middle East, and Latin America is still in progress. Preliminary findings for Sub-Saharan Africa indicate that production of major food crops between 1961 and 1977 expanded at an average rate of about 1.6 percent a year,

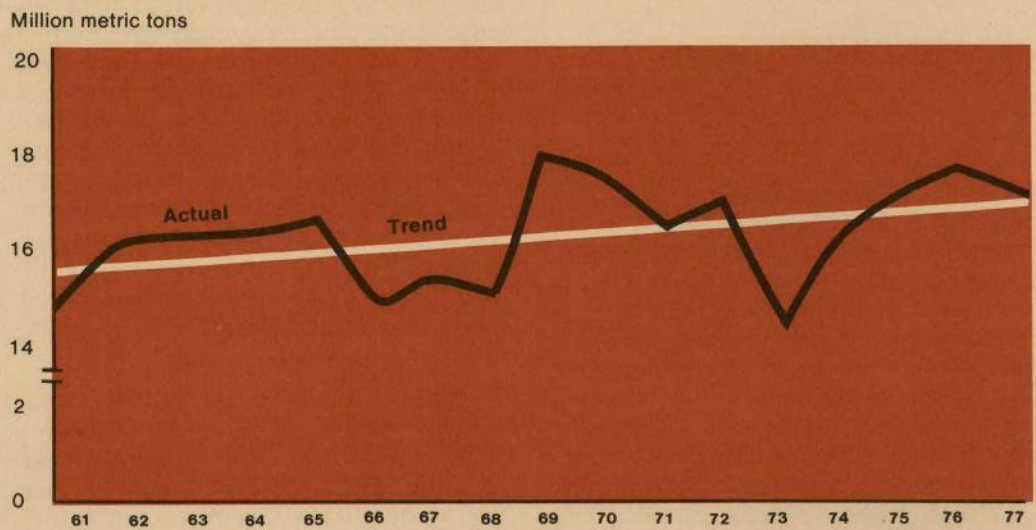
one percent slower than population. Specifically, output in the Sahelian countries remained practically unchanged during the 16-year period, and that of Nigeria increased at an annual trend rate of only 0.5 percent (see Figure 1). In addition, about 80 percent of the production growth of these crops came from increases in crop area and only 20 percent from improvements in output of area already under cultivation. Extreme weather variations in the 1961-77 period, especially in the Sahel, caused severe production fluctuations, which magnified the food problems in the region.

Meat, milk, and egg output in the region expanded at yearly rates of 2.3 percent, 1.5 percent, and 3.4 percent, respectively. Although livestock and poultry production generally increased during the period, the output of some specific commodities, such as ruminant meat in Ethiopia and cow milk in the Sahel, stagnated.

About 80 percent of the production of major food crops in Sub-Saharan Africa is consumed directly as food. The share of production used for animal feeds is relatively small (about 2.5 percent during 1973-77). The analysis indicates that per capita consumption (domestic use) of major food crops generally declined for the region as a whole and significantly decreased in Ethiopia, Kenya, Nigeria, and the Sahel. Increases occurred in Ghana, Madagascar, and Zaire. Data on livestock products show that meat and milk consumption lagged behind population growth for the region as a whole. Rapid growth in consumption occurred for meat in Zimbabwe and Tanzania, for milk in Nigeria, and for eggs in Uganda, Kenya, Somalia, and Tanzania.

In the area of trade, the study found that Sub-Saharan Africa shifted from a position as a minor net exporter of mostly noncereal food crops in the early 1960s to that of a major net importer of mostly cereal food crops in the mid-1970s. Between 1973 and 1977, the region had

Figure 1
Major staple food crop production in Nigeria, 1961-77



Source: Leonardo A. Paulino and Patrick Yeung, "The Food Situation in Sub-Saharan Africa: A Preliminary Assessment," in "Food Policy Issues and Concerns in Sub-Saharan Africa," papers prepared by researchers at the International Food Policy Research Institute for preliminary discussion with colleagues in Ibadan, Nigeria, February 9-11, 1981.

Figure 2
Major food crop production and consumption in Sub-Saharan Africa, 1977 and 2000

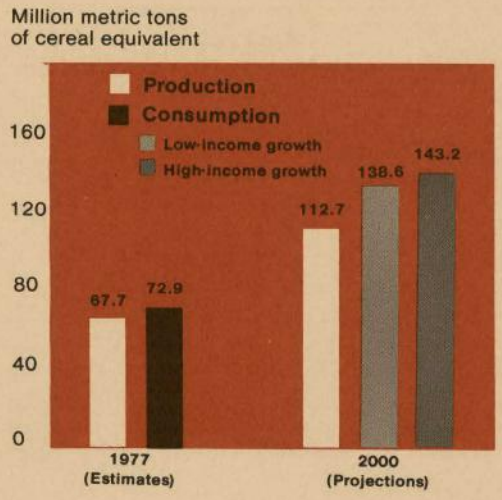
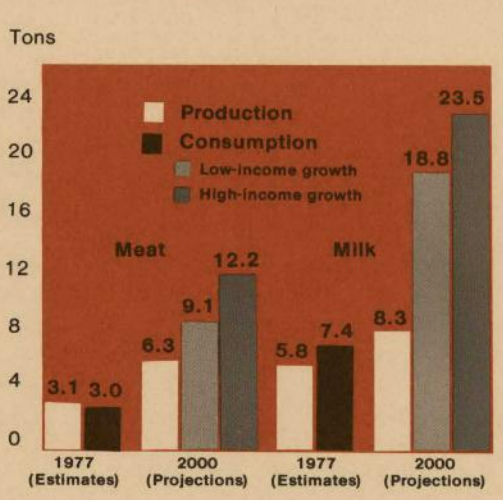


Figure 3
Livestock product production and consumption in Sub-Saharan Africa, 1977 and 2000



Source: Leonardo A. Paulino and Patrick Yeung, "The Food Situation in Sub-Saharan Africa: A Preliminary Assessment," in "Food Policy Issues and Concerns in Sub-Saharan Africa," papers prepared by researchers at the International Food Policy Research Institute for preliminary discussion with colleagues in Ibadan, Nigeria, February 9-11, 1981.

net food crop imports averaging 5 percent of its total domestic use of these commodities. Nigeria's very slow growth of food production combined with its fast growth in food consumption due to increases in income resulted in rapid growth of the country's food imports including cereal and livestock products.

The study indicates that by the year 2000 the region will have aggregate deficits of 36-40 million metric tons of major food crops, 10-15 million metric tons of milk, and 4-7 million metric tons of meat, for low and high growth rates of income (see Figures 2 and 3). Although aggregate deficits of 0.5-0.9 million metric tons of eggs are indicated for the region in that year, egg consumption will continue to be limited by local availability.

Assuming that food self-sufficiency in the region by the year 2000 is the long-term goal, food production in Sub-Saharan Africa must expand much faster than it has. The "required" average annual growth rates of food output during the period 1977-2000 are 3-4 percent for the major food crops, 5-6 percent for meat and milk, and 6-7 percent for eggs.

DATA BASE IMPROVEMENT

As a part of its continuing development of a sound data base for the food-gap analysis, the Food Trends Analysis Program completed a study in 1980 that examined the differences between the data on the major staple food crops that are published by the FAO and the United States Department of Agriculture (USDA). *A Comparative Study of FAO and USDA Data on Production, Area, and Trade of Major*

Food Staples, Research Report 19, by Leonardo A. Paulino and Shen Sheng Tseng, identifies the areas of divergence between the statistics of these two organizations and the possible causes of data differences. The report compares FAO and USDA estimates on the production, area, and trade of cereals and on the production of the major noncereal food crops for all countries and the aggregates for geographical regions, economic groups, and the world as a whole.

The study found that data divergences between the FAO and USDA statistical systems, which generally are both based on the same sources of country statistics, are in part due to the unequal number of countries reported by the systems, and the difference in the reference period used for their estimates. USDA reports on four fifths as many countries as FAO for the production and area of cereals, on two thirds to three fourths as many for cereal trade, and on half as many for the production of the major noncereal food crops (see Table 1). Differences in country numbers do not appear to contribute much to the divergences between FAO and USDA aggregates of cereal area, production, and trade. Regional aggregates of cereal production, for example, diverge largely because of the estimates of a few, mostly developing, countries. However, the uneven number of reported countries in the two systems clearly causes divergences between the aggregates for noncereals.

The FAO statistics refer to the calendar year from January to December, whereas those of USDA are generally oriented to the split-year period from July to June. Because most crop harvests in Northern Hemisphere countries occur between July and December, production and area data for these countries are reported under the same designated reference year and are in close agreement in the two systems. But for many countries in the Southern Hemisphere, the major crop harvests that occur after December result in a one-year lag between FAO and USDA data on production and area. The difference between the FAO and USDA reference periods can be expected to contribute more to the observed discrepancies between their statistics on cereal trade which follow specific accounting periods. However, data divergences in cereal imports and exports may have to be attributed to other causes because the comparison of six-year averages, which should minimize discrepancies arising from this factor, gave results in the general magnitude of single year comparisons.

The study concludes that data divergences unexplained by these two factors can be traced in part to the difference in approaches and in the methods of collecting and handling country statistics by the two organizations. FAO assembles data reported by member governments and avails itself of unofficial sources when necessary; it generates preliminary estimates when national governments report inconsistent data or are unable to provide the needed information. USDA gathers country statistics through its ag-

Table 1
Countries reported by FAO and USDA for food crop production and area and cereal trade, 1975

	FAO	USDA	Common
Crop production/ area			
Cereals	161	124	114
Noncereals	180	92	91
Cereal trade			
Imports	188	126	119
Exports	145	110	93

Source: Leonardo A. Paulino and Shen Sheng Tseng, *A Comparative Study of FAO and USDA Data on Production, Area, and Trade of Major Food Staples*, Research Report 19 (Washington, D.C.: International Food Policy Research Institute, 1980), pp. 48-51.

ricultural attachés abroad, who use both official and unofficial sources; it assesses these statistics for reliability and historical consistency and revises them when deemed appropriate. Because most of the differences between FAO and USDA agricultural data are accounted for by developing countries with apparently weak data-collecting systems, it seems likely that the data changes and independent estimations being made by these agencies are a major source of these differences.

