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FOOD  
POLICY  
RESEARCH  
INSTITUTE**

**REPORT 1982**

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**IFPRI** REPORT  
**1982**

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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# INTRODUCTION

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

To address these issues, IFPRI's research program focuses on the six major questions described below that are expected to dominate the world food situation in the years ahead. They provide the basis for IFPRI's research priorities and

for interaction with national and international policymaking bodies.



## QUESTION 1:

What food policy adjustments are needed in response to rapid growth in food import demand by developing countries?



Fueled by the ever-increasing demand for food, net imports of foodstuffs by developing countries will rise sharply in the coming decades. Food imports will rise even in those countries that successfully increase domestic agricultural production. Rapid growth in the use of basic food staples for animal feed will play a critical role in this surge in food imports.

Where will these imports come from? How will they affect domestic production strategies? What will be their effect on

the poorest countries of the world, which are just beginning to develop?

IFPRI's research on these questions builds on work of the Food and Agriculture Organization of the United Nations (FAO) and other international agencies. By using the data of these organizations to analyze past trends in production, consumption, and trade, IFPRI researchers are able to identify the food policy adjustments needed to meet the accelerating food import demand growth by developing countries. A major element in such analyses is livestock. At present little is known about the impact of livestock production growth on food supply-demand relationships and import growth. Elucidation of such relationships is particularly important to the large investment that the CGIAR system is presently making in new technology for coarse grain production.

### QUESTION 2:

What policies will allow technological change to play its central role in raising food production in developing countries?

Technological change in agriculture is the only practical way to achieve the high rates of growth in agricultural production that are needed in the coming decades. Such change requires both the development and the widespread dissemination of new agricultural inputs—seeds, fertilizer, and irrigation—among farmers.

IFPRI can facilitate technological change in agriculture by attempting to do two things. It can discover how scarce national and international resources can best be allocated to agricultural research designed to develop new means of food

production, and how the resources available for research should be divided among agricultural commodities, geographic regions, and academic disciplines. And IFPRI's research can help determine how the two critical inputs associated with the new technology—fertilizer and water—can further technological change. IFPRI's work shows that extracting the full benefits of the new high-yielding technologies demands large increases in the use of purchased inputs, particularly fertilizer, and massive investments in irrigation.

### QUESTION 3:

What combination of farm producer incentives can achieve growth and equity simultaneously?

A constant dilemma of agricultural policy is that even though higher food prices provide incentives to increase food output, they also place a terrible burden on the poor. The best long-run answer to this dilemma lies in technological change that reduces production costs. IFPRI provides insights into how, in the long run, producer incentives stimulate technological growth and change in Third World agricultural production. IFPRI analyses of fertilizer subsidies and water-pricing policy shed light on these issues.

But what of the short run, which seems to last for decades? It is here that the major dilemmas of food price policy lie and that IFPRI's specialized skills are most valuable in examining how exchange rates and commercial policies shape overall agricultural incentives. IFPRI research is also useful in pinpointing the effects of increased food prices on the poor and identifying how food subsidies might be used to counter such effects.

#### QUESTION 4:

What relative weight should be given to alternative agricultural commodities in future production patterns?

As international trade in food grows rapidly and as new technology changes relative production costs, the opportunity and need to increase efficiency through specialization will also grow. And yet, even with knowledgeable decisions, specialized crop production may lead to losses in income and nutritional status for some segments of the population. It also increases risks at all levels of decisionmaking.

IFPRI's research on this question focuses on efforts designed to develop the basis for specific policy recommendations. Much work is being devoted to analyzing the effects that increased cash crop production and specialization in export crops have on income and nutrition. Attention is also given to the import and export potentials of changing production patterns. In addition, the implications of developing and disseminating new seed varieties mean that emphasis is being given to the pattern and character of future investment in research infrastructure.

#### QUESTION 5:

What policies are needed for technological change in agriculture to stimulate the growth in income and employment necessary to alleviate rural poverty?

In the coming decades the additional jobs that will be created in agriculture will typically be too few to keep pace with the rapid growth in the rural labor force. Fortunately, research has shown that technological change in agriculture can stimulate considerable direct and indirect nonagricultural employment (and income) growth in rural areas. Increases in farm household demand for locally produced nonfood goods and services represent an important means of stimulating employment and income growth in the rural areas of many developing countries.

In the past the growth linkages associated with technological change in agriculture were neglected. But now IFPRI, in concert with other international organizations, is studying the indirect multiplier effects of technological change in agriculture. Understanding the impact and dynamics of these growth linkages is critical because they provide the possibility for substantially raising the incomes of the rural poor. IFPRI is particularly well suited to pursue this type of research by virtue of its ability to pursue an interdisciplinary approach to the production, consumption, and trade aspects of local agricultural growth.

#### QUESTION 6:

How can food security be provided to the world's poorest people in the face of unequal distribution of income, fluctuating production, and high costs of storage?

It is the poor who bear the brunt of fluctuating food supplies. For this reason efforts to alleviate poverty focus on food security programs. Unfortunately, the new agricultural technologies that provide the

means for increasing food production may be associated with fluctuations in production. Therefore, this area of research is of considerable concern to the entire CGIAR system.

IFPRI's work in this area concentrates on both national and international approaches to improved food security for the world's poor. IFPRI researchers are currently examining national approaches to protecting the poor from the effects of fluctuating food supplies and for cushioning them against the type of food price increases that may accompany growth. The effects of food prices and subsidy programs on the nutritional status of the poor and on domestic food production is also being examined. IFPRI is shifting the focus of its international food security research to examining how agricultural modernization may increase fluctuations in food production and how food aid and food distribution programs can be designed and operated more efficiently.

Research on these questions is administered through four programs: Food Trends Analysis, Food Production Policy and Development Strategy, Food Consumption and Nutrition Policy, and International Food Trade and Food Security. This report describes the research activities undertaken in these programs during 1982. The results were reported in seven research reports, seven issues of *IFPRI Abstract*, and three issues of the newsletter, *IFPRI Report*.

IFPRI publications of 1982 also included a special publication for World Food Day entitled *Food and the Structure of Economic Growth: Its Relevance to North-South Relations and IFPRI Research and the Creation of the IMF Cereal Import Facility*, a case study of how timely food policy research can lead to important public policies. In addition, five working papers were published as part of the Rice Policies in Southeast Asia Project.

In June of 1982, IFPRI published its first long-term plan, *Looking Ahead: The*

*Development Plan for the International Food Policy Research Institute*, which describes the staff, research, and financial priorities envisioned for IFPRI through 1987. This publication describes the evolution of IFPRI's research goals and their future orientations.

As in the past, the IFPRI research staff provided special assistance in looking into food problems on behalf of a number of international organizations and governments. These organizations included the Arab Organization for Agricultural Development, the Food and Agriculture Organization of the United Nations, the Ford Foundation, the Inter-American Institute for Agricultural Cooperation, the World Bank, the World Food Council, the World Food Programme, the United Nations Development Programme, the United Nations Conference on Trade and Development, and the governments of Australia, Egypt, Indonesia, Mexico, the Netherlands, the Philippines, and the United States.

For the third year, IFPRI held its annual February Board of Trustees meeting for program review in a Third World country. During the week of the meeting, which was held in São Paulo, Brazil, IFPRI researchers met with Brazilian researchers and policymakers to discuss food problems specific to the region. Discussions were also initiated on expanding IFPRI's outreach effort to include a food policy meetings and workshop program.

As a follow-up to these discussions, a food policy seminar program was begun in June. This year's annual report contains a new section that discusses IFPRI's outreach efforts during 1982, including the seminar program.

This report also contains the director's annual food policy statement, which this year looks at the world food situation and comments on future prospects for Third World countries.

# THE GLOBAL FOOD OUTLOOK: IMPLICATIONS FOR DEVELOPING COUNTRIES

The design and implementation of effective agricultural investment policies in the Third World are greatly complicated by the confusing crosscurrents in the current world food situation. While present rates of food production growth in many developing countries clearly demonstrate the need for continued technological progress in agriculture, the depressed state of food prices and the large accumulation of global carryover stocks reduce the current incentive to invest in agriculture. Such perplexities make it difficult to choose agricultural policies designed to improve the consumption and nutritional status of poor people in the developing world.

Between 1961 and 1977, total production of major food crops in the developing world increased at an average rate of 2.6 percent per year. This was only slightly faster than the average annual population growth rate of 2.5 percent. On a per capita basis, food production in the Third World increased by only 0.1 percent.

This modest rate of per capita food production growth in the Third World reflects in part the poor performance of

Africa for the past 20 years. Per capita food production in Africa was almost constant during the 1960s, but declined shockingly during the 1970s. And in 1980 it was 15 percent less than in 1969-71 (excluding South Africa).

During the past few years the depressed level of cereal prices has reduced the stimulus for faster rates of food production growth in the Third World. Between 1980 and 1982 rice prices in current U.S. dollars dropped 26 percent, wheat prices 22 percent, and maize prices 13 percent. Of course, given the rising relative value of the U.S. dollar, the decline in cereal prices in terms of other currencies was somewhat less, but it was still quite large. Under these circumstances the returns to capital investment and technological change in agriculture appear to have decreased markedly.

Just as the rise in food prices and the pressure on world stocks in 1974 brought expectations of increased investment in agricultural production and development, so the current situation seems to bring opposite expectations. But inevitably,

long-term policy decisions based on extreme short-term changes in highly volatile markets will prove wrong. The reduced level of investment in agriculture that is now being contemplated by international lending organizations and national governments will ensure that food supplies will become tighter in a few years. Such reduced investment is also likely to lead to greater poverty and less rural participation in growth than in the past.

## CEREAL PRICE

**TRENDS** During the past 200 years, the major year-to-year fluctuations in cereal prices that we are now witnessing do not seem to have had any measurable impact on the long-term real price trends for these commodities. The real price of maize, for example, has shown little trend either up or down over the last two centuries. Except for the highly stable period of the 1950s and 1960s, there have been major year-to-year fluctuations in current maize prices every half dozen years or so. Downward or upward price trends, which have led to a halving or doubling of the real price of maize, have occurred several times over the last two centuries. From 1865 to 1890, from 1920 to 1930, and from 1950 to date the real price of maize trended down. From 1895 to 1920 and from 1930 to 1950 the trend was up. A belief in long-term cycles would lead to the expectation of a 10-30 year upward trend from the present.

During the same 200-year period the real price of wheat has trended down, primarily because it started the period well above maize prices. The upward and downward fluctuations in the intermediate term, however, have been the same as for maize.

One should expect such year-to-year and short-term fluctuations in cereal prices and should not allow such fluctuations to dictate unwise policies for the future. Each of the past short-term trends

has been the result of specific and peculiar conditions, and it would not be surprising if the next trend period was similarly unique in its causal forces. It is those unique forces that are the subject of IFPRI analysis—an analysis that is essential to the effective allocation of CGIAR research resources.

## PRODUCTION AND CONSUMPTION

**TRENDS** There are major dynamic forces at work that profoundly influence the supply and demand for food in the Third World. The most important of these forces are the rapid growth in per capita income in many developing countries; the growing importance of livestock consumption in total cereal use; and the increasing importance of yield increases in agricultural production growth. The balance of these forces promises further growth of food deficits in the developing countries of the world, surpluses in the developed countries, and the reasonable prospect of a period of upward-trending real food prices.

Despite the growth-dampening effects of the current recession, much of the present Third World population lives in countries in which per capita income is either growing rapidly or soon will be. Only some 400 million of the Third World population, located largely in Africa, now live in countries that still require decades of institution building to achieve high rates of income growth.

When income grows rapidly the resulting increase in food demand in developing countries is likely to exceed domestic production capabilities. The high marginal propensity of low-income people to spend increments to income on food, coupled with still rapid population growth, cause food demand growth in such countries to increase 5 percent or more each year.

Most developing countries have been unable to sustain such high rates of food production growth. For this reason, many rapid-growth countries (in which per capita income increases by more than 5 percent annually) are forced to rely on ever-increasing amounts of food imports. Between 1961-65 and 1973-77, net food imports to rapid-growth countries increased from about 5 million metric tons to 12 million tons, an average rate of increase of 6.6 percent per year.

While the rapid-growth countries have recorded a particularly high rate of food import growth, it is important to recognize that the developing countries as a whole have also greatly increased their net imports of basic food staples. Net food imports by developing countries as a whole rose from about 10 million tons in 1961-65 to 28 million tons in 1973-77, an average rate of increase of over 9 percent a year. This is a highly leveraged reflection of the faster increase of food demand than supply in these countries. In many of these countries the ever-increasing demand for food outstrips even the most successful of national efforts to expand local production. According to IFPRI research, during the period 1961-76 the 16 developing countries with the highest growth rates in basic food staples production collectively more than doubled their net imports (in tons) of food. That is a particularly dramatic indication of the forces at work.

As development takes place, the population growth rate decreases. But even more importantly, income begins to grow and its increases change the character of the demand for food. Demand for fruits, vegetables, and livestock products is more elastic, and at high incomes the demand for such goods becomes important.

The dominating effect of livestock products, in particular, in the growth of food demand is not generally understood. Indeed, empirical analysis often artificially constrains this force in making projec-

tions. Current IFPRI research is attempting to illuminate and substantiate the power of livestock consumption growth.

In a low-income country like India, livestock feed probably constitutes no more than 6 percent of the total basic food staple supply. But in the United States, livestock feed makes up about 80 percent of the major food crops consumed domestically. Understanding the precise path by which this transition occurs is essential if the future global food situation is to be depicted accurately. Livestock product consumption causes nonlinear, accelerated growth in demand for basic food staples used as livestock feed, a demand that grows rapidly over a wide range of incomes and remains high even for people whose incomes are relatively large. Such demand creates its own production problems because of the inability to expand pasture areas, the changing character of livestock consumption, and the inelastic supply of by-product and waste feeds. Pigs and poultry are currently the two fastest growing livestock products in the Third World and demand particularly large amounts of concentrate feed.

Current IFPRI work on Taiwan illustrates the increasing importance of livestock consumption in the growth of Third World food demand. During the early twentieth century, national policies did much to stimulate income and agricultural growth in Taiwan. In more recent years such income growth has fueled an explosive increase in cereal (maize) imports, and in the proportion of cereals used for livestock feed. Between 1960 and 1970, the 147 percent rise in per capita meat consumption in Taiwan has led to a large increase in the amount of cereals fed per pound of livestock product produced.

What we need for defining the future growth rate for basic food staples in the Third World is an appropriate generalization of the livestock experience in Taiwan. That will soon be available from IFPRI researchers.

## FUTURE FOOD DEFICITS AND SURPLUSES

The interaction of the population, income, and livestock factors described above is likely to produce growth in Third World food demand that greatly exceeds the ability of these countries to produce food. On the basis of a straight-line projection, by country, using 1966-77 production and income trend data and United Nations median population estimates, a net deficit of 75 million tons of major food crops in the Third World is likely by the year 2000. Although this figure represents only 5 percent of the total projected food demand in the developing world for that year, it is nearly three times the estimated food deficit of these countries in 1977.

As might be expected, IFPRI research shows that the rapid-growth countries will have the largest net production shortfall (65 million tons) by the year 2000. Despite the large size of this deficit, I would argue that this estimate is too small because per capita consumer expenditure growth rates in these countries will remain high, even with lower oil revenues, as investment rates decline and past investment provides income. In addition, livestock product imports will be partially displaced by domestic production based on imported feed, and physical and institutional constraints in these countries will make it difficult to greatly expand present rates of food production growth.

IFPRI's work on trends also shows that the slow-growth countries (in which per capita income increases less than 1 percent) will register a large net production shortfall (40 million tons) by the year 2000. This result is unexpected given the growth of income and population in these countries. Large-scale foreign assistance to those slow-growth countries helps to ease the impact of such food production shortfalls. For example, foreign aid to

Sub-Saharan African countries currently equals about 52 percent of their gross domestic investment.

It is difficult to estimate the ability of the developed world to respond to these projected long-term food deficits in the Third World. A simple projection of 1966-77 production and consumption trends yields a net surplus in the developed world of only 46 million tons of basic food staples by the end of the century. However, this is the product of a huge surplus in the United States, and a large deficit in the Soviet Union. By contrast, projection of the longer period, 1961-79, yields a net surplus of 196 million tons! Where one falls between these two projections is a function of such factors as the European Community's policy on prices, the extent to which U.S. agricultural technology can maintain high rates of yield increases, and Soviet bloc policies on meat consumption and rationalization of production. It is not unreasonable to suppose that the present downward trend in food prices will bring little of the shift needed to generate larger net exports by the developed countries.

## NEED FOR INVESTMENT IN AGRICULTURE

What conclusion can we draw from these contrasting trends in developed and developing countries? My judgment is that the food deficit of developing countries will be larger than is now projected, that the surplus of developed countries will be smaller, and that if the two are to balance each other, a modest upward trend in real food prices will be required. The accuracy of this judgment depends on what happens to the U.S. dollar exchange rate. A continued "overvaluation" of the dollar will depress U.S. production.

The expectation of higher real prices is based largely on the effect of income growth on livestock production in the

Third World. A major increase in the real price of cereals would substantially reduce that source of demand. Hence, a large secular increase in prices is unlikely. During the next year IFPRI research on the dynamics of food production and consumption in the Third World will leave the developing country part of the analysis quite firm. At the same time we will endeavor to arrive at a clear assessment of United States and Soviet production potential as a basis for a surer global picture.

All of the above suggests that the environment for developing countries to invest in agriculture will be favorable during the next few decades. New technology and physical investment will have the benefit of lower costs reinforced by somewhat higher real food prices.

Technological and physical investment in agriculture seem likely to bring ever-increasing returns particularly in view of the potential many developing countries now possess to reduce their costs of production. Through technological investment in agriculture even countries that face an unfavorable change in the terms of trade may still encounter a favorable change in the factor terms of trade. As an extreme example of the importance of technological innovation, many African producers are now seeing

their export markets for rubber, palm oil, and cocoa being taken over by countries with more effective research and development programs. The role of the CGIAR in encouraging developing countries to invest in agriculture—and particularly in food crop production—should be emphasized.