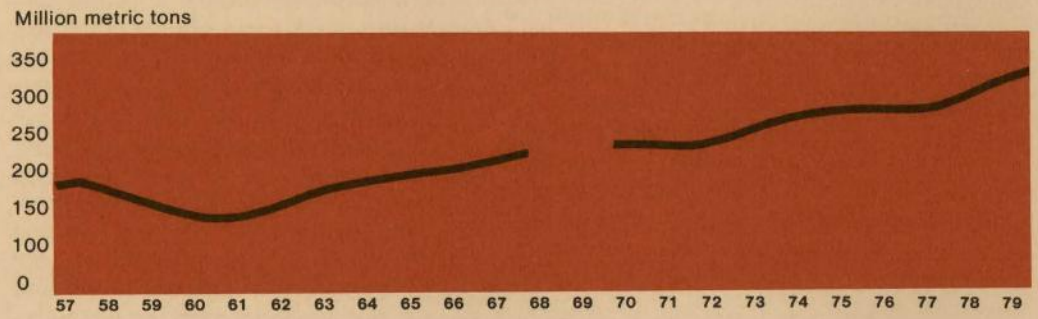
During 1980 the Food Trends Analysis Program continued its assembly and analysis of Chinese statistics in its efforts to expand its data base. Two research reports on the People's Republic of China were completed. *Food Production in the People's Republic of China*, Research Report 15, by Anthony M. Tang and Bruce Stone, contains two analyses. The first reviews China's development strategy and its relation to China's agricultural sector between 1952 and 1977. This work by Tang predicts that China's plans for food production and imports should provide the Chinese people with basic nutritional needs through the year 2000. The second analysis, by Bruce Stone, examines current Chinese agricultural policies and goals based on China's past agricultural record. Although it concludes that China will be able to attain its goal of 400 million metric tons of grain by 1985, such achievement will take an immense effort.

Supplementing the data made available from these studies, *A Review of Chinese Agricultural Statistics, 1949-1979*, Research Report 16, by Bruce Stone, presents a collection of statistics useful for understanding problems of foodgrain supply and demand in the country during the last 30 years. The *Review* is primarily concerned with national data from official government series, separate estimates, and unofficial attempts to reconstruct official series from various Chinese materials. It also includes discussions of discrepancies among series, general data quality, probable future trends, and other issues of significance.

The systematic publication and dissemination of Chinese official statistics, which ceased in the late 1950s, resulted in the paucity of agricultural data for the 1960s and most of the 1970s. Consequently, research dealing with the agricultural economy of China during this period required the painstaking and time-consuming process of gleaning scraps of information and isolated figures from the Chinese press and radio, visitor and refugee reports, and data-lean government and academic publications. Publication of official data was resumed in June 1979 when the State Statistical Bureau presented a collection of production statistics for 1977 and 1978, followed months later with mid-year estimates for 1979. In the succeeding year, final production figures for 1979 were published together with comparisons of output for the years 1949, 1952, and 1978. The *Review* includes these and other current official statistics that were made available later.

The study assumed that Chinese official data, some of which needed adjustments for consistency, and series generated from official material can better reflect actual events than wholly independent estimates made outside the country. As indicated by the available statistics, foodgrain production in China expanded 1.8 percent a year in 1958-70 and 3.5 percent during 1970-79 (see Figure 4). After a rapid recovery of output during 1949-52 following the wartime decline, a production growth rate of 3.5 percent a year was achieved in 1952-57 based largely on traditional techniques and organizational changes. An output decline due to natural disasters and the poorly conceived and executed policies of the Great Leap Forward during 1958-60 was followed in 1961-67 by recovery and rapid growth centered in areas that adopted modern agriculture. China underwent another brief wave of decline and recovery in 1968-70, which lagged during the first phase of the Cultural

Figure 4
Foodgrain production in the People's Republic of China



Source: Bruce Stone, "China's 1985 Foodgrain Production Target: Issues and Prospects," in Anthony M. Tang and Bruce Stone, *Food Production in the People's Republic of China*, Research Report 15 (Washington, D.C.: International Food Policy Research Institute, 1980), p. 88.

Note: This includes soybeans and tubers valued at one fifth of their natural weight.

Revolution. Periods of alternating stagnation and rapid expansion occurred between 1971 and 1976, arising from widespread adoption of modern agriculture accompanied by bad weather and by rural policy problems during the end of the second phase of the Cultural Revolution. From 1977 to 1979 China was in a period of transition, featuring auspicious policy changes, large increases in application of industrial inputs to agriculture, and rapid growth.

Based on the assembled data, the study also examines the changes in population, livestock, international grain trade levels, per capita foodgrain and total caloric consumption, cultivated area, multiple cropping, crop distribution and yields, fertilization, farm mechanization, crop pest and disease control, irrigation, rural electrification, and the rural terms of trade. The *Review* relates these to the changes of Chinese agricultural policy during the past three decades.

FOOD POLICY RESEARCH STATISTICS

Another project in progress is the organization of a set of derived statistics drawn from data related to food policy that IFPRI has collected over the years. The compilation includes information on food production and consumption, agricultural production and trade, agricultural inputs, food aid, national expenditures for agriculture and agricultural research, and other food-related matters. These are being presented on a country basis and mostly in terms of relationships between variables and of their trends and other indicators of change. Currently a larger set of these derived data is being organized for internal use by the IFPRI research staff. A smaller compilation of the data will form the basis of a "facts book," which will be published as a service to the research community.

IFPRI continues to share its data library on food and agriculture with sister institutes within the CGIAR system. Requests have been answered for time-series and processed data on wheat, maize, and barley by the International Maize and Wheat Improvement Center (CIMMYT), on root crops by the International Potato Center (CIP), and on sorghum, millet, chickpeas, pigeonpeas, and groundnuts by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

FOOD PRODUCTION AND DEVELOPMENT STRATEGY PROGRAM

Research priority and design in the Food Production and Development Strategy Program are based on three premises: the process of growth must be consciously guided to ensure maximum participation of the poor in its benefits; the forces governing agricultural growth are complex, interrelating agriculture with other sectors; and technological change is central to the process of acceleration in agricultural production. The program has moved progressively toward empirical research designed to generate conclusive evidence and to conceptualize policy issues. These conclusions are expected to influence the production policies of developing nations in direct and indirect ways.

Researchers in the production program have been working on 12 interrelated projects in 1980. These projects focus on policy issues in three broad areas: specific production policies, production strategies, and linkages between agriculture and the rest of the economy.

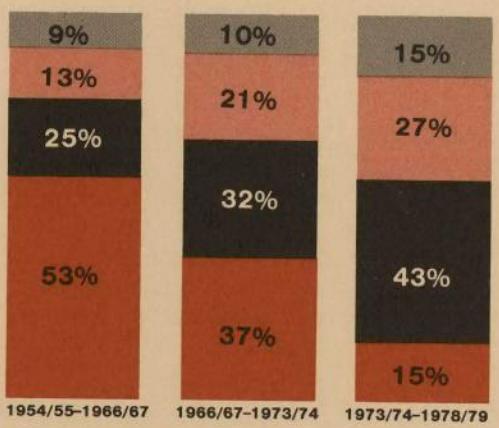
SPECIFIC PRODUCTION POLICIES

Research is being undertaken in four areas.

FERTILIZER

Research completed in the continuing project on fertilizer shows that although chemical fertilizer use began in the 1840s, over 90 percent of the growth in world fertilizer consumption has occurred since World War II, more than half since the mid-1960s, and more than a quarter after the oil crisis of 1973/74. Between 1973/74 and 1978/79, the developing countries, which currently use only a quarter of the world's fertilizer, increased their consumption by 9 million metric tons—as much as the growth in the entire world's consumption in the first century of fertilizer use. In the five years after the oil crisis, developing countries accounted for more than 40 percent of the total increment in world fertilizer consumption (see Figure 5).

Figure 5
Share of total growth in world fertilizer use by country group



Source: Estimates made by Gunvant Desai from data in several FAO publications on fertilizer consumption.

A common element underlying the rapid growth in fertilizer consumption at different times and in several countries is the push from the supply side which often originated from events and variables exogenous to farmers' effective demand for this input. Expanded fertilizer supply accelerated growth in consumption not only through lowering fertilizer prices but also, and often more decisively, by exerting pressure for the development of systems for fertilizer promotion and distribution, agricultural research, extension, and credit.

Three major considerations underscore the importance of the supply side in generating sustained growth in fertilizer consumption of the developing world. They are substantial untapped potential for fertilizer use, the complementarity between yield-increasing technologies and high levels of fertilizer use in the developing countries, and the continued heavy dependence of developing countries on fertilizer imports. These considerations raise a number of policy questions about making increased fertilizer supplies available to the developing world, particularly because of the shifting locations of fertilizer surpluses from the developed market economies to the centrally planned economies of the U.S.S.R. and Eastern Europe.

In its second phase, the research on fertilizer is examining the complexities of interdependence among the essential elements in the process of growth in fertilizer use. This will make it possible to identify key policy areas and alternative policy instruments. Research has also begun on a detailed study of Nigeria.

IRRIGATION

Research on the impact of irrigation on rice production has been conducted as a part of the collaborative Rice Policy in Southeast Asia Project which is reported in the Regional Projects section.

AGRICULTURAL RESEARCH

Agricultural growth is likely to falter without a steady flow of tested technology. Effective institutions for agricultural research are the primary sources of new technology. Unfortunately, developing nations have frequently failed to appreciate the crucial role of agricultural research. Francis S. Idachaba's *Agricultural Research Policy in Nigeria*, Research Report 17, published in 1980, supports this conclusion. It points out that, although the agricultural sector is of major importance in Nigeria's national economy, allocations to agricultural research have been reduced drastically in the last 20 years. Idachaba suggests that the funding for agricultural research should be a joint federal and state responsibility and that new investments should be made in research on farm labor and mechanization. Furthermore, efforts should be made to integrate institutional and university research.

IFPRI will undertake a major project on agricultural research. The emphasis will be less on traditional cost-benefit analysis of research and more on the resource allocation mechanism for agricultural research, management of research resources, and manpower development for research. Analysis of national research systems will be the main focus of these investigations.

RISK MANAGEMENT POLICIES

When agricultural prices and yields are uncertain, the allocation of resources is often inefficient. Domestic food supplies and export earnings fluctuate. Government interventions in risky markets may be desirable to mitigate these effects, but not enough research has been conducted to provide sound guidance on the appropriate mix of intervention policies. As an initial effort in this area, IFPRI is developing and testing an analytical framework that could be used in evaluating risk management policies in collabo-

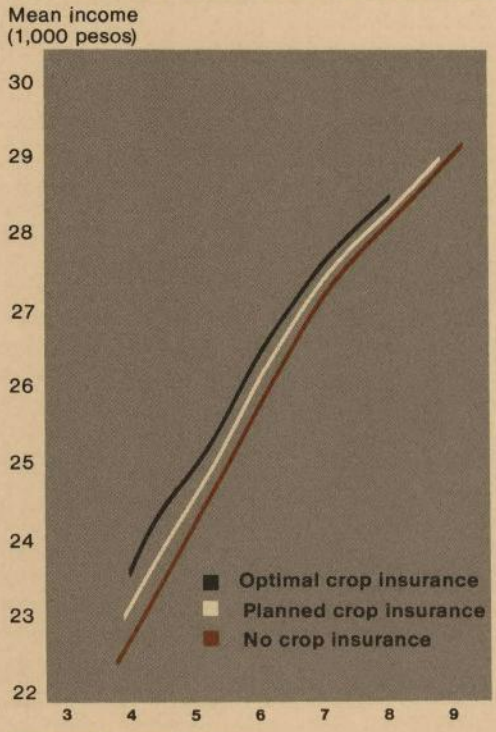
ration with researchers from other institutions. Particular attention is being given to price stabilization schemes and crop insurance programs.

Research completed in 1980 indicates that the social gain from price stabilization may be large but the size of the gain is sensitive to market parameters. For example, if demand and supply elasticities are both 0.5 and the coefficient of variation of yields is 0.1, then for each $200 transacted in the stabilized market (equivalent to about one ton of wheat), the maximum social gain from price stabilization ranges from $3.36 when producers plan on the basis of average revenue forecasts to $60.15 when producers expect last period's price. These gains increase to $17.85 and $166.78, respectively, when the coefficient of variation of yields is 0.25. Because the gains are consistently small when producers plan on the basis of average revenue forecasts, a program of data collection, appropriate forecasting, and information dissemination could encourage producers to act on the basis of more accurate predictions, thus achieving a large part of the gains of a buffer stock scheme. If producers consistently use the average revenue forecast, price stabilization is unlikely to return an attractive gain in social welfare unless the coefficient of variation of yields is exceptionally high.

Other research in this area has developed a method for evaluating price stabilization policies that takes into account the interactions between markets arising from interdependencies in the supply and demand of commodities. It also allows for adjustments in resource allocation patterns and changes in average supply, domestic prices, employment, and export earnings that result from the reduction in price risk confronted by producers. The method is illustrated by the evaluation of a hypothetical bean price stabilization scheme in Guatemala. The results suggest that the social welfare gain from such a scheme is likely to be modest but producers' incomes might be significantly increased (by about 2 percent). National bean production might increase by 4 percent on average, whereas the domestic price would decline by about 14 percent.

Research also shows that the effectiveness of crop insurance depends on the level of development of other risk-sharing institutions (such as rural credit markets), on complementary government policies (such as price stabilization schemes), and on farmers' ability to insure themselves through savings or crop diversification or both. Experiments with a model of the temporal rainfed areas in Mexico showed that there are situations where crop insurance may be quite beneficial to farmers (see Figure 6). The converse is also true. An analysis of food

Figure 6
Levels of mean income and income risk with and without crop insurance schemes for rainfed areas of Mexico



Source: Peter B. R. Hazell, "Economic Considerations in the Design of Crop Insurance for Small Farms," International Food Policy Research Institute, Washington, D.C., 1980. (Mimeographed.)

crop insurance using an agricultural sector model of Guatemala suggests that the supply response effects of insurance can be significant and that social welfare might be increased through crop insurance. Therefore the main beneficiaries might be consumers; producers' incomes decline when the additional supplies of food are sold in the domestic market (because of inelastic demand). This result counters the argument that crop insurance should be left to the private sector; private insurance agencies have no means of capturing any of the gains when they accrue to consumers. This work was undertaken at the request of the Mexican government, which is attempting to design government risk-sharing schemes for farmers in temporal rainfed areas in an effort to boost national food production. IFPRI has also been asked by the Inter-American Institute of Agricultural Sciences to look into the feasibility of crop insurance schemes for small farmers in other Latin American countries.

PRODUCTION STRATEGIES

Determining the effects of various policy choices is crucial for many developing countries because of sharp conflicts in policy objectives and the need for the appropriate use of resources. A number of research projects in the production program are designed to explore the scope of this strategic adjustment in production policies. Also, researchers have participated in discussions on production-related issues outside of the Institute. At the request of the Bangladesh government, IFPRI was called upon to comment upon on the strategy and design of the agricultural sector of Bangladesh's Second Five-Year Plan. Participation has also occurred in country missions organized by multilateral donors. Missions to Bangladesh and Nepal under the initiative of the International Fund for Agricultural Development (IFAD) were concerned with production strategies in agriculture.

MULTIPLE CROPPING

In *Impact of Irrigation and Labor Availability on Multiple Cropping: A Case Study of India,* Research Report 20, Dharm Narain and Shyamal Roy examine the factors that contribute to multiple cropping from state to state and in areas within selected states and identify those factors most important for increasing cropping intensity.

Multiple cropping, the planting of successive crops on the same land in the same year, is assumed to depend on three factors: availability of labor per unit of sown area and extent and quality of irrigation. The pressure of population expansion produces the incentive to grow more food and also provides the labor needed. However, where rainfall is insufficient or the soil cannot retain moisture, irrigation is the most essential factor. Regression equations show that in 12 of 17 selected states these three factors account for 80 percent of variance in multiple cropping. Data on these variables appear in Table 2.

Widespread irrigation facilities are of little use if the source of water dries up in the postmonsoon season. Therefore the quality of irrigation explains 43 percent of the variance in multiple cropping, whereas the extent of irrigation explains only 8 percent. An attempt to determine the relative value of the various kinds of irrigation for multiple cropping shows that tubewells have the most positive effect—double that of dug wells and canal irrigation. A 1.0 percentage point increase in area irrigated by tubewells increased the cropping intensity index by 0.9 percentage points.

This report concludes that the amount of irrigation expansion called for in the Sixth Five-Year Plan (15 million hectares) would yield a 5-6 percentage point increase in cropping intensity or a 1 percent increase per year in gross cropped area. Even without an increase in the growth rate of productivity, this would lead to a 3.5 percent increase per year in agricultural production. If a larger portion

Table 2
Factors influencing multiple cropping in India by state, 1973/74

State	Cropping Intensity[a]	Availability of Labor[b]	Quality of Irrigation[c]	Extent of of Irrigation[d]
Andhra Pradesh	114	0.5	27	28
Assam	125	1.1	22	24
Bihar	129	1.0	21	28
Gujarat	108	0.4	13	14
Haryana	144	0.4	49	49
Himachal Pradesh	163	1.6	66	17
Jammu and Kashmir	133	1.2	20	44
Karnataka	106	0.4	18	12
Kerala	136	0.5	40	21
Madhya Pradesh	114	0.4	5	9
Maharashtra	106	0.4	20	8
Orissa	122	0.6	35	15
Punjab	146	0.4	55	72
Rajasthan	112	0.4	13	15
Tamil Nadu	129	0.8	31	46
Uttar Pradesh	134	0.9	17	42
West Bengal	121	0.7	4	24

Source: Dharm Narain and Shyamal Roy, *Impact of Irrigation and Labor Availability on Multiple Cropping: A Case Study of India*, Research Report 20 (Washington, D.C.: International Food Policy Research Institute, 1980), p. 27.

[a] Gross cropped area as a percent of net sown area.

[b] Cultivators per hectare.

[c] Multiple cropped area irrigated more than once as a percent of net irrigated area.

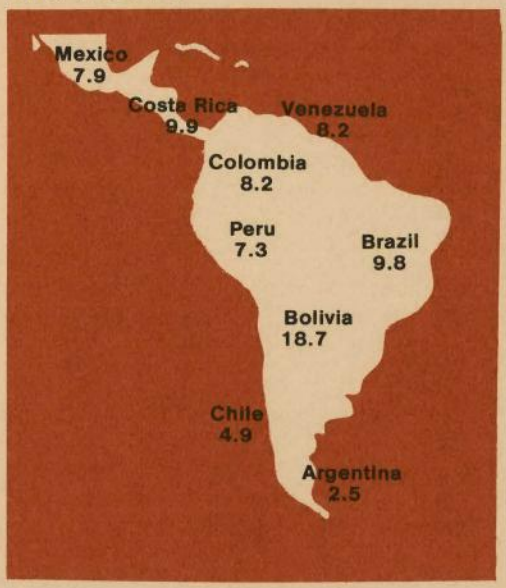
[d] Net irrigated area as a percent of net sown area.

is irrigated by tubewells, the expansion of gross cropped area would probably be even greater. The resulting growth in productivity, especially if yield-increasing technologies are used on these newly irrigated areas, could put the targeted annual growth rate of 4 percent well within India's reach.

PUBLIC RESOURCE ALLOCATION TO AGRICULTURE

Allocation of public financial resources is generally used to accelerate agricultural growth. IFPRI's initial research effort in this area developed homogeneous expenditure series for governments of nine Latin American countries. A preliminary paper has been prepared presenting the expenditure series and some conclusions. It shows that aggregate government expenditures for the agricultural sector have increased at an annual rate of 8 percent in the nine countries (see Figure 7 for the individual growth rates), but the expenditures varied greatly from country to country and from time to time. The government expenditure for the agricultural sector as a percentage of aggregate gross domestic product ranged from about 1 to 4 percent, and as a percentage of the value added in the agricultural sector ranged from 3 to 20 percent. The average share of agriculture in the total government budget was greater than 5 percent but was highly variable primarily because expenditure for agriculture fluctuated.

Figure 7
Annual average rates of growth of government expenditures on agriculture, 1950-78



Source: Victor J. Elias, *Government Expenditures on Agriculture in Latin America*, Research Report 23 (Washington, D.C.: International Food Policy Research Institute, 1981).