Finally, it is important to recognize that technological investment in agriculture affects the rural (and urban) poor in a way that is not possible with investment in other sectors of the economy. Technological change in agriculture not only provides the poor with expanded food supplies, but actually increases their effective demand for such supplies through the income and employment multiplier effects of agricultural change. The indirect distributional effects of technological change in agriculture argue forcefully for the direction of increased national funding into the more productive sectors of agriculture. It is essential that the current temporary break in the favorable price environment for agriculture not be allowed to obscure the very considerable nutritional and distributional benefits attendant to national investment in agriculture.

John W. Mellor  
Washington, D.C.

# FOOD TRENDS ANALYSIS PROGRAM

Building on food and related data from other international organizations, research in the Food Trends Analysis Program examines the historical trends of food production, consumption, and trade in developing countries and assesses the prospective food situation in the Third World, based on trend-oriented projections of food output and demand in these countries. Studies are aimed at a general diagnosis of the world food problem in the years ahead, through its likely size, dynamics, and critical locations, in order to help identify areas for in-depth research on food policies by other IFPRI programs. Study results also add to the pool of information available to policymakers who are seeking solutions to the food problems of Third World countries. In addition to the global assessment, program activities include more detailed analyses of food trends for specific countries or groups of countries.

## FOOD GAP ANALYSIS

The recently completed food gap studies analyzed the food trends of 105 developing countries (including the People's Republic of China) during the past two decades. These studies also developed projections of production and market demand for the major food crops and the primary livestock products to the year 2000. Specific commodities included in the analysis are cereals, roots and tubers, pulses, groundnuts, bananas and plantains, meat, milk, and eggs. Some of the salient findings of the studies are given below. Results are presented for the regions of Asia, North Africa/Middle East, Sub-Saharan Africa,

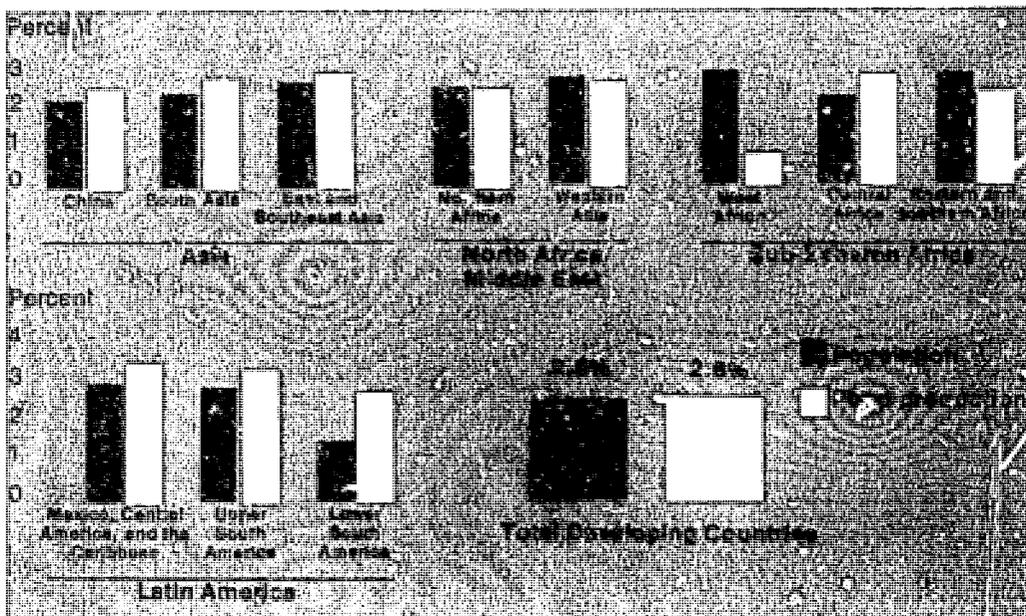
and Latin America, and where possible, their subregions.

## MAJOR FOOD CROPS

The 2.6 percent annual growth in the production of major food crops in the Third World during the period 1961-77 slightly outpaced the population increase (Figure 1). Growth in output was particularly rapid in the northern subregions of Latin America. Mexico, Central America, and the Caribbean had the highest growth rate in food output, with production about half a percent ahead of population growth. Food production also grew rapidly in Upper South America. The 0.7 percent rate of increase in production in West Africa was the lowest, while its population growth of 2.9 percent was one of the highest. Food production grew faster than the population in Lower South America, in all three Asian subregions, and in Central Africa. It kept abreast of population growth in Northern Africa but lagged behind population expansion in Western Asia and in Eastern and Southern Africa.

Rice, wheat, and maize, which together represent more than three fifths of major food crops grown in developing countries, accounted for about 70 percent of the increase in food production in the Third World between 1961-65 and 1973-77 (Figure 2). Rice's contribution of 31 percent was the largest. Rice and maize, which contributed 15 percent, both expanded by 2.8 percent a year during the period. But wheat had the most rapid growth of output at 4.3 percent, resulting in its 25 percent contribution to the increase in production and a rise of about 3 percent in its relative share of total food output. Millet, sorghum, and

Figure 1  
Growth of population and food production in developing countries, 1961-77



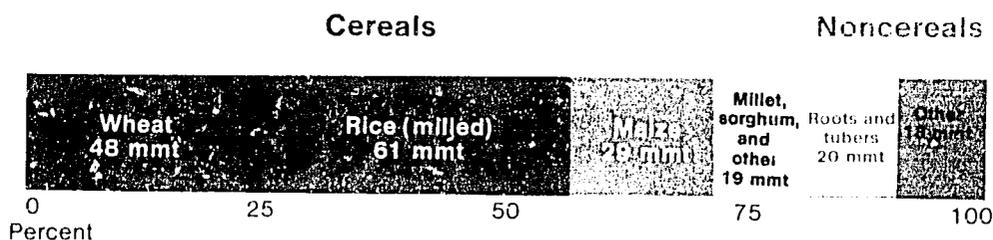
Sources: Food and Agriculture Organization of the United Nations, "Production Yearbook Tables, 1975 and 1978," Rome, 1976, 1979; Republic of China, Executive Yuan, Directorate-General of Budget, Accounting and Statistics, *Statistical Yearbook of the Republic of China, 1979* (Taipei: Taiwan, 1980); Anthony Tang and Bruce Stone, *Food Production in the People's Republic of China*, Research Report 15 (Washington, D.C.: International Food Policy Research Institute, May 1980); United Nations, Department of International Economic and Social Affairs, *World Population Trends and Prospects by Country, 1950-2000* (ST/ESA/SER.R/33), 1979; and U.S. Bureau of the Census, Foreign Demographic Analysis Division, "Population Estimates for the People's Republic of China, Intermediate and Low Series," Washington, D.C., April and June 1980. (Mimeographed.)

other cereals jointly accounted for 10 percent of the increase. The remaining 20 percent of the increase in food production came from the noncereal components of major food crops, with roots and tubers representing more than half. As a group, these noncereals increased in output by about 2.4 percent a year from the early 1960s to the mid-1970s.

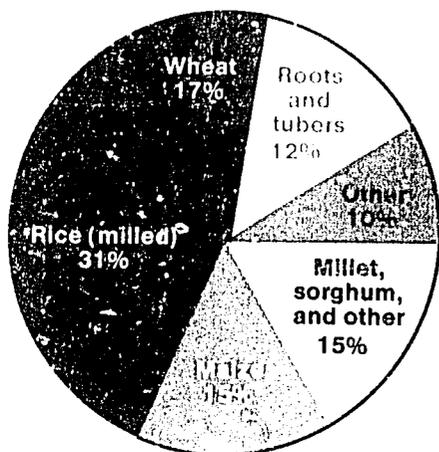
Between 1961-65 and 1973-77, consumption of basic food staples in Third World countries grew an average of about 3.2 percent a year. The rates of increase of the main items of domestic utilization were 3.1 percent for food use, 3.9 percent for animal feed, and 2.7 percent for other uses. The relative share of staples used

for feed in total consumption rose nearly 2 percent. The rapid increase in the use of major food crops for feed, especially grain, indicates that the consumption patterns of Third World countries are shifting toward more livestock products. This trend can be expected to continue in view of the rapid growth of incomes in many developing countries, particularly the oil-exporting nations and those countries in relatively more advanced stages of development. Although the major determinant of food consumption growth in the Third World is still the increase in direct food use, which represents more than 70 percent of the domestic utilization of basic food staples, the influence of the growth of feed use will continue to rise.

Figure 2  
**Contributions of different commodities to the food production increase in developing countries, 1961-65 to 1973-77**



**Percentage of total production**



Source: Food and Agriculture Organization of the United Nations, "Production Yearbook Tapes, 1975 and 1978," Rome, 1976, 1979.

Notes: mmt stands for million metric tons. The percentages of total production are for 1973-77. Noncereals are measured in cereal equivalents.

Like production, the fastest growth in total consumption of the major food crops between 1961-65 and 1973-77 was in Mexico, Central America, and the Caribbean, and the slowest was in West Africa (4.5 percent and 1.9 percent, respectively). Consumption also grew rapidly in Northern Africa at 3.9 percent and in China at 3.8 percent. Consumption growth rates of less than 3 percent a year between the 1960s and 1970s occurred only in West Africa, South Asia, and Eastern and Southern Africa, where increases in the use of major food crops directly for food significantly lagged behind population growth. This is indicative of declining per capita food availability in these subregions. Growth of food use was also slightly

slower than population expansion in Upper and Lower South America, but for these relatively high-income subregions such a trend is more an indication of a consumption shift away from the basic food staples than reduced food availability. In 1973-77, direct food use of these commodities accounted for three fourths or more of total consumption of the subregions in Asia and Sub-Saharan Africa, where food use is still the main determinant of consumption growth. In contrast, less than half of major food crop consumption in the South American subregions is directly consumed. In Upper and Lower South America, the use of basic food staples for animal feed increased to about 35 and 55 percent,

respectively, and has become an important codeterminant of the growth of total food consumption in these subregions. Between 1961-65 and 1973-77, considerably rapid increases in feed utilization of 9.2 percent a year in Mexico, Central America, and the Caribbean and of 6.3 percent a year in Northern Africa occurred. The two South American subregions and East and Southeast Asia increased feed use by 4-5 percent. With the increases in the consumption of livestock products generated by income growth in the developing countries, the expanding derived demand for livestock feed may be expected to play a more dynamic role in the Third World food situation in the coming decades.

Average annual growth rates of 2.4 percent in exports and 5.0 percent in imports of the basic food staples by Third World countries caused their net imports of these commodities to increase almost threefold between 1961-65 and 1973-77 (see Table 1). Food trade data by sub-

region show that only Lower South America was a net exporter during both end periods. West Africa and East and Southeast Asia shifted trade positions from being net exporters, while other subregions were net importers during 1961-65 and 1973-77. Chinese food imports in 1961-65 rose by more than a third, but a doubling of China's relatively smaller exports led to an increase of its net imports of only half a million metric tons in 1973-77. South Asia's net imports increased by 10 percent, the smallest relative increase, which—coupled with a 50 percent growth in food exports—maintained the subregion's net import level between the 1960s and the 1970s. East and Southeast Asia's small net exports in 1961-65 changed to net imports in 1973-77 as the level of food imports rose. . . decline of food exports combined with a more than twofold increase in food imports in Northern Africa resulted in net imports in 1973-77 that were 3.5 times the level in the early 1960s. The traditional importing countries in Western Asia more

Table 1  
Food trade in developing countries, 1961-65 to 1973-77

Region/Subregion	Annual Growth Rate		Food Trade		
	Exports	Imports	Exports	Imports	Net
	(percent)		(million metric tons)		
<b>Total</b>	2.4	5.0	31.1	59.2	-28.1
<b>Asia</b>					
China	6.3	2.5	2.8	8.0	-5.1
South Asia	3.2	0.8	2.1	8.9	-6.8
East and Southeast Asia	2.3	6.4	8.2	12.3	-4.1
<b>North Africa/Middle East</b>					
Northern Africa	-6.8	7.6	0.4	6.7	-6.3
Western Asia	5.7	6.9	0.6	4.9	-4.3
<b>Sub-Saharan Africa</b>					
West Africa	-6.1	9.4	0.9	2.2	-1.3
Central Africa	-5.1	9.6	0.1	0.8	-0.7
Eastern and Southern Africa	-5.1	3.6	0.6	1.5	-0.8
<b>Latin America</b>					
Mexico, Central America, and the Caribbean	-2.2	9.3	0.3	5.8	-5.0
Upper South America	6.4	4.9	2.1	7.0	-4.9
Lower South America	3.8	10.0	12.4	1.2	11.2

Source: Food and Agriculture Organization of the United Nations, "Global Agricultural Programming System Supply Utilization Accounts Tape," Rome, June 1980.

Notes: Parts may not add up to totals due to rounding. Food trade figures are for 1973-77. Net is exports minus imports.

than doubled food imports between 1961-65 and 1973-77, but a significant increase of exports by this subregion helped keep down net imports in the later period.

West Africa's sharp decline in groundnut exports and a nearly threefold expansion of grain imports moved the subregion from a small net exporter in the early 1960s to a net importer in the mid-1970s. Central Africa also had a large decline in exports and a threefold rise in imports, but Central Africa's food trade levels were relatively smaller and its 1973-77 net imports were only half those in West Africa. Eastern and Southern Africa, on the other hand, experienced only a small decline in exports and a 50 percent increase in imports. Net food imports in this subregion rose four times from 1961-65 to 1973-77. Despite rapid growth of food production in Mexico, Central America, and the Caribbean between the 1960s and 1970s, the faster expansion of its food demand caused a drop in exports and a threefold increase in imports; net food imports of this subregion increased more than five times. Upper and Lower South America increased their trade positions as net importer and net exporter, respectively.

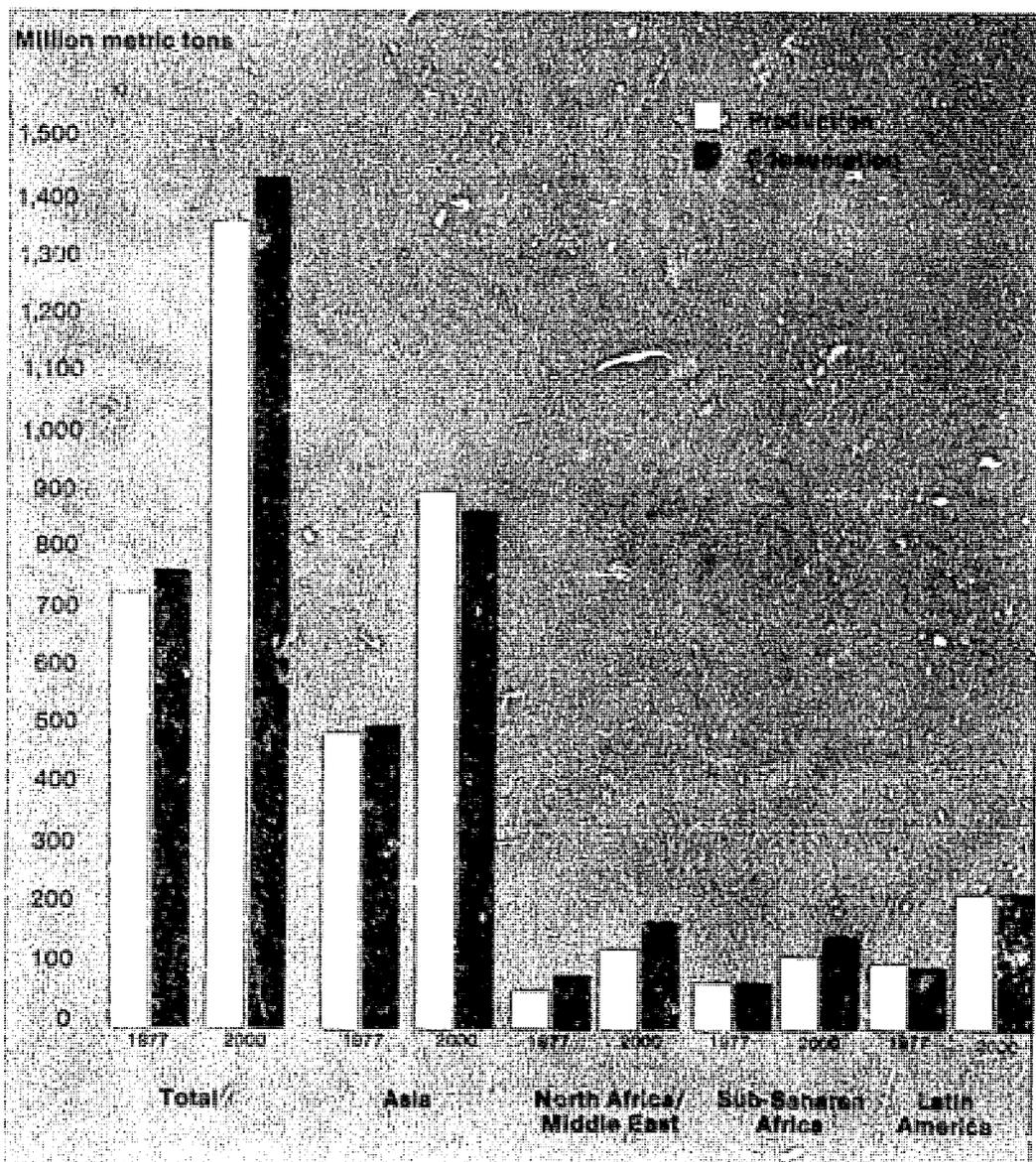
Based on the continuation of past trends in production and per capita incomes in developing countries, food projections show a total output of 1,365 million tons and a total demand of 1,440 million tons of the basic food staples in the Third World at the end of the century (Figure 3). These projections indicate an overall net food deficit of about 75 million tons, which—although representing only 5 percent of projected consumption—would be nearly three times the estimated net deficit of major food crops in these countries in 1977. (Third World countries outside China have a projected production of 940 million tons and a projected demand of 1,020 million tons of these commodities by 2000, indicating a net shortfall of 80 million tons. The projections for China, based on IFPRI-compiled data, show a slight surplus of about 5 million tons of the basic food staples.)