There was a high degree of association between the output-land ratio and the public input-land ratio in the countries under study. This is indicative of the effectiveness of public expenditure in improving agricultural productivity. But this requires further inquiry before arriving at firm conclusions.

PRICES AND INCENTIVE POLICIES

IFPRI is also studying price and incentive policies in West Africa, Southeast Asia, and Bangladesh. Work continued throughout 1980 on a project to examine whether technological change in West African agriculture could help resolve conflicts between the need for food and export crops. A first phase of this research dealt with the introduction of cultivation with oxen to Mali and Upper Volta, a new farming method in most of the savannah. Research indicates that animal traction technology can boost overall farm productivity if used in conjunction with new seed-fertilizer technologies. But because of seasonal labor shortages and the lack of modern technology, the use of animal-driven mechanized equipment is unlikely to increase cereal output in these countries appreciably. A second phase of the project considers the price policy options for accelerating coarse grain production in West Africa, taking into account the technologies available to farmers, the elasticities of factor supplies, and farmers' response to income incentives.

The collaborative Rice Policy Project in Southeast Asia, discussed in the Regional Projects section, is considering price policies. A recently completed study on agricultural price policy in Bangladesh shows that formulation of agricultural price policies is an extremely complex task requiring identification and evaluation of the multiple effects of price changes on production and consumption activities as structured by specific conditions of a given country. Production response to prices of rice, measured as a supply elasticity, is estimated to vary from 0.18 to 0.26, reflecting almost equal effects from changes in area and yield. However, since the increase in rice area is realized mostly at the cost of jute, an export crop, it does not represent a net gain to the economy. A loss is evident in overall production and employment. Thus, a moderate change in relative prices in favor of jute is desirable. This can be done by withdrawing the export tax on raw jute or by keeping the price of rice down. The study emphasizes that the agricultural price policy should be used along with technological change. It is the balanced combination of prices, technology, and institutions that sustains production growth. Without appropriate technology and effective institutions, a unilateral push in prices of the main staple may actually accelerate the process of land transfer from small to large farms.

The outstanding impediment to maintaining a high foodgrain price is consider-

ation for the nutritional status of low-income households. The short-run impact on consumption of higher foodgrain prices is more severe than the long-run impact, which primarily depends on the response of wage rates and employment to foodgrain prices. Substitution among crops with different degrees of labor intensity, a dualistic labor market with a rapidly growing labor force under the wage labor category, and the low productivity of labor all combine to limit the impact on wage income. As a result, the adverse effect of higher prices on consumption persists in the long run, but on a somewhat reduced scale. Price policies do not, however, become irrelevant in such a situation, although emphasis shifts and mechanisms differ.

The research on price and incentive policies was developed by Dharm Narain, who brought with him from India a wealth of experience and knowledge on researching, formulating, and operating price policies. His untimely death in October deprived IFPRI of valuable research leadership. At the time of his death, he was conducting a major analytical work dealing with the relationships between foodgrain prices and rural poverty in India. The production team at IFPRI is attempting to carry on his work.

GROWTH AND EQUITY

The conflict between growth and equity in the context of contemporary development problems cannot be minimized. The strategy adopted in India for increasing agricultural production in the 1960s aimed at rapid growth; it was implicitly assumed that distributive justice would follow. The success achieved in the growth of foodgrain production was outstanding, but it became clear that interpersonal and interregional disparities were widening with a potential for social unrest in the rural areas. Concern for equity and social justice grew, leading to the launching of specific equity programs designed to remedy the imbalances, superimposed as it were on those aimed at maximizing production. But these special programs were also unsuccessful in making a visible dent in the massive problems of rural unemployment and poverty. This led to a debate on whether growth and equity are goals that can be achieved simultaneously.

IFPRI's exploration of the growth and equity problem has yielded some insights on the nature of rural poverty and policies appropriate to alleviate it. The Indian experience shows that the use of high-yielding varieties is just as beneficial to small and marginal farms as it is to larger farms. The techniques can be readily adopted by farmers of smaller plots provided the requisite resources are available to them. Furthermore, irrigated area, cropping intensity, labor input, and productivity per hectare are relatively higher on small farms than on large. The technology for improving yields on dry, unirrigated land, however, is still lacking; research on rainfed agriculture should receive high priority.

Because crop production alone cannot provide enough employment and income for the marginal (and some of the small) farmers, subsidiary agricultural activities, such as dairying and raising poultry and fish, should be developed and integrated with crop production if their living standards are to improve. But as the labor force grows, agriculture still may not be able to absorb the backlog of unemployed and underemployed rural workers. Cottage and small-scale industries should be developed in rural areas. Rural public works programs, food-for-work programs, and other employment programs need to be organized on a massive scale and on a decentralized basis to alleviate immediate problems of unemployment in drought years and in chronically dry areas. The implementation of this strategy requires the support of an appropriate institutional structure.

GROWTH AND STABILITY

There is some evidence that rapid growth in agriculture leads to increased variabil-

ity in agricultural output. Schemes designed to neutralize the adverse effects of instability, such as buffer stocks and crop insurance, are costly. IFPRI, therefore, is examining ways to encourage stability through production. Preliminary studies of data from Indian agriculture suggest that variability does in fact increase as agricultural production grows. However, the use of tubewell irrigation rather than other forms of irrigation to increase production tends to minimize fluctuations.

GROWTH LINKAGES

Agricultural development strategies can strongly affect income and employment in the economy at large. However, the strength of their impact depends on the policies pursued. Therefore, an understanding of the mechanism of growth linkages and the identification of factors that determine the size of these effects is essential in formulating comprehensive production policies. Currently there are a number of research projects on this topic.

In 1979 IFPRI published *Intersectoral Factor Mobility and Agricultural Growth,* Research Report 6, by Yair Mundlak. It concluded that the major contribution of Japanese agriculture to the development of the economy was that of labor and not of savings, as is generally believed. Mundlak received the annual "quality of research discovery" award of the American Agricultural Economics Association for this report and at present is extending the model to the economy of Argentina.

Two other projects adopt a microeconomic approach. One is tracing and evaluating the indirect impact on income and employment of the new agricultural technology in Punjab State and North Arcot District of Tamil Nadu State in India. The other project is measuring the impact of rural infrastructure on agricultural productivity, income, and employment in Bangladesh. This project also involves a collaborative effort by IFPRI researchers in the production, trade, and consumption programs and the Bangladesh Institute of Development Studies (BIDS) to evaluate the short- and long-term effects of the Bangladesh Food-for-Work program. Input of the production program is concerned with determining the impact of the Food-for-Work program on agricultural production.

Household survey data from Nigeria, Malaysia, and India are being analyzed to measure the linkage effects of household demand. Previous studies indicate that the major source of indirect growth in income and employment resulting from an initial investment in agriculture is the consumption expenditures of households.

FOOD CONSUMPTION AND NUTRITION PROGRAM

Research of the Consumption and Nutrition Program focuses on the effects of various public policies and programs on real incomes, food consumption, and nutrition of low-income households and individuals. In 1980 some studies considered the impact of price subsidy policies on food consumption of the poor, others emphasized the effects of technological change, and others the causes of malnutrition.

PRICE SUBSIDY POLICIES

The realization that general economic growth is unlikely in the short run to eliminate severe poverty and its associated nutritional problems is causing governments of many market-oriented economies to turn to short-run schemes for the transfer of real income to the poor. Furthermore, rising food prices caused by growing food gaps in some low-income countries could result in a worsening of the standard of living of the poor unless appropriate changes are made in food price policies. Although direct income transfers may not be politically palatable, transfers of goods such as food staples to fill basic needs may be acceptable. Governments are looking to policies and programs that make basic food staples more accessible to the poor. The costs, however, may be high, both in government outlays and actual resource costs. Efficiency is frequently low and leakage high.

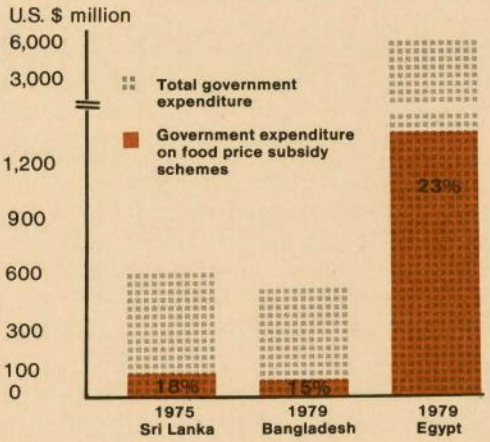
Research that can be used in formulating and evaluating policies in this area is limited; there is a strong demand for additional work of this kind. The Food Consumption and Nutrition Program places high priority on such research. Its principal purpose is to generate new conceptual and empirical knowledge that can be used to improve the diets of the poor. Although carried out on selected national policies, the goal is to develop knowledge and test analytical methods that can be used beyond the particular study.

In 1980 studies were initiated on food price subsidies in Egypt, the Sudan, and Zambia. These are expected to complement the work completed in 1979 on public food distribution schemes in India, Bangladesh, and Sri Lanka. The government expenditures on the food subsidy schemes in three of these countries appear in Figure 8. The study of food subsidies in Egypt will estimate the impact of subsidies on real income, food consumption, and nutrition for various population groups, with emphasis on the poor. Effects on domestic food production, farm sector incomes, and incomes of the rural poor will also be estimated and fiscal and foreign exchange costs considered. The behavior of low-income households, their reaction to selected policy measures, and the impact of such measures on their real income, food consumption, and nutrition will be at the core of this research.

Another study will analyze the recent removal of wheat subsidies in the Sudan. Its purpose is to estimate how the removal of the subsidy affected real incomes and food consumption of the poor. As in the study for Egypt, emphasis will be on the generation of conceptual and empirical knowledge which, with similar studies elsewhere, may contribute to the general body of knowledge.

Consumer price subsidies take several forms. One kind commonly instituted in Africa involves a subsidy to consumers

Figure 8
Costs of food price subsidies in Sri Lanka, Bangladesh, and Egypt



Sources: Data from the International Monetary Fund; James D. Gavan and Indrani Sri Chandrasekera, *The Impact of Public Foodgrain Distribution on Food Consumption and Welfare in Sri Lanka*, Research Report 13 (Washington, D.C.: International Food Policy Research Institute, 1979); Raisuddin Ahmed, *Foodgrain Supply, Distribution, and Consumption Policies within a Dual Pricing Mechanism: A Case Study of Bangladesh*, Research Report 8 (Washington, D.C.: International Food Policy Research Institute, 1979); and Karima Koryem, "The Impact of the Elimination of Food Subsidy on the Cost of Living of the Urban Population in Egypt," paper presented to the International Labor Office, 1980.

of a local staple brought about by producer price control, government monopoly of domestic marketing, and subsidized marketing and selling of grain. Additional knowledge is needed on how the real-income effects of these subsidies are distributed among the population, and how they affect food consumption and nutrition. A collaborative study with Zambian institutions recently initiated attempts to improve the understanding of the differential impacts on welfare of such a policy. This study centers on how the food marketing boards and related producer policies, primarily for maize, affect real incomes, food consumption, and nutrition among low-income, food-producing households. The effectiveness of selected policy options will be compared in the light of the policy goals.

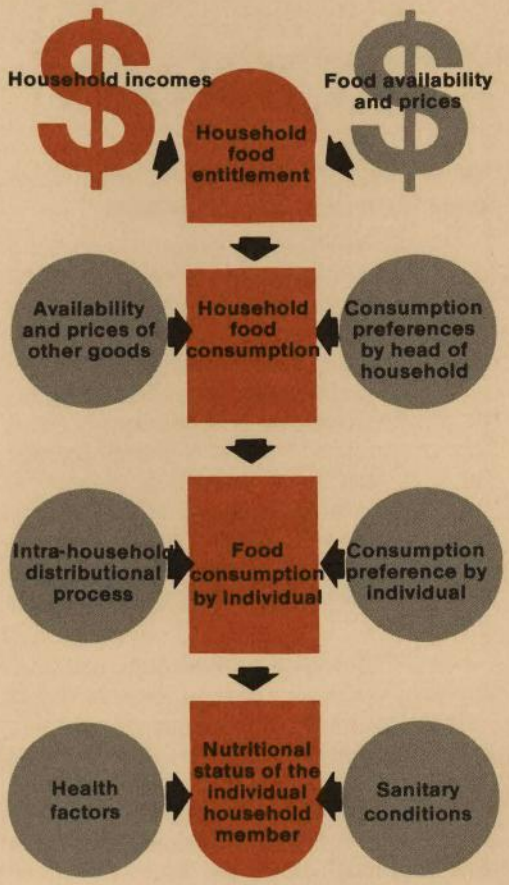
If food is available, for example from foreign aid, food-for-work projects may be effective in promoting development in rural areas with excess labor supply by improving the rural infrastructure and by expanding employment and incomes of the poor. They may also increase food consumption and improve nutrition among food-deficit households. However, the actual effects of food-for-work projects are not well documented. The efforts of the Food Consumption and Nutrition Program in the Bangladesh Food-for-Work project will assess changes in employment, income, and nutrition of the population affected by the project; examine the change in agricultural productivity in the area; and compare nutritional improvements obtained through the project with possible improvements from alternative policies.

EFFECTS OF TECHNOLOGICAL CHANGE AND RELATED PROJECTS AND POLICIES

Although alleviating short-run problems of severe poverty and malnutrition requires market intervention programs and policies such as those mentioned above, an effective, self-sustaining solution can be attained only through a development strategy that considers growth as well as equity. In food and agriculture this strategy depends heavily on technological advances to boost food production and public policies to encourage the spread of technological change and assure the desired effects on the poor.

There are a number of interacting factors that affect food consumption and nutrition (see Figure 9). Although considerable research has been done on the effects of technological change on income and asset distribution in the rural sector, very little is known about its effects on the food consumption and nutrition of

Figure 9
Factors influencing food consumption and nutrition



Source: Per Pinstrup-Andersen, "Policy Options for Short-Run Expansions of Food Consumption Among Deficit Households in Sub-Sahara Africa," in "Food Policy Issues and Concerns in Sub-Saharan Africa," papers prepared by researchers at the International Food Policy Research Institute for preliminary discussion with colleagues in Ibadan, Nigeria, February 9-11, 1981. (Mimeographed.)

low-income urban and rural households. Additional knowledge on this topic is likely to be useful in formulating public policy and agricultural research priorities. Analyses in the Food Consumption and Nutrition Program begun in 1980 are developing ways to assess the effects of selected technological changes in agriculture on the amount of food consumed and the presence of energy-protein deficiencies among the people of regions in Malaysia and Nigeria. A study of dairy development projects in India may be initiated in 1981.

In related efforts the staff of the Food Consumption and Distribution Program worked with FAO and the World Bank during the year on the development of methods for incorporating considerations about nutrition into agricultural projects.

CAUSES OF MALNUTRITION

Increasing food consumption and eliminating malnutrition by raising real incomes is a central concern of consumption-oriented policy analyses. However, there are several basic issues involved in the allocation of household income and its resulting effects on nutrition that require further analysis. These issues concern how available food is allocated among the members of a family, thus determining the nutrition of each member. It also concerns how food is acquired, and how family income is used. Based on evidence from household surveys, a study is under way to examine the influence on nutrition of sources of income, their characteristics, and the energy expenditure required for the work; control of incomes and budget allocation within the household; and increments in food availability at the aggregate and household levels.

Understanding how these factors can cause malnutrition should provide a better basis for analysis of consumption and nutritional effects of food subsidies, distribution, and production-oriented policies.

Preliminary results from evidence obtained in various African countries suggest that in this region there may be a close association between domestic food availability, production systems, and nutrition. Possible effects of malnutrition and seasonal food shortages on labor supply will be analyzed. In addition, the relationship between nutritional status and adoption of improved technological practices will be explored further.

RESEARCH RESULTS

FOOD TRADE AND SECURITY PROGRAM

The aim of research conducted in the Food Trade and Security Program is to evaluate the short- and long-run effects of trade and aid policies on food consumption and on the incentives for agricultural production growth in the developing countries.

IFPRI's research priorities in trade policy stem from two premises. First, the conditions developing countries face in world markets largely determine the options open to them in formulating their domestic strategies. Second, developing countries' trade policies cannot be separated from their more general food consumption and agricultural production strategies.

The Food Trade and Security Program evaluates possible future international developments and the scope for global cooperation and analyzes national trade policies with special reference to food supply strategies of developing countries.

INTERNATIONAL POLICY ISSUES

A pressing issue facing many developing countries today is the choice between the desire to be more self-sufficient and the need to provide adequate and stable food supplies at a relatively low social cost. One external factor influencing the choice is the instability and uncertainty of supplies in world markets. Developing countries have two distinct food supply problems. The major one is the large and growing long-term deficits in domestic food supply. The second problem, referred to as food insecurity, is the inability to meet immediate consumption level targets.

Every developing country can take important initiatives to reduce food insecurity. The remedies will include larger investments in food distribution systems, transportation, communications, and early warning systems; clearly delineated production incentives; and the appropriate mix of stock and trade policies. Except for the very large importing countries, past research indicates that heavy reliance on domestic grain reserves beyond those required as "working" stocks can be costly when trade is possible as an alternative.

International initiatives such as financial and world price stabilization schemes reduce the costs to developing countries associated with reducing food insecurity. They do not, however, solve the food supply problem. For example, lower price instability in world markets would reduce the "optimal" carryover stock levels in most developing countries. Similarly, access to food and external financial insurance such as that provided by a food financial facility would substantially reduce the need for grain reserves in developing countries and thus would provide consequent savings in interest and storage costs.

In order to provide more food security, the performance of the food-trade system needs to be improved in two ways. First, world market prices must be made more stable. This would influence the ability of developing countries to pursue more trade-oriented policies and diminish the disruptive impact of sudden changes in import prices. Second, there needs to be a system allowing individual developing countries to purchase grain on world

markets when their own production is deficient. This requires that imports be available and affordable.

Research on international issues in the Food Trade and Security Program has been centered on an assessment of the relative merits of different initiatives, which include a food financial facility, an international wheat agreement, trade reform, and food aid.

FOOD FINANCIAL FACILITY

Recently attention has been given to initiatives that address the foreign exchange problems of food-deficit, developing countries, which are derived from the variability of food import costs resulting from unanticipated domestic production shortfalls and fluctuations in world food prices and export revenues. One such initiative is a food financial facility, which is designed to protect countries against fluctuations in the cost of food imports by providing foreign exchange in years when food imports exceed the trend. Fluctuations in export revenues and prices of nonfood imports, which affect the capacity of developing countries to import food, must also be considered.

An ongoing project on the feasibility of financial arrangements for food security is examining the potential benefits, costs, and feasibility of an intergovernmental initiative on a financial facility for food imports.

In an effort to provide a quantitative assessment of the approximate magnitude of the total borrowing capacity under such a financial facility, part of the project involves estimating the financial resources required to compensate for imports above the trend during the 1965-75 period. The estimated financial resources for this hypothetical situation that would have been required to compensate for the extra observed food import bill (above trend, independent of fluctuations in export earnings) were approximately $1 billion per year for 67 developing countries. If a food consumption stabilization rule were used instead, the average annual financial resources required would be approximately $2 billion. If, on the other hand, the country coverage were reduced to the 34 most seriously affected countries only, these figures are reduced by approximately half.

Alternatively, if the financial requirements to finance food imports are adjusted for the variability in, and correlation with, export earnings, the results indicate that during the 1965-75 period the net increment necessary to compensate for the actual value of food imports would have been only $253 million annually, or approximately $1.1 billion per year if a consumption stabilization rule were used. These results suggest the considerable sensitivity of the magnitude of the overall financial flows required to stabilize food consumption according to country coverage, the type of consumption stabilization rule followed, and the adjustment made for changes in the overall balance of trade. Moreover, the results suggest that the low-income countries, in particular, would benefit from such a facility.

WORLD MARKET INSTABILITY: WHEAT AND RICE

The performance of the world's agricultural economy must be judged ultimately by the extent to which production increases can meet the needs of a growing population and by the demand for steady improvements in diets. Government agricultural policies all impinge upon the achievement of these objectives. Many such policies encourage appropriate investment decisions and reduce uncertainty about agricultural production. Other policies offset these favorable effects by causing investment funds to be misdirected or by increasing market uncertainty. The charge is often made that developed-country policies, by promoting the production of high-cost foodstuffs in industrial countries and exacerbating the instability of world markets, make it difficult for LDCs to evolve their own food policies.