All three subregions of Asia are projected to have net surpluses by the end of the century. The region is projected to achieve a net food surplus of more than 20 million tons in 2000; this would be a shift from Asia's food position in 1977 when it had an estimated net deficit of about 5 million tons of the basic food staples. Induced by fast income growth, a continued rapid increase in demand for food in North Africa/Middle East would lead to a substantial net production shortfall of the major food crops in that region of nearly 60 million tons, of which 55 percent would be in Western Asian countries of the region and 45 percent in Northern Africa. Sub-Saharan Africa also would face a sizable net deficit of 35 million tons of the basic food staples by the year 2000, if the poor food production performance of the region continues in the coming decades. More than 80 percent of the projected shortfall in Sub-Saharan Africa would be in West Africa and the remaining 20 percent in Eastern and Southern Africa. Food output is projected to be nearly equal to food demand in Central Africa. Latin America as a whole would face a small net food deficit of some 5 million tons. The large net surplus of major food crops projected for Lower South America would more than offset a large net deficit projected to occur in Upper South America and in Mexico, Central America, and the Caribbean. Rapid growth in food demand is expected to continue in these two subregions.

## LIVESTOCK AND POULTRY PRODUCTS

If the historical trends in the output of livestock and poultry products continue in the future, Third World countries (excluding China) are projected to produce 36 million tons of meat, 131 million tons of milk, and 8.5 million tons of eggs by 1990. The growth in the output of eggs would be the most rapid, the projected production being more than 72 percent higher than in 1977.

Figure 3  
**Production and consumption of major food crops in developing countries, 1977 and 2000**



Sources: Food and Agriculture Organization of the United Nations, "Estimates of Income Elasticities for Various Commodities, by Country," Rome, 1979 (computer printout); Food and Agriculture Organization of the United Nations, "Global Agricultural Programming System Supply Utilization Accounts Tape," Rome, June 1980; Food and Agriculture Organization of the United Nations, "Production Yearbook Tapes, 1975 and 1978," Rome, 1976, 1979; International Bank for Reconstruction and Development, "Gross National Products, 1960-78: Time Series Data by Country, at Current and Constant Market Prices," Washington, D.C., 1979 (computer printout); United Nations, Department of International Economic and Social Affairs, *World Population Trends and Prospects by Country, 1950-2000* (ST/ESA/SER.R/33), 1979.

Based on the projected growth of population and per capita incomes, and estimates of income elasticity of demand, the total requirements for animal products in 1990 will be 44 million tons of meat, 166 million tons of milk, and 8.8 million tons of eggs. Thus the net balances between the projected production and estimated consumption of these commodities by the end of the 1980s would be deficits of about 8 million tons of meat, 35 million tons of milk, and 0.3 million tons of eggs. Except for eggs in Latin America, all the regions would face production shortfalls in animal products by 1990. The net deficits in all these products would be large in Sub-Saharan Africa.

If these trends continue, the difference between production and estimated consumption in Third World countries is projected to widen to 21 million tons of meat and 65 million tons of milk by 2000; the production and consumption of eggs are expected to be in balance, as shown below.

	Production	Consumption	Net Deficit
	(million metric tons)		
Meat	51	72	-21
Milk	177	242	-65
Eggs	15	15	0

These projections indicate that developing countries are heading for huge deficits in animal products, as well as in the major food crops by the end of the century. But large-scale transfers of animal products from developed to developing countries are less likely, except perhaps for milk products. Acceleration of indigenous production up to the limits of potential seems to be imperative. At the same time, population pressures are causing accessible pasture and grazing lands to shrink because of the extension of cropping to new areas and the overuse

of existing ones. Pork and poultry production have more potential for growth because of the shorter reproduction cycles involved. The demand for this meat is also expected to grow faster than that of other meat. Thus larger and larger quantities of food crops will be required for livestock feed in competition with their direct use as food.

IFPRI therefore plans to study the expected demand for feedgrain and other cattle feed to achieve the required growth in livestock production. However, the limitations of data on food crops used as feed in the developing countries must first be overcome.

## NORTH AFRICA/ MIDDLE EAST

Since the 1973 rise in oil prices a striking disparity in affluence has evolved between the oil-exporting and the agriculture-dominated economies of the North Africa/Middle East region, and this has ushered in new dynamics that have profoundly affected the economic life of the entire region.

In a study of the implications for the region, it is assumed that the increase in oil revenues and their dissemination via worker remittances and other development efforts, particularly among the oil-exporting and the labor-exporting countries, have generated much of the rise in per capita income, which in turn has stimulated a substantial consumption increase, almost irrespective of the status of domestic food supply. At the same time, higher earnings accrued outside agriculture augmented the rise in urbanization and employment migration.

As a group the oil-exporting countries—which include Iran, Iraq, Kuwait, Oman, and Saudi Arabia in Western Asia and Algeria and Libya in Northern Africa—comprise nearly one third of the population and only 20 percent of the region's total cultivated area. Growth of production of basic staples in these coun-

tries has remained marginal or actually declined between the mid-1960s and the 1970s. Relative to 1973, the incremental increase of oil revenues pushed the real per capita gross national product upward by 30-35 percent in Algeria and Iran, by 50 percent in Iraq and Libya, and by 75 percent in Saudi Arabia. During the same year worker remittances among the labor-exporting countries of Egypt, Jordan, Lebanon, the Yemen Arab Republic, and the Peoples Democratic Republic of Yemen increased the per capita gross national products from 10 percent in Egypt to as high as 40 percent in the Yemen Arab Republic.

In contrast, the major food-producing countries of the region—Afghanistan, Turkey, Syria, Cyprus, Morocco, the Sudan, and Tunisia—account for nearly half of the regional population and about two thirds of both the area and the output of basic staples. Dependency on agriculture within this group of countries remains fairly strong because the sector employs nearly half of the economically active population and generates between one fourth and one third of total gross domestic product. Deficits in basic staples remained moderate at merely a tenth of the regional total.

Results of the study, utilizing 1966-80 data, suggest that between the late 1960s and the late 1970s the average growth rate of output of 2.6 percent in basic staples barely kept pace with the increase in population. Although meat and egg production increased rapidly (3.5 and 6.2 percent, respectively), milk output increased by only 2.3 percent. Yet, in practically all major food commodities, consumption growth surpassed those of population and production and resulted in a discernible upward trend in per capita food consumption throughout the region.

Whereas rapidly rising per capita income has become a force in restraining the expansion of human consumption of grains, the shift in demand toward the highly income elastic livestock and poul-

try products concurrently favors an increase in feedgrain use at rates substantially higher than those of basic staples for direct food use.

Starting from a near balance in the late 1960s, the coarse grain deficit was more than 4 million tons a decade later; this was about half the deficit level of wheat. By 1985 both crops will have accumulated a deficit of more than 8 million tons. Thereafter, as the region is expected to close the wheat deficit, coarse grains will dominate the entire deficit in food staples, reaching 35 million tons by the turn of the century.

Thus, by focusing on the increase of domestic grain supply for human consumption, particularly wheat, existing food policies may not have adequately adapted to the dynamics of demand in the region. Barring a shift in production policy toward a greater emphasis on the increase of area and yield of coarse grains, preliminary projections indicate that North Africa/Middle East will face a deficit of 45 million tons in basic staples, 5.8 million tons in meat, 20 million tons in milk, and 0.5 million tons in eggs by the end of the century. Compared to the base year 1980, the projected food gaps will increase about threefold in basic staples, meat, and eggs and fivefold in milk. Consequently, self-sufficiency in these major food commodities appears highly unlikely, as rising demand will continue to propel the region into a larger dependency on food imports.

## CHINESE AGRICULTURAL STATISTICS

The basic research on developing provincial foodgrain statistics for the People's Republic of China from 1949 to the present has been completed, and analysis is under way. Adjustments for definitional and boundary changes clearly affect the ranking of

regional foodgrain growth performance. Studies conducted elsewhere have concluded that, since the late 1950s, the Northeast has been the fastest growing foodgrain-producing area in China, followed at some distance by the North China Plain and Central China. Eastern provinces taken as a group were next, followed by South China. Slowest growing were the Southwest, Sichuan, and the Northwest. Trends Analysis's research, however, indicates that North China was unquestionably the leader. Central and East China were next (averaging roughly equivalent rates), followed at a distance by the Northeast. Northeast China does better if a 1978-80 rather than the 1977-79 final period is used, but its ranking remains the same. The data also indicate that there were smaller differences in long-term average growth rates between the high-growth and most of the low-growth provinces.

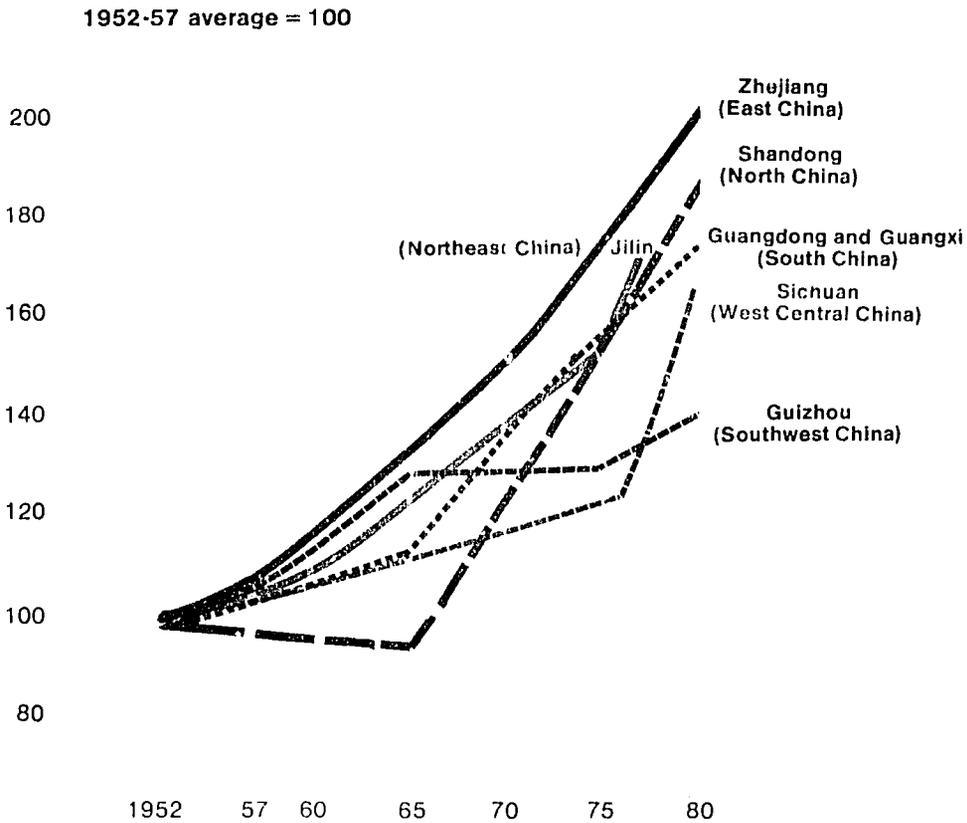
Almost all of the provinces performed more impressively during the period beginning in the late 1960s, because the major agricultural debacle of the early 1960s was over, and because the main effects of "green revolution" seed improvement and growth in industrial inputs to agriculture are captured during this period. Although the individual provincial estimates for 1965-67 exhibit much wider variances than for 1955-57 or the current period, it is clear that North China's predominance as a growth leader is even more striking. The overall growth leaders, such as Zhejiang in East China's Yangtze Valley did not outperform North China in the 1970s. The North China Plain was hardest hit by the more disastrous policies of the Great Leap Forward; large areas of land were salinized and even retired from production. Foodgrain production in these provinces (Hebei, Henan, Shandong, and Shanxi Provinces, and Beijing and Tianjin municipal areas) did not regain 1957 levels until the late 1960s, and cultivated area has not recovered even today, but growth appears to have averaged more than 4 percent per year since

1965. (Figure 4 shows an index of foodgrain production in selected provinces.)

Again, the East and Central regions performed well, about 3 percent per year, followed by the Northeast, with South China lagging somewhat behind. Since 1976 Sichuan has recorded one of the highest growth rates, which may have resulted from policy changes and perhaps some statistical distortion, but it was among the slowest growing regions during the previous two decades. The slowest growing province was undoubtedly Guizhou in the Southwest, which averaged 0.6 percent per year during 1957-79.

Although the southern provinces of Guangdong and Guangxi have often traded counties, most provincial boundary changes have occurred north of the Yellow River. Beijing and Tianjin municipal areas were enlarged, and Ningxia Hui Autonomous Region gained land from Gansu Province. In 1969 Inner Mongolia lost land to neighboring provinces, but it approximately doubled in size a decade later. The Northeastern provinces of Heilongjiang, Jilin, and Liaoning lost more than one third of their collective land area, while Gansu in the Northwest gave up more than a quarter of its former territory, and Ningxia more than a half to Inner Mongolia. Curiously, there appears to be little effect since 1979 on provincial foodgrain production statistics in these regions. The land lost by Gansu and Ningxia was mostly desert, but the immense tract of land transferred from the Northeastern provinces included both highland pasturage and relatively populated river basins encompassing some major reclamation areas. Yet foodgrain production in the Northeast remained near the 1978 level in 1979 and 1980, then fell by only 6 percent in 1981. Inner Mongolia's output paradoxically fell between 1976-77 and 1979, and in 1980 it dropped by 22 percent, recovering only the 1979 level in 1981. Production growth stagnation in both regions since 1979 reflects poor weather and retire-

Figure 4  
 Index of foodgrain production growth, selected Chinese provinces,  
 1952-80



Source: Revisions of reconstructed official Chinese figures, based on border changes and the definition of foodgrains.

Notes: Foodgrains include tubers valued at one fifth natural weight, pulses, and soybeans. Points have been plotted for 1952-57, the mid-1960s, the mid-1970s, and 1979-80. Wherever the quality of the underlying data permits, averages for three or five years have been plotted to reduce distortion due to single, atypical years.

ment of grain lands. In 1980, foodgrain-sown area decreased by almost 2 percent in the Northeast and 4 percent in Inner Mongolia.

The data also show that the variation of total area sown with particular food crops from year to year has fallen drastically since the 1950s, reflecting the success of state and provincial acreage

planning. Hence, production variability of foodgrains, until the recent major realignment of cropping patterns, became predominantly a function of yield variation and yield covariances among regions and among crops. Although provincial data is still being developed, it is clear that the yield covariances among crops have increased markedly since the 1950s, paralleling results for India.

# FOOD PRODUCTION POLICY AND DEVELOPMENT STRATEGY PROGRAM

The Food Production Policy and Development Strategy Program undertakes research with the objective of improving policies and strategies for food and agricultural production in developing countries. In order to base research on Third World realities, the program has been involved increasingly in national and regional collaboration and in dialogue with policymakers and local researchers.

During 1982 members of the Production Program conducted research on 12 projects that fell in three areas: specific production policies, development strategies, and linkages between agricultural and nonagricultural sectors.

## SPECIFIC PRODUCTION POLICIES

Research in this area concentrated on policies concerned with the generation and application of improved technology in agriculture. Policies regarding resource allocation to agricultural research, use of fertilizer, and irrigation development constitute the primary research focus.

## AGRICULTURAL RESEARCH

The application of new agricultural technologies is the responsibility of national and international research systems. The effectiveness of these institutions depends on the proper allocation of finan-

cial and human resources and their efficient management. IFPRI's research in this area focuses on these allocation and management issues through country case studies and global analyses.

Research continued on the second phase of work based on the study published jointly by IFPRI and ISNAR in 1981 (*Resource Allocations to National Agricultural Research: Trends in the 1970s*, by Peter Oram and Vishva Bindlish). The initial study provided a general review of Third World agricultural research systems. The second phase of this study carries out a more in-depth analysis of these systems.

Expenditures on agricultural research have grown, in real terms, in many national systems during the 1970s, with a number of countries maintaining annual growth rates exceeding 10 percent in expenditures and/or the number of scientists. In relation to agricultural GDP, the average level of expenditure for 51 developing economies has risen from 0.3 percent in 1975 to 0.56 percent in 1980. However, the distribution of this growth in real research expenditures has been uneven. Sixty-two percent of expenditures and 46 percent of the scientists in 51 developing market economies are concentrated in 5 countries—India, Bangladesh, the Philippines, Brazil, and Mexico. In addition to these issues of growth and distribution pertaining to research resources, the study also deals with quality aspects of national research systems,

training requirements of agricultural research scientists in the 1980s, and the implications of donor support to national agricultural research in the Third World.

During the year, work on case studies concerned with resource allocation and management in Nepal and India began. For Nepal, work has involved the analyses of the allocation of research and extension resources, organization and management of agricultural research, and the development of an overall strategy for the national research system. In the case of India, which has the most highly developed and largest national research system in the developing world, research allocation discussions and related organizational issues are particularly complex. In-depth research was initiated on the pattern of allocation of research resources by commodity, region, and problem area.

## FERTILIZER

Research on fertilizer policies in IFPRI is designed to identify policy instruments that govern the growth of fertilizer use. During 1982 a study on fertilizer policy in India was completed. In the published report, *Sustaining Rapid Growth in India's Fertilizer Consumption: A Perspective Based on Composition of Use*, Research Report 31, Guvant Desai identifies the forces behind the growth in India's fertilizer consumption from the early 1950s to the mid-1970s.