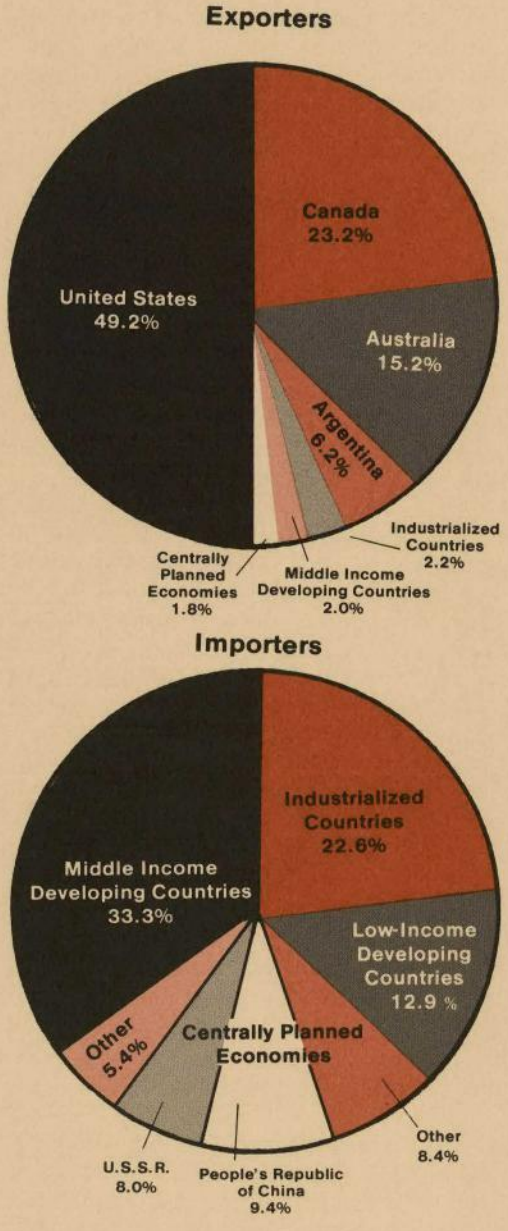
Developed-Country Agricultural Policies and Developing-Country Supplies: The Case of Wheat, Research Report 14, by Timothy Josling, examines the impact of the agricultural price policies pursued by a group of developed countries on the price and availability of wheat sold to developing countries. The study identifies those aspects of these policies that have particular significance for other countries and for food-importing developing countries and estimates the magnitude of this impact in recent years.

It argues that domestic policies designed to protect consumers and producers in developed countries shift the burden of short-run adjustments in the world market to the poor in other countries. In general, whenever stock adjustments do not equal the suppressed change in production and consumption, the country concerned exacerbates international market instability.

The group of developed countries selected for the study were those likely to have the most influence on the world grain trade: Australia, Canada, the European Community, Japan, the United States, and the Soviet Union. The role of the Soviet Union in the wheat market cannot be underestimated; during the 1970s Soviet wheat consumption exceeded the combined total consumption of all the other countries listed above. Figure 10 shows the influence on the world wheat market of the major wheat traders.

The study presents the effects of price policies on net trade (called the trade-volume effect) and availability during the 1970s. Results indicate that during the first half of the decade, stocks were released into markets as a way of exporting overproduction, and were accumulated when consumption was higher and production lower than would have been the case under freer markets. This is contrary to what is required for world price stability. For example between 1972/73 and 1973/74, a time when developing-country production was down, the net trade-

Figure 10
The average shares of the major exporters and importers in the world wheat market, 1976-78



Sources: Food and Agriculture Organization of the United Nations, "Production Yearbook Tape, 1978," Rome, 1979. The countries are classified as the International Monetary Fund classifies them in *International Financial Statistics.*

volume effect was −36 million metric tons; this "squeeze" on the market was clearly a major reason why the export price increased 70 percent over the year.

Sharing the burden of maintaining stocks as a contribution to stability is a point of contention. Canada, for instance, contributed 1.21 million metric tons to stability, whereas the contribution of the European Community was negative (−1.04 million metric tons). Although it may not matter to the developing countries which developed countries contribute to stability, if Europe's domestic policy continues to have a destabilizing influence on the world wheat market, Canada and the United States could adopt more aggressive policies to the detriment of developing countries. Because burden-sharing is necessary to any international effort to improve market stability, the differences in country reactions to world price changes give a rational and political basis for apportioning the costs of stability schemes. It is only reasonable that countries should offset the effects of their domestic price policies by more flexible stock management.

In *The Economics of the International Stockholding of Wheat,* Research Report 18, by Daniel T. Morrow, the behavior of the world wheat economy since 1960 is examined and predictions for stockholding in the near future are drawn from this analysis. The pros, cons, and possible parameters of an international stockholding agreement are also considered.

The report outlines the theory of economically optimal stockholding in a market without government intervention and then shows how government policies cause stockholding patterns to change. In comparing theory with the actual history of stockholding since 1960 it can be seen that major exporters held more stocks than was financially profitable in the 1960s to support domestic farm prices. These larger stocks helped to stabilize world prices.

In the 1970s, however, exporters turned to production controls and direct payments to support farm prices, which reduced stock levels. At the same time, the Soviets bought more grain on world markets to expand their livestock supplies, and importers, fearing export controls, sought to expand their stocks. These unforeseen demands caused world stocks to be reduced. Stockholding was larger than expected when supplies were short, and world prices fluctuated considerably.

The stocks increased in 1975/76, but this probably does not indicate a return to the policies of the 1960s. Morrow predicts stockholding in the near future will be slightly larger than is financially profitable when supplies are large and much larger when supplies are short. Unexpected policy decisions can, of course, cause deviations from this pattern.

The justification for the cost of maintaining international stocks of wheat beyond profitable levels is based on the premise that developing countries benefit when world prices are more stable. But even if a new Wheat Trade Convention were to succeed in reducing world price instability, it would not eliminate the need to cope with a highly unstable food import bill. A country's production fluctuations have a major influence on the variability in its food import bill. Thus a financial facility to help developing countries finance food imports when requirements are unusually high appears to be necessary.

Another research project completed during 1980 projects Soviet grain imports from 1980 to 1985 using three methods. Results indicate that Soviet wheat imports may average from 15.4-17.7 million metric tons annually in the 1980-85 period. Because these imports can severely affect world supply, they must be planned for if Third World countries that need to import grain are not to suffer.

Research conducted on issues pertaining to rice indicate that the world rice market is vastly different from the wheat market. Countries that are major rice consumers, located almost entirely in monsoon Asia, are also the major pro-

ducers. Consequently, very little rice is traded between countries. Of a total of 250 million metric tons of rice produced in the late 1970s, only 12.5 million metric tons, or about 5 percent, crossed national frontiers. Because the volume traded is so low, one would expect that a large amount of rice would be stored within countries to be used in stabilizing domestic prices. But at least until 1975, few importing countries stored rice extensively. Most relied instead on import adjustments. Exporting countries, including the United States, also store small quantities of rice (8 percent of total production compared to 16 percent for wheat, according to the U.S. Department of Agriculture). All these factors combine for greater price instability in the world rice market than in the wheat market.

The direction of trade in the rice market is also unstable. Importing countries are highly self-sufficient, relying on trade volume adjustment to cope with production shortfalls. Countries abruptly enter the world rice market and leave it just as abruptly. Some countries enter as importers and then become exporters; others move in the opposite direction. Without a central market or a central exchange, it is much more difficult for countries to participate in world rice trade than in wheat trade. Current research is trying to trace the source of the instability adjustment mechanisms in this market and to define ways of coping with that instability. Two exporting countries, the United States and the People's Republic of China, and the non-Asian rice importers appear to play crucial roles in somewhat allaying instability.

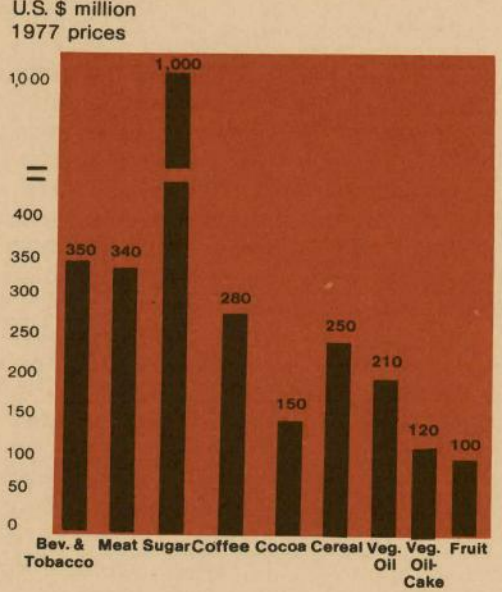
During 1980 IFPRI was invited to participate in discussions initiated by UNCTAD on these and other issues associated with instability in food trade and its effect on food security in developing countries.

TRADE REFORM

Research in the Trade Program during 1980 was also concerned with the agricultural export potential of trade liberalization in the OECD countries. *Agricultural Protection in OECD Countries: Its Cost to Less-Developed Countries*, Research Report 21, by Alberto Valdés and Joachim Zietz, assesses the export earnings and real income gains of selected developing countries if trade barriers for 99 agricultural commodities were reduced by 50 percent.

It concludes that such a reduction would increase world trade by $8.5 billion a year (in 1977 prices, using 1975-77 as a base). This would result in an increase in export revenues of approximately $3 billion a year and an increase in real income of approximately $1 billion a year for the 56 developing countries analyzed in the study. About $1.8 billion would accrue to OECD exporters.

Figure 11
Potential increase in developing countries' export earnings from trade liberalization, by commodity group



Source: Alberto Valdés and Joachim Zietz, *Agricultural Protection in OECD Countries: Its Cost to Less-Developed Countries*, Research Report 21 (Washington, D.C.: International Food Policy Research Institute, 1980).

Of the commodities analyzed, raw sugar, refined sugar, and beef and veal would net the greatest gains for the exporters. When the commodities are viewed according to the groups commonly used in international trade negotiations, the sugar and wheat groups capture about 47 percent of the total increase in export revenues in the developing countries (see Figure 11). The large export-oriented developing countries such as Brazil, Argentina, and India would benefit the most from such liberalization. However, middle-income countries and a number of low-income, developing countries would also benefit.