The study examines three aspects of growth in fertilizer use: shares of crops in total fertilizer consumption; diffusion of fertilizer use by crop; and average rates of use by crop. Wherever possible, profiles of fertilizer consumption by irrigated and unirrigated areas and by areas sown with traditional and high-yielding varieties are also developed. These findings are then related to other forces to explain the total performance of fertilizer consumption in India.

The study shows that, until the mid-1940s, when the government embarked on a grow-more-food campaign, fertilizer

use was confined to plantation crops (tea, coffee, and rubber) and a few nonplantation crops (sugarcane, rice, and tobacco). By 1955/56, 70 percent (125,000 nutrient tons) went to food crops; only 25 percent of the fertilizer used was allocated to plantation crops. By the 1970s, 80 percent of the fertilizer used went to food crops, and only 6 percent to the plantation sector (see Figure 5). Rates of diffusion (measured as the percentage change in crop area fertilized) and rates of application changed substantially during this overall growth in fertilizer consumption. Between the mid-1950s and the mid-1970s, irrigated areas, which accounted for less than one fourth of the total area sown, accounted for 70 percent of the total fertilizer consumption. Both the rate of diffusion and the rate of application of fertilizer were higher in irrigated than unirrigated areas.

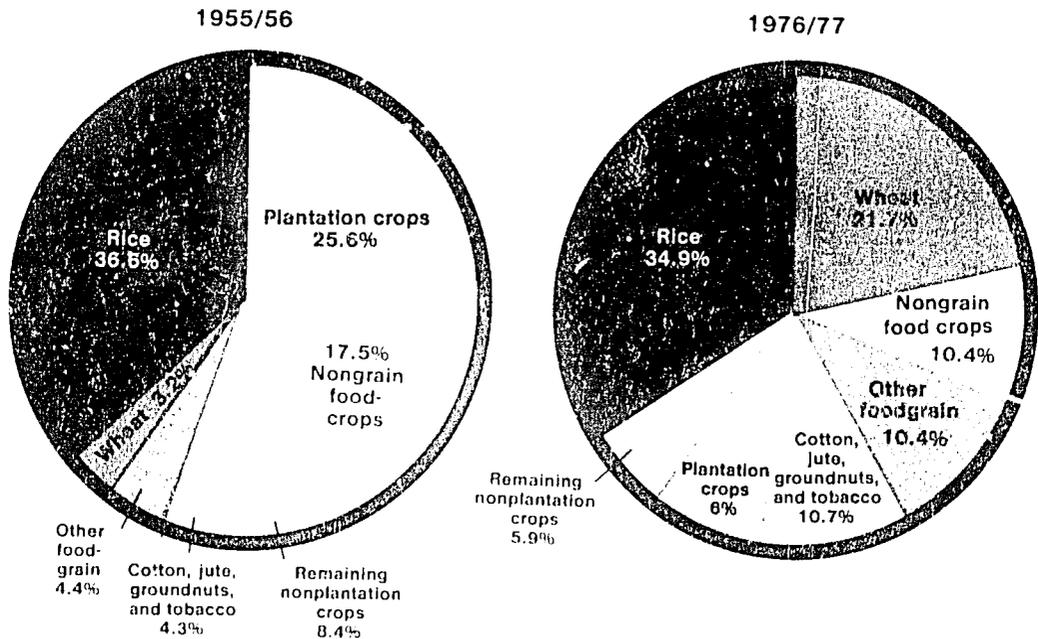
By 1976/77 two thirds of the total irrigated area and about one fifth of the unirrigated area were fertilized. Sugarcane, wheat, and rice were the most heavily fertilized crops in both areas. The report suggests that if fertilizer use on crops other than rice, wheat, and oilseeds had been promoted, if India had had a better fertilizer distribution system, and if fertilizer supplies had been more plentiful and steady, the growth in India's fertilizer consumption would have been faster. Indeed, if the fertilizer consumption targets necessary to meet the agricultural production goals of India's Sixth Five-Year Plan are to be met, India must meet its irrigation goals and expand fertilizer use in unirrigated areas.

Similar research efforts on Kenya and Nigeria were in various stages of progress in the Food Production and Development Strategy Program.

## IRRIGATION

Research on irrigation policies has been conducted as part of the collaborative Rice Policies in Southeast Asia Project, which is reported in the Regional Projects section.

Figure 5  
Share in total fertilizer consumption by crop, India, 1955/56 and 1976/77



Source: Derived from data in Guntant M. Desai, *Sustaining Rapid Growth in India's Fertilizer Consumption: A Perspective Based on Composition of Use*, Research Report 31 (Washington, D.C.: International Food Policy Research Institute, August 1982), Tables 3 and 25.

## DEVELOPMENT STRATEGIES

Research on development strategies is concerned with the constraints imposed on agricultural production policies by conflicting interests at the producer and the national level. For example, a policy to increase the market supply of foodgrains may be severely constrained by risks at the farm level. And policies to increase agricultural output by raising producer prices may not achieve their goal because an insufficient infrastructure may be unable to translate potential capacity into actual production. Research is intended to seek out the crucial elements in specific situations that can contribute to an overall strategy for increased agricultural production, emphasizing the fundamental interrelations among various policy initia-

tives. A number of research projects in the Food Production and Development Strategy Program explore the scope of this strategic adjustment in production policies.

## PRODUCT MIX AND PRODUCER INCENTIVES IN THE SAHEL

Poverty and concern for food security are extensive in the West African Sahel, an area where the improvement of incentives for food production is a key food policy issue in both national and multi-national circles. However, a relative lack of field investigation and analysis for this region has often led to implementing policies without a clear view of their impact on the overall incentives to produce as they are perceived by farmers. Work

concerning the Sahel addresses this research gap by attempting to integrate field-level data with the analysis of key issues from the food policy perspective. The approach involves close collaboration with a number of research institutions in West Africa.

During 1982 investigations continued on farmers' short- and medium-run responses to changes in relative prices among agricultural commodities in the Sahel. The study examines the interaction of seasonal price variations in good and bad years, on-farm food consumption behavior, and marketing strategies in the context of available technology. Hypotheses will be tested concerning the determinants of product mix, the composition of marketed surplus, and the timing of sales.

Household data have been provided by the Nigerian Agricultural Projects Monitoring, Evaluation, and Planning Unit from two integrated agricultural development projects in northern Nigeria. A view of technological possibilities for farmers in the area has been established by prior work at the World Bank on the same data set. Current work at IFPRI involves the estimation of the response to changes in relative prices of the size and composition of food consumption baskets. These consumption parameters will then be integrated into an existing model of production possibilities to assess the effects of seasonal price changes in good and bad years on farmers' food consumption, production, and marketing strategies. It is expected that this study will provide a clearer view of the extent to which farm-level food security concerns affect technology adoption and of the type of price incentives required to expand small-farm food sales given existing technologies.

## INSTABILITY IN FOODGRAIN PRODUCTION

Many countries have achieved impressive rates of growth in national foodgrain production in recent decades. Much of this

growth can be attributed to new technologies and to the increased use of modern inputs, such as fertilizers. But at the same time, the variability of foodgrain production around the trend also has increased. This increased instability is reflected in increased market and price instabilities, which pose difficult problems for farmers and poor consumers alike. Production instability also increases the size of emergency food stocks that needs to be carried by a government to ensure that consumption does not fall precipitately below trend.

There has been a tendency to blame much of this increased production instability on the improved seed/fertilizer-based technologies. Some researchers have also argued that plant breeders should focus less on maximizing average yields and more on reducing yield sensitivity to environmental stress. Such recommendations may prove costly for future growth in foodgrain production, and they cannot be warranted before more thorough and quantitative studies of the different sources of increased instability have been undertaken.

In 1982 IFPRI completed a study of the sources of increased instability in Indian foodgrain production entitled *Instability in Indian Foodgrain Production*, Research Report 30, by Peter B. R. Hazell. This study uses statistical identities to decompose the increase in the variance of Indian foodgrain production between 1954/55-1964/65 and 1967/68-1977/78 into its constituent parts, using data on the production of individual cereals by state. The study concludes that increases in yield variability at the individual crop and state levels accounted for only a very small share of the increase in the variability of national foodgrain production (less than 6 percent). More than 80 percent of the increase in the variability of national foodgrain production was attributable to increases in production covariances between crops grown in the same and in different states. In the period 1954/55-1964/65 there were much stronger offsetting patterns of variation

in the production of different crops grown in the same and different states, and these offsetting patterns declined considerably by the period 1967/68-1977/78. This increased synchronization in production patterns can largely be attributed to a loss in offsetting patterns of variation in yields between crops and states, and more positive associations between sown areas and realized yields.

The report indicates that the loss of offsetting patterns of variation in yields cannot be directly attributed to the new technologies, since these at worst act to increase yield variability at the individual crop and state levels. More plausible explanations are changes in weather patterns, or an increased dependence on fertilizer and on electricity for irrigation at a time when the supplies of these inputs became more erratic.

A parallel and ongoing study of cereal production in the United States indicates findings similar to the case of India. Because supplies of modern inputs are less erratic in the United States, a comparative analysis should help identify the causes of the increased synchronization of production patterns in both countries. Analyses of other countries are also planned.

Although irrigation and the development of less-risky technologies may lead to reduced yield variability, evidence to date suggests that these measures are not very effective in reducing instability in aggregate foodgrain production. From a national perspective, food security can be more effectively assured through policies designed to stabilize consumption rather than production. As other IFPRI work has shown, this can be effectively achieved through appropriate storage and international trade policies.

## AGRICULTURAL RISK MANAGEMENT POLICIES

Agricultural production is traditionally a risky business. Threatened by droughts, volatile prices, or other natural and eco-

nom ic uncertainties, farmers tend to act conservatively. They diversify their crops and are sometimes slow to adopt improved higher-yielding techniques because of the increased risks that accompany them. Such behavior reduces farmers' incomes and can lead to smaller supplies of riskier, possibly important, food or export crops. This can have undesirable effects on market prices, consumer welfare, and agricultural trade balances. In Central America, for example, beans provide an important protein source for much of the population. Yet production is significantly curtailed by this crop's high-risk factor.

Risk can create problems of income instability for farmers and increase the likelihood that a farmer will default on his bank loans. This together with the low interest rates on agricultural lending typically enforced by governments can severely deplete the capital of agricultural development banks.

Recognizing the critical importance of these problems, IFPRI and the Instituto Interamericano de Cooperación para la Agricultura (IICA) sponsored a conference on agricultural risks and crop insurance in February 1982. Researchers from IFPRI's Food Production and Development Strategy and International Food Trade and Food Security Programs; policy analysts, insurers, and researchers from Latin America and IICA; and specialists from the United States, India, the Food and Agriculture Organization of the United Nations, the World Bank, and the U.S. Agency for International Development met at IICA's headquarters in Costa Rica. They assessed the merits of crop insurance as part of development policy within the context of the interplay of credit markets, price policies, and agricultural insurance.

Typically, a government faces a range of policy options in stabilizing farm incomes, depending on the risks involved. It is important to begin by assessing the real sources of risk. Some risks can be tackled directly. For example, production variability arising from unreliable fertilizer

deliveries can often be resolved by consistent import policies and improved transport and storage systems. Likewise, some weather-related risks may be diminished through irrigation investments, which also contribute to increased production.

Many risks lie beyond direct government control and must be dealt with by compensating farmers in bad years. If price fluctuations are the primary cause of income fluctuations, then price supports or price stabilization schemes may be the best approach. A well-functioning credit market can also help to tide farmers over from poor to good years.

Crop insurance works best when yield risks are the primary source of fluctuations in incomes. It spreads risks among many farmers, through diverse regions, across sectors of the economy, and over time. Like other risk-sharing arrangements, it enables the individual farmer to focus more aggressively on average profits, thereby mitigating many of the effects of risk.

Despite this, the fact is that farmers in both developed and developing countries have generally been unwilling to pay the full cost of all-risk crop insurance. There are, however, many examples of farmers paying the full cost of insurance against some specific types of risks, such as fire and theft hazards. Consequently most all-risk programs remain public-sector schemes. Their management is often subject to political pressures on premium determination and coverage, and the programs are often used as a mechanism to transfer income to farmers. Countries such as the United States, Japan, Brazil, and Mexico have several decades of experience with publicly supported crop insurance programs. All of these schemes are heavily subsidized from the public purse, ranging from a low of 25 percent of indemnities in the United States to 50 percent of total payments in Brazil and 80 percent in Mexico and Japan. Subsidies of these amounts cannot be justified solely in terms of the risk-reducing ad-

vantages of crop insurance.

At the conference, papers were addressed to such issues as measuring farmers' demand for insurance, how to design crop insurance programs to make them more attractive to farmers, the effect of crop credit insurance on the lend-

ing policies of agricultural banks, ways to reduce the cost of all-risk insurance programs, and the economics of public subsidies for agricultural insurance. A book based on the conference papers is being prepared jointly by IFPRI and IICA.

## GROWTH LINKAGES

In a setting of dynamic technological change with sustained and continuing increases in the productivity of agricultural resources, the agricultural sector can stimulate growth in income and employment in many sectors of the economy. There are two types of linkage mechanisms that produce these growth effects: resource transfers, which comprise the flows of food and raw materials, capital, foreign exchange, and labor from the agricultural to the nonagricultural sectors, and demand linkages, which comprise farmers' demands for farm inputs and marketing and processing facilities and rural household demands for consumer goods and services.

IFPRI's work on resource transfers includes a series of historical, quantitative studies of the intersectoral resource flows that occur between agriculture and the rest of the economy during the process of economic growth. These research efforts attempt to clarify how agricultural investment and technological change enhance long-term, national economic growth by selecting countries at different levels of agricultural success.

Work on intersectoral resource transfers in Argentina between 1941 and 1971 resulted in Research Report 36, *Agriculture and Economic Growth in an Open Economy: The Case of Argentina*, by Domingo Cavallo and Yair Mundlak. In

Argentina's case, per capita agricultural output in the early 1970s was less than it had been prior to World War II. In addition, during the period 1940-72, agricultural production was 2.3 percent below the output of the rest of the economy because of off-farm labor migration and a weak growth of factor productivity in agriculture. Agricultural wages were less than half nonagricultural wages. The study indicates that a combination of agricultural export taxes, industrial protection, and real exchange rate policies worked against agriculture and succeeded in extracting on average about one half of the annual value of agricultural output evaluated at factor cost for nonagricultural purposes.

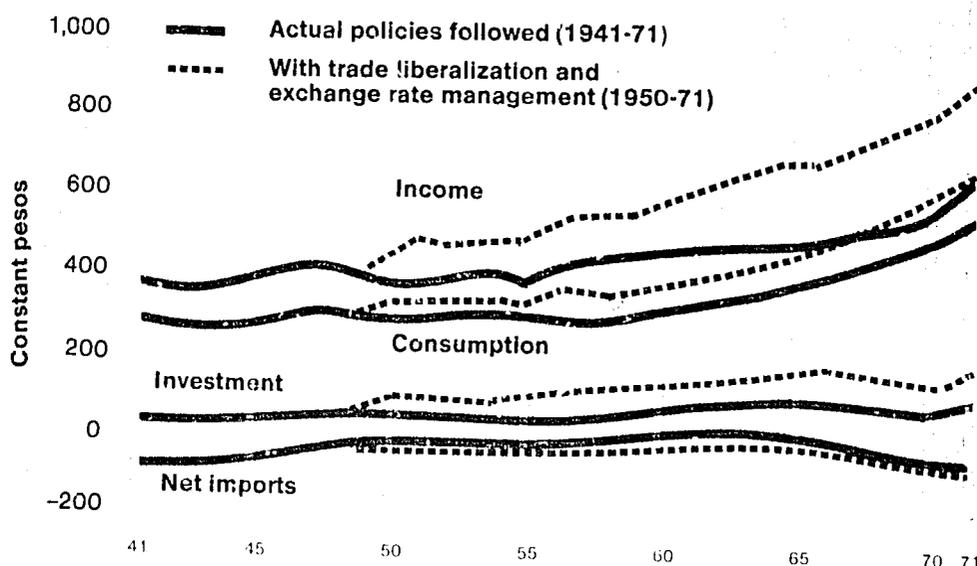
The research shows that if, during the period 1950-71, the Argentinian government had pursued more liberal trade

policies while at the same time maintaining the real rate of exchange between tradables and nontradables, then the national economy would have performed much better (see Figure 6). In fact, the study estimates that agricultural and non-agricultural per capita output could have been 30-40 percent higher than they actually were by 1971.

This study clearly demonstrates the contributions a dynamic agriculture can make to national economic growth in an open economy, and highlights the cost of development strategies that place too much emphasis on industrialization within a protectionist framework.

The potential strength of agricultural growth in stimulating national economic development was also demonstrated in a study of the Indian economy, *Agricul-*

Figure 6  
Effects of trade liberalization with exchange rate management on per capita income and expenditures, Argentina, 1941-71



Source: Domingo Cavallo and Yair Mundlak, *Agriculture and Economic Growth in an Open Economy: The Case of Argentina*, Research Report 36 (Washington, D.C.: International Food Policy Research Institute, December 1982), Figure 46, p. 73.

*tural Growth and Industrial Performance in India*, Research Report 33, by C. Rangarajan.

In the study, agricultural linkages are divided into three groups—production, demand, and savings and investment—and incorporated into a macroeconomic model using data from 1961 to 1972. The analysis indicates that agricultural growth has a significant effect on industrial and overall growth. Rangarajan estimates that a 1 percent increase in the growth rate for agriculture raises the industrial growth rate by 0.5 percent and the rate of growth of national income by 0.7 percent.

IFPRI's research on demand linkages has stressed the linkage effects of household consumption patterns. An earlier study in Malaysia in which IFPRI research staff participated found that each dollar of income generated among farmers by an irrigation project generated a similar amount for the region through the indirect effects. This research also showed that intermediate demands for agricultural inputs and services were responsible for only a small part of the indirect gain; the larger share arose from increased farm incomes generating rural household demands for consumer goods and services. Related research continues in Tamil Nadu, India, to determine if similar results would occur under different social and economic conditions and within the context of more modest productivity gains obtained from high-yielding rice varieties rather than from large-scale irrigation investment.

An important focus of IFPRI's growth linkage work is to identify ways in which government policy can be used to enhance the secondary growth effects of increases in agricultural output in rural areas. Projects to investigate three aspects of the rural linkage question continued during 1982.

Investment in infrastructure is one area of investigation. Work on Bangladesh explores the role of such investment in an effort to determine the levels necessary for agricultural growth. Investment in irrigation, roads, and transport systems

helps increase agricultural productivity and investment in roads, banks, and markets is necessary to aid the flow of commerce without which the growth of the local economy is inhibited.

IFPRI research with farm household data from Malaysia and Nigeria indicates that most of the multiplier effects arising from increased farm incomes seem to occur within the rural areas. They focus on such consumer-oriented sectors as transport, entertainment, health, and housing and on locally produced fruits, vegetables, eggs, and dairy products. These types of goods and services tend to be labor intensive and require only limited capital, thereby providing rounds of growth that are beneficial to the rural poor.

IFPRI's work shows that larger shares of incremental income are spent on locally produced nontradable goods and services as incomes increase (see Figure 7). Research suggests that because the demand for those goods and services creates the largest multiplier effects within rural areas, a successful rural development strategy may require renewed emphasis on increasing the incomes of middle-income farm households. This is not to say that lower-income households should be neglected, but rather to suggest that the best hope for helping the rural poor is to indirectly generate increases in employment and wages in the local nonfarm economy.

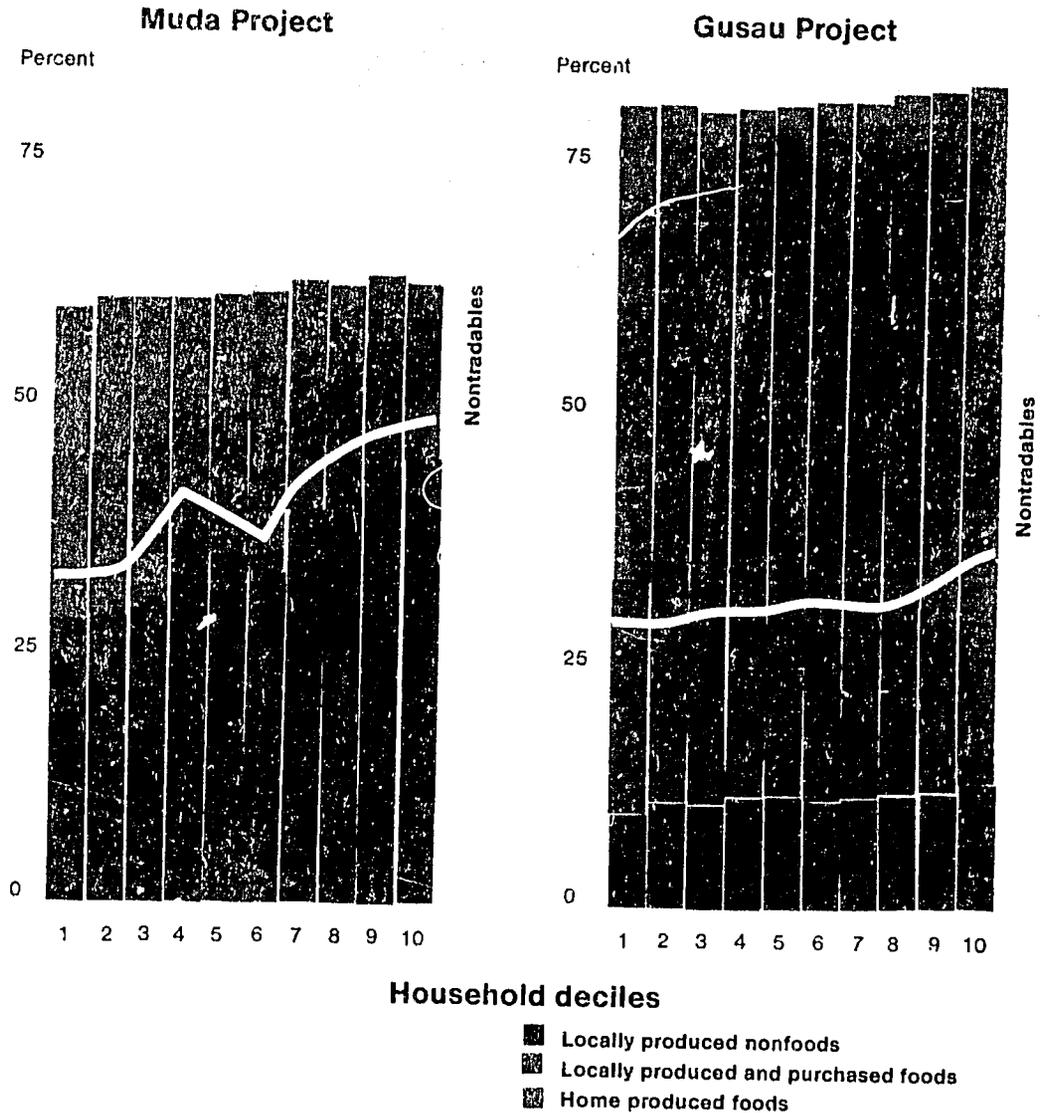
Although the crucial importance of farmers' access to farm inputs and agricultural marketing and processing facilities is well-established, much less is known about the importance of their location and about the effects of farmers' access to consumer goods and services. This is the third area of policy investigation.

During 1982 a study was completed on the relationship between agricultural growth and the development of services and marketing centers in rural areas in Andhra Pradesh, India. The study demonstrated that increases in agricultural productivity do not take place without

adequate and timely provision of key rural services. Furthermore, governments may have to take a leading role in providing these services since the private sector

tends to wait until an adequate network of marketing centers and a critical volume of business have been established before moving in.

Figure 7  
**Marginal budget shares for locally produced goods and services by farm household in the Muda irrigation project area, Malaysia, 1972 and the Gusau agricultural development project, Nigeria, 1977**



Source: Peter Hazell and Ailsa Roell, *Rural Household Expenditure Patterns and their Implications for Development Strategy: Studies in Malaysia and Nigeria* (Washington, D.C.: International Food Policy Research Institute, forthcoming).

# FOOD CONSUMPTION AND NUTRITION POLICY PROGRAM

Research conducted by members of the Food Consumption and Nutrition Policy Program continues to focus on improving the understanding of how public policies affect food consumption and nutrition of low-income household members. Studies are undertaken in order to assist in designing policies that are more effective in reaching the poor, without losing sight of other policy objectives.

During 1982 research was conducted on the impact of consumer-oriented food subsidy policies and other food and agricultural policies on the incomes, food consumption, and nutrition of the poor. Research continued on the impact of technological change and the seasonal and annual fluctuations in food production on poor people's incomes, food consumption, and nutrition. Household food acquisition behavior and its interaction with food policy is a key area of inquiry.

During the year a number of case studies were conducted as bases for integrative analyses to follow. Completed research studies were published concerning food price subsidy policies, and preliminary results were obtained from analyses of other food and agricultural policies in selected countries.

## FOOD SUBSIDY POLICIES

During recent years some countries, such as the Sudan and Sri Lanka, have scaled down their food subsidy programs. Others, Colombia for instance, have made plans for reducing their programs. Still others, including Venezuela, are considering new large-

scale subsidy programs. As a result there has been a growing need for information to assist in assessing the consequences of policy modifications. This includes finding alternative ways to reach the poor and malnourished while avoiding untenable effects on foreign exchange balances, government spending, and domestic food production.

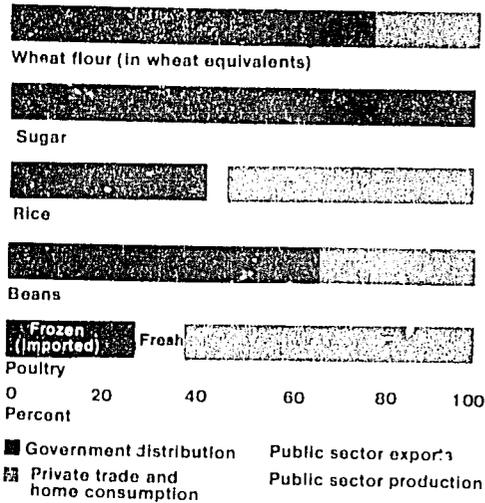
Research in the Consumption and Nutrition Program during 1982 contributed to expanding the body of knowledge accumulated in case studies of Bangladesh, Sri Lanka, Brazil, and India.

## FOOD PRICE SUBSIDIES IN EGYPT

An extensive analysis of the Egyptian food subsidy program continued during 1982. This project, funded as a special study by the U.S. Agency for International Development, has six phases. As part of the first phase, Harold Alderman, Joachim von Braun, and Sakr Ahmed Sakr in *Egypt's Food Subsidy and Rationing System: A Description*, Research Report 34, provide a comprehensive survey of this government's extensive intervention program in food pricing and distribution.

The Egyptian government holds a dominant share in the marketing of all basic food items (see Figure 8). Egypt's subsidized wheat flour and bread are available, in principle, to all consumers without restriction. Monthly quotas of rice, tea, cooking oil, and sugar are provided at low, subsidized prices to about 90 percent of the population through ration cards. These quotas vary by re-

**Figure 8**  
**Percentage of total consumption**  
**of major commodities distributed**  
**by the government, Egypt, 1980**



Source: Derived from data in Harold Alderman, Joachim von Braun, and Sakr Ahmed Sakr, *Egypt's Food Subsidy and Rationing System: A Description, Research Report 34* (Washington, D.C.: International Food Policy Research Institute, October 1982).

gion, and are distributed through registered grocers. A second tier of quotas, at higher subsidized prices, is also marketed through cooperatives and government retail stores, but availability is less assured. Beans and lentils are sold at two quota prices but are not always available.

Frozen meat and poultry are distributed through government stores and cooperatives with monthly limits on purchases. Per capita quantities of rationed goods distributed at the first tier of prices have changed little, but those of the second tier have grown faster than the population, as have sales of frozen meat and chicken. Per capita consumption of wheat flour products also has risen.

The report finds that some of the increase in consumption is the result of numerous changes in regional quotas authorized by the Ministry of Supply and

Home Trade. Quotas on the local level are based on ration guarantees and regional supply. However, because decisions about how much should be imported and distributed are made by separate authorities who do not set prices, the system is not responsive to international price fluctuations in the short run. Official prices do not rise when local demand exceeds the quotas, but waiting lines and other costs of food acquisition influence consumer purchases. There also is open market trading in scarce commodities.

The authors indicate that regional distribution patterns differ by commodity. Rice and oil are distributed in larger quantities in the urban areas than in the rural ones. Per capita rationed sugar appears to be evenly distributed in rural and urban areas; subsidized cereals are available in different quantities in rural and urban areas, but a distinct urban bias does not exist. This lack of an urban bias for total cereals can be attributed to large sales of subsidized wheat flour in rural areas and sales of large quantities of subsidized bread in the government-controlled bakeries in urban areas.

In a second phase of this project, research is under way on the effects of the Egyptian food subsidies on domestic agricultural production and sectoral income. Preliminary results indicate that the dual pricing system resulting from the food subsidy program does not adversely affect the agricultural sector. Analysis of the government budget allocations shows that during the period 1972-80, when the food subsidy system was growing, gross fiscal support of the agricultural sector increased. In fact, because agricultural input subsidies grew at roughly the same rate as fiscal food subsidies, agricultural producers had a fiscal support system based on policy objectives comparable to those for consumers. However, the share of investment in agriculture was reduced while food subsidies grew and the share in nonagricultural investment did not decrease.

The price policy analysis indicates that there were major changes in the domestic price patterns as food subsidies increased. The separation of controlled and open market prices became more distinct, as represented by the gaps between subsidized consumer prices, government procurement prices, and prices on the uncontrolled open market. However, the implicit taxation of the farm producers through lower procurement prices was reduced in the late 1970s and early 1980s as food subsidies grew. Part of the burden of financing cheap food prices for consumers was shifted from the agricultural sector (through higher prices) to the general budget (increased subsidies). The implicit tax rate on the agricultural sector due to depressed prices was about 17 percent in 1980, which is close to the overall taxation of the economy. As the table below indicates, half of this implicit taxation was due to depressed cereal, pulse, and sugar prices and half was the result of cotton export taxes. Increased protection of the animal produce sector greatly reduced the burden.

Crop	Share of Implicit Tax
	(percent)
Cotton	+85.4
Rice	+37.4
Sugar	+24.3
Wheat	+19.3
Maize	+4.2
Pulses	+2.4
Meat, milk, and feed	-73.0

Implementation of this policy meant that producer prices had little or no relation to world prices. Analysis of the production response indicates that this policy has not led to a solution of Egypt's food supply problems. The excessive growth in demand suggests that an overhaul of the subsidy system, particularly of the unlimited subsidization of wheat,

is required. Without changes in food distribution or consumer pricing, the current gap will continue to widen uncontrollably.

The major equity element in Egypt's current agricultural pricing policy is the protection of the livestock sector through higher prices paid to livestock producers. This establishes an implied income transfer from meat consumers, the urban rich, to small farmers. But research suggests that this policy bears inefficiencies that would be overcome by setting input and output prices closer to international levels. This would result in production effects in the agricultural as well as in the nonagricultural sectors of the fairly diversified economies of Egyptian villages.

In a third phase of the Egyptian food subsidy study, research was conducted on the relationship between food subsidies and imports. Because the food subsidy scheme relies heavily on imported foods and because it influences the production and consumption of traded goods, its implications for Egypt's foreign sector are important.

The preliminary results indicate that the rapid increase in Egypt's food subsidy expenditures was met by deficit financing, which fueled inflation. At the same time, the price of foreign exchange rose and Egypt's net foreign assets fell.

During the 1970s, per capita real food imports increased sixfold. As a result, in order to purchase the necessary food imports, nonfood imports were reduced, destabilizing the manufacturing sector. Although Egypt has been able to acquire goods and services with foreign loans and grants, this cannot be sustained in the long run. Scaling down the subsidy system could lead to lower inflation, reduced imports, and better conditions for the industrial sector.

## FOOD PRICE SUBSIDIES IN BRAZIL

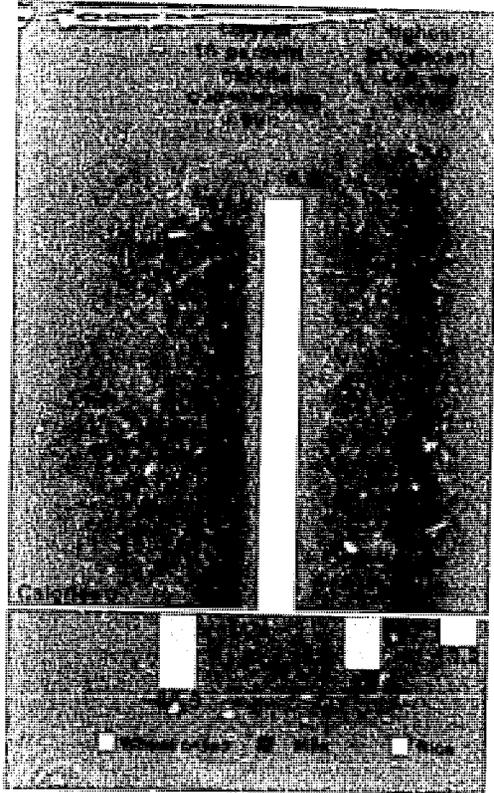
*In Food Consumption Parameters for Brazil and their Application to Food Policy,*

Research Report 32, Cheryl Williamson Gray measures the effects of changes in the price of each of the principal food commodities and in the incomes of the poor on nutritional status. Using data from the 1974/75 National Household Expenditure Survey, she estimates income and price elasticities of the principal foods and total calorie intake for both the malnourished and the adequately nourished and for high-, middle-, and low-income groups.

These consumption parameters are then used to study the nutritional effects of two government policies: food subsidies and the alcohol program. The study analyzes the effects of the current wheat subsidy on nutrition and compares them to the nutritional effects of comparable hypothetical rice, milk, and cassava subsidies. It also examines the potential nutritional effects of the alcohol program that result from displacement of food crops and increased employment.

The study compares the nutritional and income effects of an urban subsidy of approximately 1 billion 1974 cruzeiros on wheat bread to the effects of equivalent hypothetical subsidies on rice, milk, and cassava flour. If increased calorie intake among calorie-deficient households is the goal, the study results indicate that wheat is not the proper commodity to subsidize. Not only is actual calorie intake likely to decline when wheat prices fall, due to the substitution of wheat for higher calorie foods, but calorie intake of the most severely malnourished sector of the urban population will probably fall the most. In contrast, an equivalent subsidy on milk would have a positive effect on milk consumption, but the greatest benefit would go to the wealthiest sector of the urban population. Williamson Gray finds that the most effective and efficient subsidy for nutritional purposes would be a rice subsidy. It would have a substantial effect on the calorie intake of the calorie-deficient population. Moreover, only the rice consumption of the poor would rise, not that of the wealthier portion of the population (see Figure 9).

Figure 9  
**Increase in total daily per capita calorie consumption from a 1 billion cruzeiro subsidy on selected foods for the lowest calorie consumption group and the highest income group, Brazil, 1974/75**



Source: Cheryl Williamson Gray, *Food Consumption Parameters for Brazil and their Application to Food Policy*, Research Report 32 (Washington, D.C.: International Food Policy Research Institute, September 1982), Table 25, p. 42.