FOOD AID

During the past two decades the absolute level of food aid has declined only slightly. However, because developing countries are now importing substantially more grain on a commercial basis, food aid has dropped sharply as a proportion of total cereal imports. Further, as Table 3 indicates, there has been a striking shift in the country distribution of food aid flows.

IFPRI's current research on food aid attempts to look behind these trends to assess the probable roles of commercial imports and food aid for meeting effective demand in developing countries during the coming decade.

Economic growth prospects are good for most Latin American and Asian countries that were formerly large food aid recipients. In Latin America, Brazil, Chile, Colombia, Mexico, and Peru are examples of countries which have substantially increased their cereal imports but depend on food aid only in small amounts to finance special feeding programs in low-income regions of their countries. The smaller countries of Central and South America are more nearly self-sufficent, though at relatively low levels of consumption, and food aid for special feeding programs and emergency relief represents a fairly stable but small proportion of their modest cereal imports.

In Asia the drive to self-sufficiency has virtually eliminated India's import requirement. Except for Bangladesh, Indonesia, and Sri Lanka, most other large importers have greatly reduced their reliance on food aid as a proportion of total imports. Smaller Asian countries import very little, and food aid flows to them are only for emergencies and are negligible in amount. If improvements in agricultural production performance and overall economic growth persist, the trend toward higher commercial import levels and phasing out food aid should continue.

The picture in North Africa and the Middle East is less clear. All of the Maghreb countries of North Africa, plus Iran, Iraq, and Saudi Arabia have substantially increased their commercial purchases of foodgrains to the point that they now rank among the leading importers of the world and depend very little, if at all, on food aid. However, except for oil exporters, the economic base upon which these countries are building is still quite fragile, and economic development plans emphasize improving agricultural production performance and reducing the rate of long-term cereal import growth. Even Egypt, which is very dependent on food aid, has quadrupled total cereal imports since 1961 and now commercially finances two thirds of its cereal imports. Other Middle Eastern countries have increased their total levels of cereal imports while maintaining food aid at fairly stable levels. Only Turkey, once a large importer and food aid user, has followed India's route and is now virtually self-sufficient in wheat, its most important foodgrain.

Domestic production and import requirements in this region are highly variable, and food aid flows do vary from year to year. For some of these countries, food aid dependence is high, and the prospects are not good for any immediate improvements in their capacities to be self-reliant in basic foodgrains. Others have been successful in their efforts to improve domestic production performance. Over the longer-run the Sudan,

Table 3

Total cereal imports and the proportion received as food aid by selected developing countries, 1961 and 1978

Country	1961		1978	
	Cereal Imports	Food Aid Share	Cereal Imports	Food Aid Share[a]
	(1,000 metric tons)	(percent)	(1,000 metric tons)	(percent)
Sub-Saharan Africa				
Nigeria	1,221	1	2,044	0
Others	1,378	8	3,898	13
Asia				
Bangladesh	n.a.	n.a.	1,646	59
China	4,891	0	12,640	0
Hong Kong	607	4	805	0
India	3,956	98	396	23
Indonesia	1,216	10	2,731	23
Korea, DPR	480	0	406	0
Korea, Rep. of	533	100	3,647	16
Malaysia	696	...	1,513	0
Pakistan	1,086	100	1,053	24
Philippines	547	1	797	4
Singapore	569	1	997	0
Sri Lanka	712	16	1,146	27
Viet Nam	94	n.a.	1,676	n.a.
Others	316	10	494	4
Latin America				
Brazil	1,936	51	5,722	...
Chile	128	58	1,222	1
Colombia	262	50	529	1
Cuba	549	1	1,844	0
Mexico	99	23	2,853	0
Peru	470	24	984	4
Venezuela	406	0	1,413	0
Others	961	11	2,598	10
North Africa/ Middle East				
Algeria	587	2	2,850	...
Egypt	1,373	82	5,954	35
Iran	214	100	3,048	0
Iraq	484	8	1,707	0
Lebanon	296	21	596	14
Libya	140	56	650	0
Morocco	589	23	1,689	9
Saudi Arabia	179	3	1,378	0
Syria	329	100	413	10
Tunisia	485	44	793	18
Turkey	877	58	37	0
Others	730	25	2,547	10
Total	**29,369**	**33**	**74,716**	**9**

Sources: Food and Agriculture Organization of the United Nations, "Trade Yearbook Tape," Rome, various years; International Food Policy Research Institute, "Food Aid Data Base," Washington, D.C., 1980. These sources show countries that imported more than 300,000 tons in 1961 or more than 500,000 tons in 1978.

Note: n.a. means not available.

[a] The food aid shares in 1978 are underestimated by the amount distributed by the World Food Programme and not counted as part of bilateral food aid contributions. Minor bilateral food donations are also excluded. This underestimation primarily affects the flows to "other" countries in each region.

now a reasonably large importer, could become a grain supplier for the region.

The food needs of Sub-Saharan Africa have received considerable attention because of the negative effects of drought and civil disturbance on consumption in a number of countries. Most African countries are importing more to offset declines in domestic production as well as to meet growing demand. Their capacity to sustain such increases in imports without commensurate economic growth is questionable. Food aid has been used as a temporary solution, although the increase in food aid's share of total imports has not been as striking as reports of need might indicate. Continued utilization of food aid in combination with domestic measures to achieve steady growth in staple crop production can be expected in the near future.

The work of the Food Trade and Security Program on food aid issues during 1980 also included research on food aid entitlements and national self-reliance for the World Food Council.

DEVELOPING COUNTRY TRADE POLICY ISSUES

Ultimately the purpose of food policy is to provide adequate and stable food supplies at minimum social cost. Food consumption policy in developing countries is generally constrained by trade and the balance of payments and is inextricably related to food import policies.

Furthermore, trade and exchange rate policies can greatly influence prices and incentives in the long run. Food consumption, income distribution, and investment in agricultural protection are all affected by these policies. Often policies that are not explicitly directed at either food consumption or production have substantial, sometimes unintended, impacts on them. In many developing countries the role of the agricultural sector is so large that repercussions for the general economy must be considered in analyzing any food policy. Thus a comprehensive economic approach is necessary.

A central premise of IFPRI's approach is that in most developing countries where agriculture represents a large share of the national economy, the food and nonfood markets are closely interconnected. Because of this interdependence, policy interventions outside agriculture will be transmitted to agriculture and vice versa. This makes available a wider range of policy instruments to deal with food consumption and growth objectives than is generally recognized.

This viewpoint is relatively unexplored and major research gaps exist. The studies on the Sahel, Egypt, and Colombia provide a framework for further studies using this approach to food policy analysis.

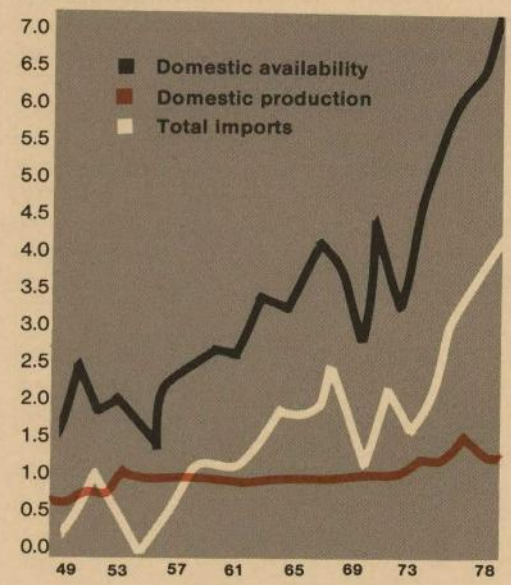
FOOD SECURITY AND SELF-SUFFICIENCY

Work in the Food Trade and Security Program continued on approaches for short-run food supply management for food security in the Sahel and began on cereal import management in Egypt. This Sahel work, funded as a special project by the U.S. Agency for International Development and U.S. Department of Agriculture, was undertaken in an attempt to identify means of attaining food security in the region. Findings suggest that storing grain reserve supplies would probably be much more expensive than a food insurance or compensatory financing facility. Also, unless the region is completely isolated from world trade, regional grain reserves would probably be more expensive than grain reserves in individual countries.

The Egyptian project is examining the impact of domestic consumption and production policies on wheat imports. (Figure 12 shows wheat imports and wheat production and consumption in Egypt during the last 30 years.) Wheat imports are controlled by a state trading

Figure 12
Egypt: domestic production, domestic availability, and total imports of wheat, 1949-78

Million metric tons



Source: Grant M. Scobie, *Government Policy and Food Imports in Developing Countries: The Case of Wheat in Egypt* (Washington, D.C.: International Food Policy Research Institute, forthcoming).

authority, an arrangement which is found in many developing countries. Because wheat imports represent a substantial proportion of total import expenditures, this study emphasizes the overall balance-of-payment adjustment problem in which food and nonfood imports and adjustments in reserve holdings compete for foreign exchange. Tentative results suggest that although the amount of commercial wheat imported depends on its foreign exchange position, Egypt tends to reduce nonfood imports in order to maintain wheat imports during periods of reduced foreign exchange supplies.

TRADE POLICIES AND AGRICULTURAL INCENTIVES

A special project partially financed by the Rockefeller and Ford Foundations on the impact of exchange rate and commercial policy on incentives to agriculture in Colombia from 1953 to 1978 was completed in 1980.

This study shows how the allocation of resources between exports and imports not only results from the tariffs or subsidies specific to each of those activities but also depends on prices of nontraded goods. As a result of Colombia's trade policies, the food production sector in Colombia has become a nontraded sector.

The analysis indicates that import duties on manufactured goods are equivalent to export taxes on agricultural exports. In Colombia about 70 percent of export revenues come from agricultural products. Furthermore, the export subsidies that applied to some exports did not offset the overvaluation of the peso. This means that the production of cotton, tobacco, bananas, coffee, and flowers, among others (products for which Colombia has substantial comparative advantages), was largely discouraged. On the other hand, food products such as milk, wheat, vegetable oil, and sugar received relatively high protection during the 1950s and 1960s. For corn this rate was above 50 percent, for barley and rice more than 30 percent, for meats between 20 and 50 percent in the 1960s. There was a considerable reduction in protection to food products in general during the 1970s.