The report indicates that if the objective is to increase the incomes rather than the calorie intake of the poor and malnourished, different policies should be pursued. Subsidies on wheat bread and rice would have significant and approximately equal effects on income. In contrast, a subsidy on milk would heavily favor the wealthier segment of the population. Subsidizing cassava flour, a food

consumed primarily by the poor, would be the most effective means of transferring income. A subsidy on cassava flour or rice would be more difficult to administer than the current subsidy on wheat, however, because wheat is the only commodity whose domestic and foreign purchase and sale is handled exclusively by the government.

In her analysis of the alcohol program, Williamson Gray indicates that less displacement of food crops and greater employment opportunities would be created if cassava cultivation in the North-east is pursued in lieu of sugarcane cultivation in the Southeast.

## OTHER FOOD AND AGRICULTURAL POLICIES

Although government food subsidy programs may be effective in expanding food consumption by the poor and malnourished, they may be economically or politically untenable. Modifications in other food policies may in some cases be more cost effective and lead to self-sustaining nutritional improvements by better integrating the malnourished into the development process. But existing knowledge of the effects of such modifications on poor people's food consumption and nutritional status is rather limited. Research was undertaken during 1982 on the consumption and nutrition effects of state marketing boards and associated pricing policies for maize in Zambia, alternative price levels for rice in Thailand, and a food-for-work program in Bangladesh. All of these studies focus on estimating food demand parameters for the poor and malnourished and identifying consumption and nutrition effects of existing and alternative policy formulations.

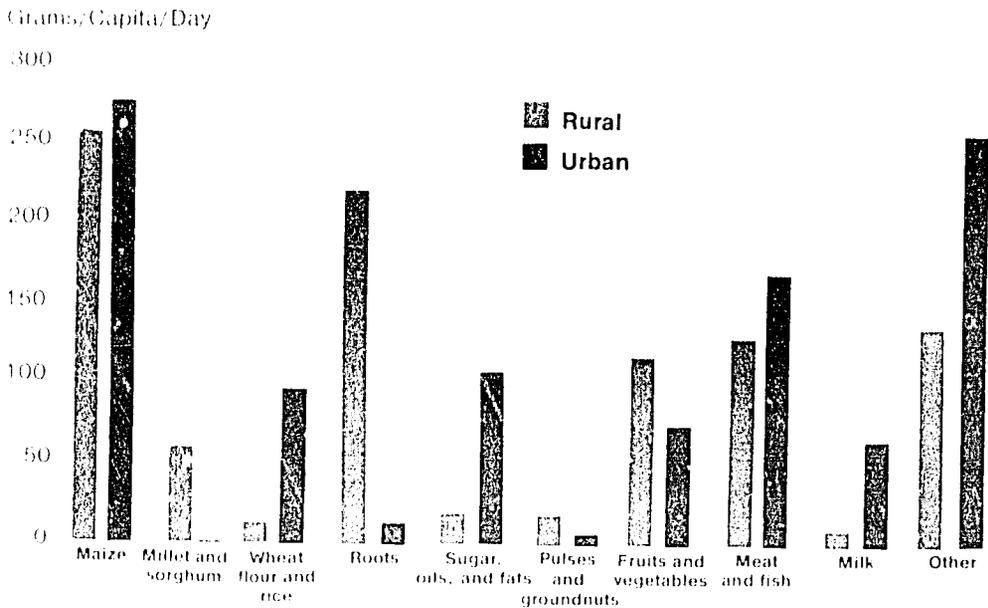
## MAIZE MARKETING POLICIES IN ZAMBIA

Since the 1900s the importance of maize

in Zambian diets has been steadily increasing. Prior to this time sorghum, millet, and cassava were the main staples. Until very recently, maize provided less than half of the calories consumed by the population on a national basis. In Luapula, Northwestern, Northern, and Western Zambia—four of the most remote and underdeveloped provinces — cassava, millet, and sorghum still supplied a substantial proportion of dietary calories. Figure 10 shows the diet composition for Zambia in the mid-1970s. Even though maize is clearly the staple food for the country as a whole, there are marked differences between rural and urban areas and different parts of the country. From the beginning, the growth in adoption of maize production was fueled by its commercial potential. Additional impetus was provided later by the availability of newer, improved varieties and of inputs that increased yield response. Historical evidence indicates that government policies have played a central role in the evolving pattern of production and marketing of maize. It can also be seen that urban interests have generally dominated this policy process—stemming initially from the importance of the mining sector in the gross national product.

Consumer subsidies and state control of maize marketing have been the cornerstone of maize policies for at least 50 years. Prior to independence in 1964, it was government policy to protect settler agriculture at the cost of African agriculture. This combination of policies resulted in a rapidly expanding urban industrial labor force to work the mines in the boom years after World War II. Consumer subsidies were curtailed only during the depression years of the 1930s and in the late 1950s, when urban unemployment was becoming a problem. Prior to independence the consumer subsidy went almost exclusively to mining and urban workers, which indicates its purpose was not so much to aid workers as to provide industry with a steady supply of cheap labor.

Figure 10  
Composition of diets in rural and urban Zambia



Source: Food and Agriculture Organization of the United Nations, *Perspective Study of Agricultural Development for Zambia* (Rome: FAO, 1976)

Although the basic framework for maize policies did not change in the period after independence, additional objectives were superimposed on the earlier ones. In 1974-75, the geographical range of commercial participation of maize producers was increased by introducing uniform pricing after earlier attempts to subsidize producer prices in outlying provinces. After the steep food price increases of 1974, other efforts were made to broaden the participation in commercial maize production. Rapidly raising the purchase price for maize was a principal means of ensuring access to the grain being produced by the state marketing board. At the same time, however, consumer prices were kept low. By the 1977 harvest year, the volume of maize handled by the marketing board and the nominal consumer subsidy for maize were at all-time highs. It appears that the magnitude of the consumer subsidy in the mid-1970s led to adjustments

in farmer grain-marketing behavior. Farmers sold more maize at higher prices, and increased their purchases of millic maize meal from the state distribution system.

Research in 1982 involved examining how maize marketing policies have fostered commercialization by traditional-sector farmers and, in turn, have affected the food consumption and nutrition levels of the rural and urban people. The focus is on a district in the Eastern Province where farmers have easy access to inputs, production credit, and marketing institutions. A large subsistence sector also exists. National and provincial time-series information and data from an in-depth, year-long household survey in the area are being analyzed. Following an understanding of the trends in commercialization in maize production from the macro data, the survey will be used to analyze how commercialization affects income and food flows for the household. In par-

ticular, the dietary adequacy during the lean season, when production activities for the next crop require extremely heavy workloads, will be analyzed from this perspective.

## CONSUMPTION EFFECTS OF RICE PRICE POLICIES IN THAILAND

Rice is the major staple food as well as an important export earner in Thailand. It is the primary source of calories for all Thais. The price of rice is an important determinant of real income among low-income Thais. Farmers and rural and urban poor spend as much as 20 percent of their total household expenditures on rice.

The Thai rice system is an integral part of the world grain system, contributing 20-25 percent of all rice traded in the world market. The Thai government intervenes in the rice market, both domestically and at the export level. Collecting rice export premiums is one major control measure by which the Thai government assures sufficient domestic supplies at acceptable consumer prices. These prices are usually well below world market prices; thus the rice prices received by farmers are also depressed. In effect, this policy has subsidized nonfarm consumers at the expense of rice producers.

Although the economy-wide effects of rice policies have been estimated in the past, relatively little is known about their effects on the income, consumption, and nutrition of the rural and urban poor. Research in the Consumption and Nutrition Policy Program into these areas has begun to examine some questions particularly relevant to specific socio-economic groups. One question being asked is what are the effects of a higher domestic rice price on nutrition and income distribution?

A number of preliminary findings are of particular interest. First, assuming that

wages and rice supply and consumption remain constant, results indicate that raising the domestic price of rice would lead to a slightly higher level of total absolute poverty in Thailand, as the table below indicates.

Changes in the Price of Rice	National Average Poverty Incidence
No Change	20.40%
10% increase	20.38%
20% increase	20.42%
30% increase	20.51%
40% increase	20.80%
50% increase	21.05%

Second, an increase in the price of rice would most affect nonfarm laborers, clerical, production, and general workers, as well as some nonrice farmers. Third, increasing the rice price while wages, rice supply, and consumption remain constant would not improve the income distribution as is often assumed.

These findings indicate that the government's pricing policies for rice alone may not decrease poverty in Thailand. Other policies, including those pertaining to production considerations, must play an integral part. In the long run, if the domestic rice price is to increase in Thailand, it is essential that there be compensating policies or programs to help generate income for low-income groups. Without these measures their calorie intake will fall even lower, thus seriously jeopardizing their nutrition.

## FOOD FOR WORK IN BANGLADESH

In Bangladesh, research continued on the consumption and nutrition effects of the food-for-work project, which is being conducted in collaboration with the World Food Programme. A report on this proj-

ect is included in the Regional Projects section.

## STRUCTURAL CHANGES IN FOOD DEMAND

Although the impact of changes in income and population growth on food demand is well understood, little is known about the structural changes in demand and their causes. Such knowledge is important to improve food demand projections and to better estimate the nutritional consequences of these changes.

Work has been completed on demand parameters, food consumption patterns in rural and urban areas, and the potential impact of demographic shifts on the demand for rice in the Philippines and Indonesia as part of the Rice Policies in Southeast Asia Project (see the Regional Projects section). Ongoing research focuses on two important causes of structural changes: rural to urban migration and scarcity of firewood in rural areas. This research effort is of an exploratory nature and is limited to a project on migration in Mexico and one on the interactions of firewood scarcity, women's time allocation, and nutrition in Nepal.

# INTERNATIONAL FOOD TRADE AND FOOD SECURITY PROGRAM

**INTRODUCTION** Research in the International Food Trade and Food Security Program is concerned with the effects of trade and aid policies on food consumption, production, and agricultural growth in developing countries. It examines developing-country trade policies and their implications for food supply strategies as well as developed-country and global initiatives and their implications for agricultural development in the Third World.

Three conditions faced by developing countries are the foundation of the research effort. One, developing-country trade and exchange rate policies profoundly affect food consumption and agricultural production strategies. Two, the agricultural sectors of most developing countries greatly influence and are greatly influenced by their overall economies. Three, the world market plays a major part in determining domestic food strategies.

## DEVELOPING- COUNTRY ISSUES

Food consumption in the Third World continues to rise, adding to the inability of developing countries to meet these needs from domestic supplies. Food import policies, which are inextricably related to general trade policies and balance-of-payments constraints, often hamper national food policies designed to improve production and consumption. In developing countries where

agriculture is an important part of the general economy, policies that are not explicitly directed at the agricultural sector often affect food consumption and agricultural growth.

During 1982 research on national trade and food supply strategies was concerned with short-term food supply management and the long-term impact of general economic policies, such as trade and exchange rate policies, and production incentives and agricultural growth. Work continued on food strategies and their implications for import policies in India and Egypt. Work was initiated on trade policies and agricultural incentives in Nigeria, Thailand, and Peru.

## FOOD STRATEGIES AND IMPORT POLICIES

IFPRI research was completed on government foodgrain operations in India in the face of fluctuating production and continued on the balance-of-payments implications of the food subsidy program in Egypt. Research was initiated on food import policies pertaining to wheat, rice, and maize in Peru.

An important element of food supply management in developing countries is the division of the grain markets into concessional and commercial sectors. Typically, the government purchases part of the domestic grain surplus and controls imports in order to provide grain to low-income people at subsidized prices. Determining the minimum amount of

grain that should be made available to the poor at the least cost to the government involves making important policy decisions.

Research on India's wheat sector examined the trade-offs of subsidizing consumption, maintaining adequate stock levels, minimizing imports, and reducing government costs. In India, the steady growth in production also has made the food supply system increasingly self-reliant, with a shift from total dependence on imports to almost negligible imports in recent years. However, the system is maintained at a very high financial cost to the national treasury, primarily because of the huge accumulation of foodgrain reserves.

The study explores the possibilities of reducing this cost with the help of a dynamic programming model for the period 1979-92. The conclusion of these exercises is that, even when it is subjected to recurring environmental shocks in two consecutive years, the basic objectives of the system can be met adequately, at about one third of the present cost, if stocks are maintained at not less than 25 percent of the succeeding years' requirements. Even if wheat stocks are maintained at not less than 50 percent of the succeeding years' requirement of the concessional system, the cost of the system can be reduced by about 21 percent from present levels.

In addition, the results show that complete stability in prices and consumption—the ultimate objective of any distribution system—can be attained at about one half the present cost with adjustments in import and inventory policies.

Research on the relationship between Egypt's food subsidy scheme and its food imports and the implications for Egypt's foreign sector was undertaken as part of the extensive analysis of Egypt's food subsidy system being conducted by the Food Consumption and Nutrition Policy Program. This is discussed in more detail in the Consumption and Nutrition Program section of this report.

## TRADE POLICIES AND AGRICULTURAL INCENTIVES

Past IFPRI research indicated that general trade and exchange rate policies can affect relative prices and thus agricultural production incentives. Often import policies are the principal policy instruments affecting domestic food prices. Research in this area has continued to examine the long-term impact of general economic policies on food production; to explore the trade-offs between export crop and food crop production; to examine the implications of existing trade policies on land use, incomes, and the balance of trade; and to examine implications for domestic food supplies.

Research initiated in 1982 on Nigeria focuses on three policy issues: how and to what extent have trade and exchange rate policies influenced the structure of incentives for agriculture, as compared to other sectors; to what extent do trade and exchange rate regimes encourage or discourage food production relative to the production of export crops, and what are the implications for food production and supply; and how and to what extent does the presence of a dominant non-agricultural export sector (oil and minerals) affect the links between production incentives, output responses, and incomes in agriculture. Work in progress in this study has focused on the development of the analytical framework and identification of sources of information and data requirements for the study.

A different aspect of trade policy and agricultural incentives is examined in a study of crop diversification in Thailand. An important characteristic in the post-World War II agricultural development in Thailand was the very fast expansion in agricultural production and exports from upland crops, which resulted in output growth of such major crops as maize, cassava, sugarcane, and rubber. Most of the production was exported.

From 1959 to 1974, forest area, which

covered about 21 percent of the total national territory, was cleared and the upland crop area was expanded by about the same size. This fast agricultural expansion was carried out mainly by the spontaneous action of Thai peasants who, responding to the relative prices of the private marketing sector that were the result of newly formed agricultural infrastructures and to forest land made available to them by new highways, migrated in large numbers into forested area to clear it and grow the upland crops.

This crop diversification took place under government intervention in the form of trade policies such as export taxes, quotas, and export subsidies. These interventions caused large changes in the relative domestic prices of these products and in the productive factors. Investment in infrastructure, mainly highways and irrigation systems, and investment in agricultural research are also considered to have influenced this agricultural diversification considerably.

Certain important trade policy measures, such as the export tax policy for rice, were affected by domestic rice shortages or surpluses and strong government concern about the domestic rice price stabilization caused by the sharp increase in the variability of the world rice price level.

This research attempts to identify the impact of agricultural trade policy tools such as export taxes, quotas, and subsidies, and of government capital formation, such as construction of irrigation systems and of highway systems, on post-war agriculture. It will examine agricultural diversification and risk, the effect of diversification on the changes and variability in the output mix and exports of rice and the four major upland crops, and the changes in the net income of producers and consumers.

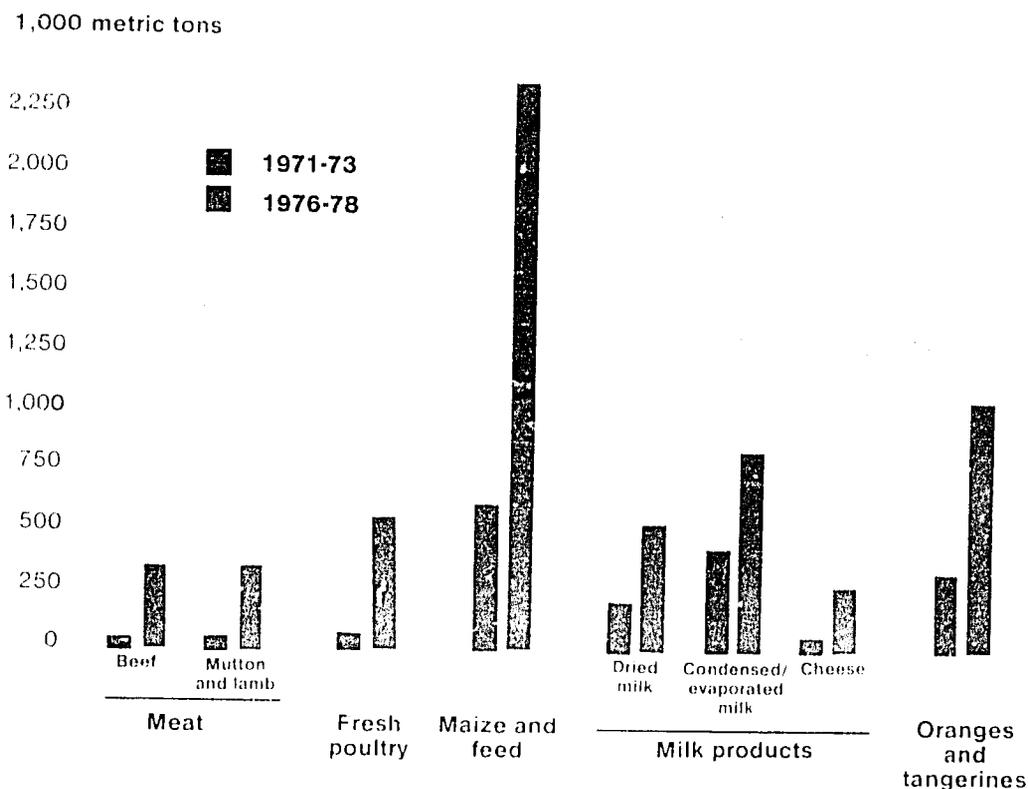
Research on specific developing-country export potential focused on Kenya's agricultural sector and its most likely trading partner, the Middle East.