In the 1970s the group consisting of sugar, barley, and rice showed negative nominal rates of protection, in some cases reaching 50 percent. The 20 percent overvaluation of the peso in 1970 is an additional tax on these products on top of the quantitative export restriction imposed on them. Milk, wheat, corn, and vegetable oils continued to receive positive protection in the 1970s, but at lower rates, ranging between 25 and 50 percent. As an indirect effect and perhaps unintentionally, a third group of nontraded food commodities—cassava, potatoes, plantains, and other root products—was granted protection.

The study analyzes the effect on production of crops in each of these groups.

REGIONAL PROJECTS

RICE POLICIES IN SOUTHEAST ASIA PROJECT

In collaboration with the International Fertilizer Development Center and the International Rice Research Institute, IFPRI is examining the policies that influence rice production, consumption, price, and trade in Southeast Asia. This joint effort begun in 1979 involves researchers located at these centers and national researchers from Indonesia, Malaysia, the Philippines, and Thailand—the countries on which the project focuses.

The project, which involves researchers from three of IFPRI's four program areas, is looking at the costs and benefits of government policies pertaining to rice and the impact of these policies on rice production and consumption and the economies of the four countries. Among the aims of the project is to define an analytical framework and research methods that can be used to devise policies for particular situations.

The role of the Food Production and Development Strategy Program in the collaborative project is to estimate the impact of investment in irrigation on rice production, prices, and farm income in Southeast Asia and to examine the effectiveness of alternative investment policies. The studies completed in 1980 review past trends and projects for the next decade in area, yield, and production of rice, emphasizing the contribution of irrigation for the four study countries.

In Malaysia irrigation development has increased domestic production from about 55 percent of domestic consumption in the early 1960s to about 90 percent in the 1970s, despite rapid growth in consumption. Nearly 85 percent of rice is produced on irrigated lands. Government priorities have shifted from expansion of irrigation to intensification of on-farm irrigation and drainage infrastructure and management.

In the other three countries irrigation faces a major challenge in the coming decade: it must foster greater growth although the most readily exploited irrigation projects have already been exhausted. Thailand has depended mainly on increases in area harvested to expand rice production; only 30 percent of land is irrigated. With land suitable for rice production almost fully utilized, emphasis has shifted to on-farm improvements in existing irrigation systems, increased double cropping, the spread of high-yielding varieties, and wider use of fertilizers and pesticides to boost production.

Half of Indonesian rice production is from irrigated land, which is highly concentrated in Java. Exploitation of potentially irrigable area in Java and of large water sources throughout Indonesia is nearly complete. Smaller-scale irrigation developments off Java now have priority. They include tidal basin development, run-of-the-river diversion dams, and labor-intensive *sederhana* projects.

Irrigated area now accounts for about 60 percent of Philippine rice production. However, because growth in physical land area planted with rice is limited and modern varieties have been almost fully adopted, irrigated area must expand more rapidly than in the past decade if growth in output is to continue. The potential exists for developing new large-scale irrigation projects and for intensifying multiple cropping by improving existing systems.

Work in the Food Trade and Security Program has centered on issues as they relate to food stability. For a country such as the Philippines, which is not a large rice trader, a buffer stock policy would be

a costly way of attaining stability in food consumption. Reliance on trade appears to be a better option. For Indonesia and Thailand, both major rice traders, the situation is somewhat more complex and dependent on the impact their import and export fluctuations exert on the world price. Related research on the structure of the world rice market in the Food Trade and Security Program is expected to shed light on this.

As part of the second phase of this study, detailed examination of the price policies in the Philippines has begun. The Philippines has been acquiring stocks of rice not as part of a conscious price stabilization policy but as a by-product of its price support policies. Consequently the workings of this policy and its costs and benefits to farmers, consumers, the government, and the overall economy are being investigated. A study that will examine optimal storage policy as it relates to locations in Indonesia is also planned.

The Food Consumption and Nutrition Program has been examining the structure and trends of food consumption patterns in the region by commodity and population group. Initial emphasis has been on the relationship between rice and other food commodities.

Preliminary results indicate that rice contributes roughly half of the total calories consumed in the countries studied. In rural areas and among low-income groups, roots, tubers, and maize are important contributors of calories; in urban areas a large proportion of the total food intake is of livestock and wheat products.

In view of the rapidly increasing urbanization in the region, the large differences in the consumption patterns of rural and urban consumers have significant implications for future trends in food consumption. The consumption of wheat relative to rice in urban areas is sensitive to the wheat/rice price ratio. Similarly, the consumption of rice, root crops, and maize in rural areas is sensitive to their relative prices. This indicates that pricing policy may be an effective tool for changing consumption patterns.

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FINANCIAL STATEMENT

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

BALANCE SHEET as at December 31, 1980 and 1979

ASSETS

	1980	1979
Current Assets:		
Cash	$ 11,946	$161,917
Accounts receivable	42,955	11,123
Employee and other receivables	25,094	21,665
Prepaid expense	11,910	2,690
	91,905	197,395
Property and Equipment:		
Furniture and equipment	196,088	174,697
Leasehold improvements	26,716	11,090
Library	2,080	2,080
	224,884	187,867
Less—accumulated depreciation and amortization	134,730	95,734
	90,154	92,133
TOTAL ASSETS	$182,059	$289,528

LIABILITIES AND FUND BALANCE

Current Liabilities:		
Accounts payable and accrued expenses	$164,578	$119,425
Advance Payment of Grant Funds	-0-	145,610
Fund Balance	17,481	24,493
TOTAL LIABILITIES AND FUND BALANCE	$182,059	$289,528

The accompanying notes are an integral part of these statements.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

STATEMENT OF REVENUE, EXPENSE, AND FUND BALANCE
For the Years Ended December 31, 1980 and 1979

	1980		1979	
Revenues:				
Grants	$2,375,764		$1,667,752	
Reimbursement of expenses	67,456		91,085	
Investment income	16,345		17,633	
Other income			5,864	
		$2,459,565		$1,782,334
Expenses:				
Salaries		1,219,076		927,718
Employee Related Costs:				
Employee benefits	287,150		229,838	
Recruitment and relocation	34,910		52,709	
Staff travel	118,662		104,960	
		440,722		387,507
Consulting Services and Contracts:				
Outside consultants	213,869		139,340	
Fellowships			11,534	
Trustee expenses	44,651		34,583	
		258,520		185,457
Communications & Computer Services		230,862		195,583
Office Operation:				
Depreciation	38,996		33,260	
Equipment rental	25,697		35,125	
Office supplies & other operating expenses	42,783		32,797	
Professional fees	27,544		17,913	
Rent	118,019		90,333	
Telephone & telegraph	33,702		27,671	
Temporary & clerical services	30,656		14,846	
		317,397		251,945
		2,466,577		1,948,210
Excess of Expenses Over Revenue		(7,012)		(165,876)
FUND BALANCE—BEGINNING		24,493		190,369
FUND BALANCE—ENDING		$ 17,481		$ 24,493

The accompanying notes are an integral part of these statements.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

STATEMENT OF CHANGES IN FINANCIAL POSITION
For the Years Ended December 31, 1980 and 1979

	1980	1979
Source of Funds:		
Excess of expenses over revenue	$(7,012)	$(165,876)
Items not affecting working capital:		
Depreciation	38,996	33,260
Prepaid grant funds	(145,610)	145,610
	(113,626)	12,994
Use of Funds:		
Additions to property and equipment	37,017	46,413
DECREASE IN WORKING CAPITAL	$(150,643)	$(33,419)
Components of Increase (or Decrease):		
Cash	$(149,971)	$ 94,507
Accounts receivable	31,832	(109,631)
Employee and other receivables	3,429	(479)
Prepaid expense	9,220	$ 904
Accounts payable and accrued expenses	(45,153)	(18,720)
DECREASE IN WORKING CAPITAL	$(150,643)	$(33,419)

The accompanying notes are an integral part of these statements.

NOTES TO FINANCIAL STATEMENTS
December 31, 1980 and 1979

Note 1. Summary of Significant Accounting Policies

The Institute is a non-profit, non-stock corporation qualified as an organization exempt from Federal Income Tax under Sec. 501 (c) (3) of the Internal Revenue Code as a publicly supported institution to which contributions are deductible by other individuals and organizations.

Income

Grant income is reported as revenue for the time period the grant is required to cover. Reimbursement of expenses from contracts is included in revenue when services are performed or expenses incurred and the right to reimbursement accrues.

Property and Equipment

Property and equipment is stated at cost. Depreciation is provided over an estimated useful life of 5 years furniture and equipment and over the life of the lease for leasehold improvements. Expenditures for additions are capitalized and expenditures for maintenance and repairs are charged to earnings as incurred. When properties are retired or otherwise disposed of, the cost thereof and the related accumulated depreciation are removed from the respective accounts and the resulting gain or loss is reflected in earnings.

Note 2. The Institute occupies office space under various leases expiring through September 30, 1985. The leases provide for rent increases based on increases in building operating costs and increases in the Consumer Price Index. Minimum lease payments, net of sublease arrangements made by the Institute as sublessor, for all non-cancellable operating leases having a remaining term in excess of one year at January 1, 1981, are as follows:

1981	$153,131
1982	$132,189
1983	$104,496
1984	$104,496
1985	$ 78,372

Note 3. The Institute is purchasing retirement annuity contracts for employees under agreement with the Teachers Insurance and Annuity Association and the College Retirement Equities Fund. The cost was $158,531 and $131,434 for 1980 and 1979 respectively.

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CERTIFIED PUBLIC ACCOUNTANTS

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March 18, 1981

Officers and Trustees
International Food Policy Research Institute
1776 Massachusetts Avenue, NW
Washington, DC 20036

We have examined the balance sheet of the INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE as at December 31, 1980 and 1979, and the related statements of revenue and expense and changes in financial position for the years then ended. Our examination was made in accordance with generally accepted auditing standards and accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion the financial statements present fairly the financial position of the Institute as at December 31, 1980 and 1979 and the results of its operations and the changes in its financial position for the years then ended in conformity with generally accepted accounting principles applied on a consistent basis.

R E Lang & Associates, P.A.

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