Data from the oil-exporting countries in West and North Africa, the Persian Gulf states, Iran, and Indonesia show that 96 percent of the value of all their agricultural imports in 1978 were food products, with a total value of \$9.3 billion. During the year 36 percent of the imports were cereals, 21 percent were meat products, 11 percent were sugar, 10 percent were milk products, and 10 percent were oil-seed products. Between 1971-73 and 1976-78, there was about a 640 percent increase in poultry product imports and beef product imports, a 500 percent increase in the growth of mutton and lamb imports, a 280 percent increase in the growth of maize and feed imports, a 250 percent increase in orange and tangerine imports, and a 100-200 percent increase in the growth of milk product imports (see Figure 11).

The major part of this research effort examines the constraints on export potential for a number of commodities for which rapid growth in import demand was identified among the oil exporters. The products selected for the study are beef, sheep and goats, maize, pulses, horticultural crops, sugar, coffee, and tea. The constraints are found domestically and in the world market. In the case of beef, sugar, and dairy products, for instance, the fact that the EC subsidizes exports of these products has contributed to a major drop in their international prices. In the case of coffee, the international coffee agreement requires that all above-quota production be sold in nonquota markets, which includes the oil-exporting countries. This has resulted in depressed prices. However, Kenya's production costs are lower than those of the South American producers, suggesting that Kenya should seek to expand exports aggressively in nonquota markets.

For sheep and goats the major constraint is domestic in nature—an export ban resulting from fear of losing breeding stock. The high differential between domestic and international prices suggests that there is a large potential for the

Figure 11  
**Import volume of selected commodities, selected oil-exporting countries, 1971-73 and 1976-78**



Source: Michael Schluter, *International and Domestic Constraints on Kenya's Potential to Export Food Products to Oil-Exporting Countries* (Washington, D.C.: International Food Policy Research Institute, forthcoming).

export of sheep and goats. Domestic constraints related to maize and horticultural crops are based on high marketing costs due to inadequate infrastructure. In June 1982, for instance, it was estimated that the transport cost of maize from the farm to port was \$70 per ton.

The study also examines political and administrative constraints. As in many developing countries, the bureaucratic procedures are formidable and act as a major barrier to entry for small African-owned businesses. However, the greatest barriers for "hardcore" food products are probably the political risks of rising food prices associated with allowing food exports. This creates a dilemma. If exports are discouraged, local production adjusts

to local demand through the price mechanism so there is no surplus for export. The absence of an exportable surplus then argues against allowing food exports, which are perceived as depriving local consumers of important items in their diet.

## INTERNATIONAL POLICY ISSUES

Determining the extent to which a developing country wishes to be self-sufficient is one of the most pressing food policy issues faced by government planners today. Greater self-sufficiency carries with it greater production risks and reliance on physical

and economic conditions within the country. Less self-sufficiency places greater reliance on imported food and worldwide economic conditions.

In an effort to improve the understanding of the international framework in which national policies are formulated, research in the International Food Trade and Food Security Program is concerned with the security and stability of international food supplies and the long-term financing of food and other critical imports. The security issue involves research on reducing instability in world food markets and on financial arrangements that alleviate the impact of short-term fluctuations in the food import bill. The long-term financing issue concerns the extent to which commercial trade can close the expected gaps in food supplies and the potential markets for developing-country agricultural exports.

During 1982 research continued in the areas of trade reform and food security. In the area of trade reform a study was published on the trade policies of the European Community (EC) and research was initiated on trade between developing countries. In the food security area research continued on food aid, the international rice market, and rural income stabilization policies.

## TRADE REFORM

### European Community Grain Economy

As part of IFPRI's analysis of developed-country policies and other processes that could affect long-run supply availability and short-run price stability in major food supplies, *Policy Options for the Grain Economy of the European Community: Implications for Developing Countries*, Research Report 35, by Ulrich Koester, examines the implications of the future role of the EC in world trade in cereals during the 1980s.

The study analyzes four policy options for the EC grain economy from the stand-

point of the developing countries. The first option is a continuation of the past grain policy. This would increase the tradable wheat surplus of the EC from 11.4 million tons in 1980 to 17.3 million tons in 1990. The total grain surplus would increase from 2.8 million tons in 1980 to 25.3 million tons in 1990 (see Figure 12).

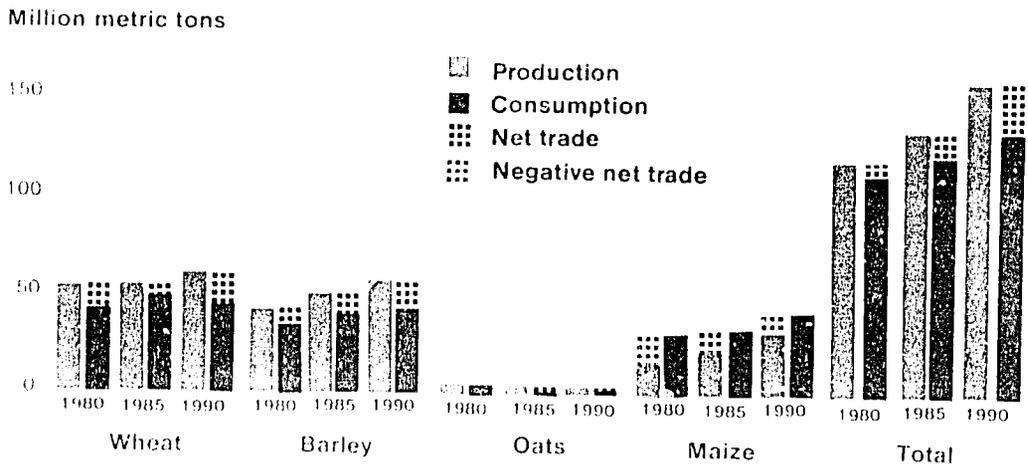
The second option is a partial liberalization of the EC grain economy, which would result in an increase in the world price of grains. Because most developing countries are grain importers, they would face a welfare loss and the market for cereal substitutes, especially cassava, probably would be eliminated. However, by liberalizing grain trade, the EC would open markets for imports of processed grain products.

The third and fourth options assume modifications of the variability in domestic grain prices, a reorientation of the EC grain price ratios, and a modification of the present storage policy. The analysis shows that the EC could contribute more to stability without changing the degree of protection for the EC grain producers.

### Inter-Developing-Country Trade

There is genuine concern that the rapid growth of world trade during the last 20 years could slow down significantly as a consequence of the deceleration in economic activity and the growing move toward protectionism in the developed countries. Although the volume of trade between developing countries in the aggregate has been modest, the potential exists for greatly increasing it. A study in progress on the structure of trade in agricultural products among developing countries from 1962 to 1979 identifies developing-country markets and commodities having the highest potential for import demand growth and describes the recent trends in developing-country agricultural exports. The study examines trade of 47 commodities for 94 countries by origin and destination during the 17-year period.

Figure 12  
**European community: grain production, consumption, and net trade for 1980 and projected to 1985 and 1990**



Source: Ulrich Koester, *Policy Options for the Grain Economy of the European Community: Implications for Developing Countries*, Research Report 35 (Washington, D.C.: International Food Policy Research Institute, 1982), Table 7, p. 23.

Note: These figures include data for Greece. Consumption is defined as domestic disappearance; net trade is defined as production minus consumption.

Preliminary results indicate that rice, sugar, and tea have the greatest export value of all agricultural products from developing countries. Particularly noteworthy was the major increase in vegetable oil trade within the Third World. Trade of fresh fruits and nuts, animal feed, and fresh, chilled, and frozen meat also grew rapidly during the period. In contrast, the volume of trade in such traditional export crops as rice, wheat, tea, cotton, coffee, rubber, and oilseeds declined or remained stable.

Other developing countries are the principal export markets for most processed foods exported by developing countries, whereas products exported as raw materials go to developed and centrally planned-economy countries. During the 17-year period, major increases in the share of developing-country exports going to developing countries occurred for meat, fertilizer, vegetable oils,

and dairy products. In absolute terms developing countries imported 80 percent of other developing-country exports of rice, dairy products, and fertilizer.

The study identifies which developing countries and country groups are the principal markets for developing-country exports for each of the agricultural commodities (Table 2 shows the destination of developing-country imports). For example, the North Africa/Middle East region imported more than one fourth of developing-country exports of live animals, butter, tea, and manufactured tobacco. Sub-Saharan Africa imported mainly meat and rice. The oil-exporting countries, the newly industrialized countries, and Latin America represent important and growing markets for developing-country exports of livestock products (meat, fats, and dairy products), rice, processed foods from cereals, and manufactured tobacco.

Table 2  
**Destination of developing-country exports by commodity group,  
 1977-79**

Commodity Group	Asia	Sub-Saharan Africa	North Africa/ Middle East	Latin America
	(percent)			
Live animals	5.7	9.4	39.2	9.3
Meat	0.8	3.4	7.3	6.8
Dairy products	11.4	3.9	5.3	46.3
Cereals	15.6	9.7	12.3	12.5
Fruits and vegetables	3.4	0.5	6.7	7.7
Sugar	9.7	2.2	11.8	6.8
Coffee, tea, and spices	1.2	0.5	4.0	1.4
Animal feed	4.5	0.2	2.3	1.1
Miscellaneous prepared foods	14.0	4.2	11.9	16.0
Beverages	0.8	6.5	0.6	7.8
Tobacco	3.5	2.0	5.1	0.5
Hides, excluding furs	1.7	0.3	4.0	1.5
Oilseeds	2.0	1.7	3.8	3.2
Crude rubber	5.3	0.2	1.2	2.7
Fibers	10.2	1.1	2.5	1.7
Crude fertilizer	6.8	0.2	3.2	7.4
Miscellaneous crude materials	9.8	0.8	4.0	1.6
Animal fats and oils	1.4	0.4	4.2	55.7
Vegetable oils	16.4	1.6	7.0	5.3
Processed fats and oils	11.2	6.1	3.6	6.8
Manufactured fertilizer	35.4	4.5	17.4	8.8

Commodity Group	All Developing Countries	OECD	Centrally Planned-Economy Countries	World
	(percent)			(U.S. \$ million)
Live animals	63.6	36.1	0.4	255.0
Meat	18.2	79.0	2.7	1,169.0
Dairy products	66.9	32.4	0.7	67.9
Cereals	50.1	31.2	18.7	2,696.2
Fruits and vegetables	18.3	72.1	9.6	4,012.3
Sugar	30.4	59.6	9.9	1,714.2
Coffee, tea, and spices	7.0	83.6	9.4	9,720.1
Animal feed	8.1	75.7	16.1	1,885.2
Miscellaneous prepared foods	46.2	52.8	1.0	112.7
Beverages	15.7	42.6	41.6	181.5
Tobacco	11.0	82.5	6.5	919.0
Hides, excluding furs	7.5	78.1	14.3	178.9
Oilseeds	10.7	78.2	11.1	1,142.2
Crude rubber	9.5	68.9	21.6	1,637.0
Fibers	15.5	54.4	30.1	2,436.7
Crude fertilizer	17.4	61.8	20.8	845.9
Miscellaneous crude materials	16.1	80.6	3.3	607.2
Animal fats and oils	61.6	38.3	0.1	53.3
Vegetable oils	30.3	62.0	7.7	2,248.7
Processed fats and oils	27.8	72.1	0.2	58.1
Manufactured fertilizer	66.1	25.6	8.3	292.4

Source: Alberto Valdés, *Intra-LDC Trade: Trends, and Prospects for Trade Expansion and Diversification* (Washington, D.C.: International Food Policy Research Institute, forthcoming).

Note: The first seven columns are calculated by dividing developing-country exports to a region by developing-country exports to the world and multiplying by 100. The figures for the last column have been deflated to 1975 prices.

## FOOD SECURITY

### Food Aid

Research continued on determining what proportion of estimated demand for cereals in low-income countries could be commercially financed and what proportion would have to be financed with food aid or other balance-of-payments assistance by 1990. Subsidiary objectives were to analyze the historical pattern of cereal trade and food aid flows to determine what changes in trends could be observed and what relationships, if any, could be detected between food aid flows and cereal import dependence. During 1982 research concentrated on the relationship between food aid and the dynamics of cereal import dependence.

Results indicate that most of the growth in the absolute volume of commercial cereal imports occurred in the middle- and higher-income countries of Latin America and North Africa/Middle East. For a number of these countries, import dependence, or the ratio of cereal imports to total staple consumption, also increased. However, for many of the higher-income countries where this trend is observed, the increase in import dependence is associated with high growth rates for various other economic indicators such as per capita GNP, export earnings, industrial production, and in some cases per capita staple-crop production.

Thus declining self-sufficiency in cereals primarily reflects the effect of increasing per capita income on demand for food and changes in dietary patterns that generally accompany income growth. If incomes are growing rapidly and tastes in food are becoming more varied, cereal import dependence may increase even if domestic production performance is reasonably good. Also, if the terms of trade favor food imports and nonfood exports, and exports are a leading sector in income growth, increasing import dependence may simply reflect a country's economic response to its comparative advantage

in international markets. It was found that in the majority of cases, countries with rapid income growth and strong export sectors are those that have been increasing their dependence on commercial cereal imports, and that this increase is associated with improvement in the aggregate food supply situation for virtually all of them.

On the other hand, in low-income countries, self-sufficiency ratios are relatively high, but per capita food supply is seriously inadequate. This indicates that these countries are constrained from importing the amounts required to meet nutritional needs, probably for a combination of reasons including a lack of effective domestic demand and a lack of foreign exchange. Food aid can overcome both of these constraints if it is used to create additional demand among the poor through direct distribution programs or targeted food subsidy schemes.

Implications for policymaking suggest that targeted distribution of food aid commodities compatible with local dietary habits of poor people should be the preferred mode of distributing additional food aid in low-income countries. Cost and management constraints will have to be overcome, but it may be easier to confront these directly and obtain the maximum potential benefit from the food aid, rather than using inappropriate commodities for open-market sale in urban centers in countries where rural and urban markets are not yet closely linked, and where the policy environment is not favorable to agricultural growth.

Other work in the area of food aid has concerned analyzing the impact of food-for-work programs on agricultural production and economic development in Bangladesh. This is discussed in detail in the Regional Projects section.

### The World Rice Market

Research on the world rice market continued during 1982. This research has identified two structural features of the

market. The first is that the rice market is a thin market—one in which the fluctuations of each individual country's volume of trade is large. Thus the cost of locating rice buyers and sellers is high. The second structural feature is that there has been a sharp decline in the volume of rice exported by the traditional Asian exporters—Burma, Thailand, and Vietnam. Although Thailand continues to export significant quantities, the other two sources have been replaced by the United States and, more recently, Pakistan. Concomitant with these shifts, there have been changes in imports with monsoonal Asia importing less rice and Africa and the Middle East expanding their shares.

The price of rice relative to wheat has also doubled since the war (see Figure 13). The reasons for this trend are a more rapid growth of population in rice-eating countries than in wheat-eating countries, as well as their higher income elasticities on the demand side, and on the supply side a faster increase in the productivity of wheat production than of rice production.

Because of these changes in the structure of the world rice market, rice-importing countries have tried to reduce their dependence on the world market by placing more value on domestically produced rice than rice procured on the world market. Governments have sought to subsidize rice production inputs or credit for inputs. When it is necessary for governments to enter the world rice market, they have little flexibility, which leads to low price responsiveness and high price instability.

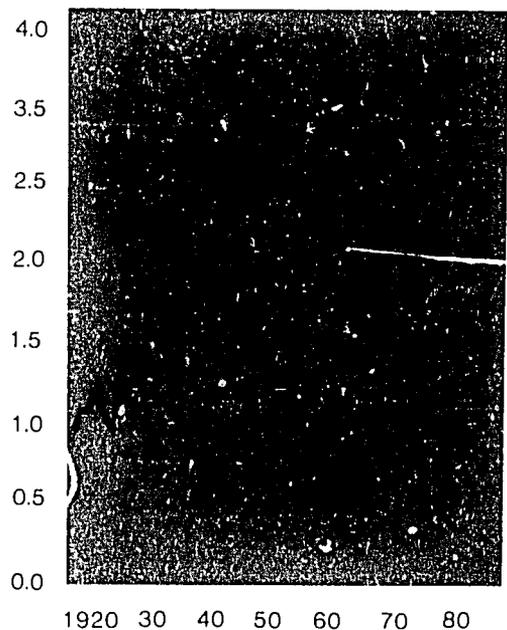
These circumstances have led to a higher degree of instability in the rice market as compared to other world markets, particularly wheat. The difficulty in locating buyers and sellers has reduced the volume of rice traded. In addition, the structure of the market has probably played a role in stimulating technological progress in the importing countries, whereas it may also have discouraged it in exporting countries.

## Rural Income Stabilization Policies and Food Security

Farmers are subject to high degrees of income fluctuations, in addition to possible resource misallocations resulting from risk. Rural income stabilization policies are an integral part of food security objectives aimed at minimizing shortfalls in the food consumption of poor people.

In collaboration with researchers in the Food Production Policy and Development Strategy Program, researchers in the Trade and Food Security Program were involved in the IFPRI/IICA conference on Agricultural Risk and Crop Insurance, held in Costa Rica in February 1982. The main findings are reported in the Production Policy Program section of this report.

Figure 13  
Ratio of world rice prices to world wheat prices, 1920-80



Source: Ammar Siamwalla, *The World Rice Market: Structure, Conduct, and Performance* (Washington, D.C.: International Food Policy Research Institute, forthcoming).

# REGIONAL PROJECTS

## RICE POLICIES IN SOUTHEAST

**ASIA** IFPRI's collaborative effort with the International Rice Research Institute, the International Fertilizer Development Center, and national institutions in Indonesia, Malaysia, the Philippines, and Thailand continued in 1982. During the year the third workshop bringing together researchers from the collaborative institutions and countries was held, and five working papers were published.

The project, which is investigating policy alternatives for the solution of food problems in Southeast Asian countries, is divided into five research areas: irrigation, trade and reserve stocks, fertilizer, consumption, and the integrating model. Preliminary results from several studies were reported at the Jakarta workshop held August 18-20.

### IRRIGATION

Three studies focus on the impact of irrigation on income distribution utilizing comparable methodologies. The literature has hypothesized that, although irrigation increases productivity, it may worsen the income distribution, thereby offsetting productivity gains. The studies examine the functional distribution of income among factors of production (land, fixed capital, management, labor, and current inputs) and the personal income distribution among earners (landlords, operators, hired laborers, current input earners, and other earners).

Results for several irrigation systems in the Philippines indicate that irrigation substantially increased the income to all factors of production, with gains to land and fixed capital slightly larger than gains

to labor and management. The large absolute gains for all factors more than compensated for the small shift in shares of total output among factors. In addition, irrigation induced large and equally distributed increases in personal income among earners. Moreover, irrigation improved the income distribution among households.

Preliminary results from the analysis of an irrigation system in Central Java were similar. There were substantial gains to all factors of production and to all earners in the production process. Management gained the most, but again, the large absolute gains for all classes of earners offset any declines in the share of output. For example, while the share of output for hired labor declined from 27 percent before irrigation to 25 percent after, earnings increased by 31 percent, from 720 kilograms per hectare of rice equivalent to 945 kilograms per hectare.

In Thailand, income distribution under rainfed irrigation, surface irrigation, and surface irrigation with land consolidation regimes caused substantial increases in earnings of labor and productivity of land. There was an apparent increase in the relative share of land, the higher the level of water control.

### TRADE AND RESERVE STOCKS

In the area of trade and reserve stocks, a study was presented on the working stock requirements of the regional depots of the Indonesian national logistic agency (BULOG). Using BULOG's data on distribution of lead-times required for each order and on regional demand, the re-order points (the level of stocks that would trigger an order) were computed for each regional depot, the objective

being to ensure availability 99 percent of the time. Comparison of this approach to the simple rules of thumb adopted by BULOG indicate an increase of about 20 percent in the minimum stock required. Additional work will assess the costs of alternative reorder points.

An analysis of the effectiveness and implications of the policy of the Philippine government of enforcing floor and ceiling prices of rice through stock operations and import/export policy found that as the Philippines moved from being a major importer to a small surplus rice producer, the enforcement problems shifted from that of maintaining the ceiling price to that of insuring a floor price. More significantly, the narrowness of the gap between the two prices relative to the private costs of storage, processing, and transport increased the burden on the public sector, which provides the subsidy to bridge the difference.

## FERTILIZER

The fertilizer research being conducted under this project is concerned with the production response to fertilizer use and the efficiency of the fertilizer marketing system. Research is expected to provide information on such topics as the role of fertilizer in shifting the rice supply, expanding and improving the efficiency of fertilizer use, the economic implications of fertilizer subsidies, and fertilizer price policies.

The fertilizer marketing component attempts to provide an analysis of the national fertilizer marketing system; identify major problems and sources of inefficiencies; determine marketing costs, price formation, and the implications of price policy intervention for each fertilizer marketing channel; examine the impact of existing fertilizer marketing systems on rice production; and suggest ways to improve the efficiency of the existing marketing systems along with the costs and benefits of proposed changes.

Research on fertilizer production re-

sponse and marketing has been initiated in Indonesia. Papers presented outlined the initial plans under way for data collection and field surveys. The rice response analysis will include data from research stations throughout Indonesia, permitting a highly disaggregated estimate of response functions. The marketing study has access to complete data from the government fertilizer marketing agency.

Proposals from Malaysia and the Philippines were finalized. The Malaysian project will cover both fertilizer marketing and response analysis; the Philippine project will analyze fertilizer marketing efficiency. Response function analysis for the Philippines will be handled at IFDC, based on the substantial data already available. Papers presented at the workshop gave a broad outline of the structure of the fertilizer marketing systems for the Philippines and Malaysia.

## CONSUMPTION

Four projects in the consumption area reported demand estimates for Indonesia, Thailand, and the Philippines. Each study examined differences in demand elasticities across income groups, concluding in general that low-income groups respond more to prices than high-income groups. Both Philippine studies found, however, some instances of middle-income groups being most responsive to price and income shifts. Because low-income groups are more price sensitive and spend a relatively high proportion of their incomes on food staples, poor urban consumers are most seriously hurt by increasing staple food prices. The effects of higher staple prices for the rural poor are more difficult to determine since they mean more employment opportunities and higher incomes on the supply side.

## INTEGRATING MODEL

Research in this area attempts to integrate the analyses of rice sector price, fertil-

izer, and water policies. Two integrating models have been developed. The model for the Philippines incorporates a relatively aggregate demand/supply structure. The policy problem is to achieve a desired level of rice supply and price while keeping fiscal cost at a tolerable level. The model can be used to calculate the direct government financial cost of irrigation investment, fertilizer subsidy, and rice imports required to achieve the desired level, given the specified value of variables including land available for rice, the rate of adoption of modern varieties, the rates of growth of population and per capita income, the milling ratio, and the marketing margins. The system simulates events for 1965, 1970, 1975, and 1980, and then makes projections for 1985, 1990, 1995, and 2000.

The model for Indonesia, still in prototype form, attempts a more disaggregated analysis of the demand/supply structure for rice. Fertilizer prices and distribution, credit, investment in irrigation and mechanization, support and milling prices for rice, and rice and wheat trade policies are among the government policy instruments that can be analyzed within this framework. Implementation of the prototype model structure and data collection continued.

## WORKING PAPERS

A list of the working papers published during 1982 as part of this project and summaries of some of their main points appear below.

*Irrigation and Rice Production in the Philippines: Status and Projections*, Working Paper No. 3, by Pat S. Ongkingco, José A. Galvez, and Mark W. Rosegrant. Rice yields grew steadily in the Philippines during the 1970s because of the use of high-yielding seed varieties, increased fertilizer use, and expanded irrigated area. The area harvested expanded minimally in the early part of the decade and declined in the second half. This paper suggests that irrigation develop-

ment has the greatest potential for increasing yields during the 1980s and beyond.

*Status and Performance of Irrigation in Indonesia and the Prospects to 1990 and 2000*, Working Paper No. 4, by Albert J. Nyberg and Dibylo Prabowo. Irrigation expansion became a government priority during the 1970s. Java, which has 85 percent of the technically irrigated area, has the most potential for improvement of irrigation systems. Expansion to new areas will occur off Java in primarily small-scale projects. If government policies are realized, Indonesian rice production could exceed consumption by 1990.

*Staple Food Consumption in the Philippines*, Working Paper No. 5, by Ma. Eugenia C. Bennagen. Data from the Philippine food demand studies indicate that rice accounts for 75 percent of the staples consumed and that the demand for rice is relatively insensitive to income and prices. The consumption of corn, the second major staple, greatly depends on the availability of rice. Wheat has not become a staple food in the Philippines, in part because the government has kept wheat prices high.

*Food Consumption Patterns and Related Demand Parameters in Indonesia: A Review of Available Evidence*, Working Paper No. 6, by John A. Dixon. In its examination of the size of and variations in the consumption of Indonesian staple foods, this paper suggests that per capita consumption of rice, the major staple, will increase as incomes increase, particularly in rural areas. The consumption of wheat, which contributed little to Indonesian diets, will increase in both rural and urban areas.

*An Economic Analysis of a Reserve Stock Program for Rice in the Philippines*, Working Paper No. 7, by Amande Te. The Philippine rice economy is modeled to simulate reserve stock management strategies with different trade scenarios. Results indicate that a free trade strategy benefits consumers while hurting producers, and a reserve stock strategy

causes minor shifts in producer and consumer incomes.

## FOOD FOR WORK: BANGLADESH

It is generally acknowledged that the objectives of food-for-work programs are to create off-season employment for the landless and poor, to improve nutrition, and to create a physical infrastructure for the promotion of agricultural and rural growth. IFPRI has been conducting research to determine the actual impact of such programs, specifically in Bangladesh. This work will be followed up with comparative studies in other countries.

The Bangladesh work is being undertaken in collaboration with the Bangladesh Institute of Development Studies (BIDS) in Dacca. Together, IFPRI and BIDS are conducting an evaluation of food-for-work projects that receive wheat from the World Food Programme. The wheat is used to pay local laborers who participate in food-for-work projects. Canal excavations, river embankments, and road construction are among the most important development objectives of the Government of Bangladesh and are suitable for the unskilled laborers who need the food.

The first part of the evaluation is concerned with the short-term effects of food-for-work projects on employment, income, and consumption. The second

will examine the growth processes generated by the projects.

Field surveys conducted in 1982 indicate that the food-for-work projects do employ needy people. Nearly 70 percent of the workers interviewed were landless or near landless and a large proportion of them had no other source of wage employment during the work season. The quality of work is higher where local people appear to be motivated to do a good job because they perceive they will benefit from the completed project. At most projects the workers are local people who live close to the worksites and work an average of nine hours per day. Workers' productivity varies according to soil characteristics and the distance earth has to be moved. Survey results indicate that although wage rates are supposed to account for these differences, they often do not.

Two areas where administrative changes may be recommended include fixing and monitoring of in-kind payments for different categories of labor and administrative services and the timeliness of procedures for selecting projects and issuing government authorizations to proceed with the work. Both issues are currently under review by various Bangladesh administrative agencies.

During the last six years, the wheat used for food-for-work projects has averaged about 18 percent of Bangladesh's total cereal imports, indicating that the food aid provided makes an important contribution to the total food supply.

# OUTREACH

During 1982 IFPRI continued to generate information on major questions concerning food and agricultural policies both nationally and internationally. The manner in which developing-country policies can be improved has been the subject of intense discussion at IFPRI. One thing is certain; the process of influencing policies is complex. No single approach is adequate in all cases. It is the cumulative effect of a continuous flow of appropriate information interacting with the perceptions and priorities of policymakers that produces results. Understanding this, IFPRI attempts to have an impact on developing-country food policy through rigorous research and appropriate outreach.

The effectiveness of IFPRI's research depends on the relevance of the issues studied and the form in which the results are disseminated. With the guidance of an international Board of Trustees, composed of individuals from developing countries and international agencies, IFPRI's international research staff investigates issues that are attuned to the agricultural problems of developing nations.

IFPRI research has direct as well as indirect effects on food policy. For example, researchers at IFPRI have been concerned with the sources and extent of fluctuations in agricultural production and world price variability. This has resulted in research on the food supply problem that has contributed to the creation by the International Monetary Fund (IMF) of a cereal import facility. Through its published research reports and papers, IFPRI demonstrated that much of the food security problem created by production shortfalls could be solved with adequate institutional arrangements that would allow the world market to provide short-term supplies at reasonable long-term costs.

Less directly, IFPRI research results also have stimulated other research efforts, particularly at the national level. Research published in 1980 on production instability in India suggested the need for better seed varieties to control production fluctuations. This was followed by research indicating that changes in weather patterns, unreliable supplies of inputs, and variability in areas sown with individual crops had more to do with production fluctuations than inherent yield instability of new seed varieties. These reports (*Instability in Indian Agriculture in the Context of the New Technology*, Research Report 25, July 1981, by Shakuntla Mehra, and *Instability in Indian Foodgrain Production*, Research Report 30, May 1982, by Peter B. R. Hazell) have led to further research by Indian researchers and discussions in Indian journals and the Indian press.

**PUBLICATIONS** Most of IFPRI's research output is produced in published form. Between seven and nine research reports are published yearly. The reports present analytically rigorous research results and implications for policies. Four-page abstracts of the reports highlighting their implications for policy-making are published in English, Spanish, and French. *IFPRI Report*, a newsletter published three times a year, includes a commentary on current food policy issues. IFPRI also makes available reprints of journal articles published by IFPRI staff and publishes other special papers on an ad hoc basis.

Publications are mailed to some 6,000 individuals and organizations represented on the mailing list, including approximately 3,000 individuals, libraries, educational institutions, and research organizations in the Third World. In addition,

IFPRI exhibits its publications and information at international meetings. Among the places publications were displayed in 1982 were several locations in the People's Republic of China, Jakarta, New York, and Washington, D.C. It is thought that by exhibiting its publications at international meetings and conferences, IFPRI can reach more professionals and thus stimulate other research efforts in the same or related fields.

## COLLABORATION WITH CENTERS IN THE CGIAR

As a member of the Consultative Group on International Agricultural Research, IFPRI utilizes research on the new technological developments undertaken by the agricultural production scientists of the other centers within the CGIAR system. This has led to joint research activities with other centers of the system. During 1982 these collaborative efforts included:

- The preparation of a paper entitled "Research Allocations in National and International Agricultural Research," presented at the May meeting of the CGIAR in Paris.
- Participation in discussions with CIAT, CIP, and CIMMYT on a proposed workshop to examine Latin American agricultural policy and implications for agricultural food policy research in the region.
- Participation with researchers from ICARDA in a workshop sponsored by the United Nations University on nutrition and agriculture.
- With ICRISAT, development of a proposal, to be undertaken with GERDAT (Groupement d'Etudes et de Recherches pour le Développement de l'Agronomie Tropicale), to assess the implications of millet and sorghum production policies and of the rising importance of wheat, rice, and maize

in consumption patterns in semiarid West Africa.

- With ILCA, CIAT, IRRI, and ICRISAT, the planning and coordination of a workshop on nutrition and agricultural research.
- With IRRI, continuation of the collaboration on the Rice Policies in Southeast Asia Project, the program development of the CHEMRAWN II conference held in Manila in December, and the IARC publications exhibit in the People's Republic of China.

## COLLABORATION WITH LOCAL INSTITUTIONS

Many IFPRI research activities are undertaken in conjunction with local and regional research organizations around the world. This interaction serves a number of purposes. It provides local expertise and insights for IFPRI research work, enhances national research capacities through interaction with IFPRI's specialized international staff, and improves the perception of relevant national and regional policy concerns at IFPRI. It also is an essential vehicle for conducting new survey work, where necessary, to generate important data for policy analysis. Collaborative activities also provide opportunities to incorporate research results into the delineation of actual policies. Many of IFPRI's regional projects and projects in each of the program areas have local collaborative links. IFPRI is striving to increase the number of such efforts.

Specifically, IFPRI's research on rice policies in Southeast Asia is being undertaken with researchers and policymakers in Indonesia, the Philippines, Thailand, and Malaysia. As an outgrowth of this work, the Asian Development Bank has asked IFPRI and IRRI to collaborate on research assessing future rice production and consumption in the Philippines in

order to determine appropriate irrigation strategies. The ongoing research in Bangladesh on food-for-work is being conducted in conjunction with researchers from the Bangladesh Institute of Development Studies. With the results of this research, the Government of Bangladesh expects to improve the food-for-work program and other programs affecting food and nutritional status.

During the summer of 1982, researchers from three of IFPRI's research programs participated in a workshop held in Nairobi on Food Policy Research Priorities for Kenya. IFPRI was invited to attend at the request of the Kenyan National Council for Science and Technology. The workshop was designed to discuss a range of perceived research priorities and to pinpoint a set of topics for future research efforts. IFPRI expects to become involved with these efforts in 1983 in the areas of food security and the effects on nutrition of production patterns.

IFPRI's collaborative research project with ICRISAT and GERDAT on the cereal policies in semiarid West Africa will include four subprojects carried out by national research institutions. Preparations for this work were finalized in Upper Volta, the Ivory Coast, and Senegal.

Other research projects undertaken in collaboration with local institutions include:

- With the Arab Organization for Agricultural Development, the examination of food consumption patterns as they are affected by changes in income in countries of the Arab region.
- With researchers at the Jawaharlal Nehru University and the Tamil Nadu Agricultural University in India, the tracing and evaluation of the indirect income, employment, and other multiplier effects of high-yielding cereal varieties in India's rural regions.
- With the Zambian National Food and Nutrition Commission and the Rural Development Studies Bureau of the University of Zambia, determining the consumption and nutrition implications of maize price and marketing policies in Zambia.
- With the Agricultural Projects Services Centre of Nepal, investigating how the depletion of wood resources influences nutrition and agricultural productivity in the hill areas of Nepal.
- With the Philippine Ministry of Agriculture and the National Nutrition Council, assessing the benefits and costs of a proposed food price discount program.
- With the Institute of National Planning in Egypt, continuing the study of Egyptian food price subsidies.

In addition to these collaborative research efforts, IFPRI has sought to enhance national research capacities by providing specialized training in Washington, D.C. During 1982, two officials of the Indonesian Ministry of Agriculture spent two months each at IFPRI studying the food consumption and nutrition effects of government policies, at the request of the Government of Indonesia. Arrangements were made to provide similar training to three officials of the Sri Lankan Ministry of Agriculture to study at IFPRI for six months each, at the request of the Government of Sri Lanka.

## SEMINARS AND MEETINGS

In 1982 IFPRI strengthened its outreach effort by creating a Policy Seminars Program. Its primary purpose is to facilitate the flow of policy-relevant information generated by IFPRI research to decision-makers in developing countries. Various meeting formats are employed, with particular emphasis on seminars that provide an opportunity for personal communication between IFPRI researchers and individuals who formulate and implement food and nutrition policies in these coun-

tries. Although much of IFPRI's data-gathering and analysis is necessarily country-specific, policy seminars provide a framework for exploring the wider applications of this work to economies that face comparable food policy issues and may, therefore, profit from an interchange of ideas and experiences. These meetings attempt to respond to the needs of developing countries with a view to identifying policy choices and their probable consequences. The program is reciprocal in its outreach potential, serving as a means to communicate research results more effectively while eliciting the views of those directly involved in the policy process on future priorities for research. This approach, it is hoped, will ensure the timeliness and relevance of IFPRI research to the critical issues facing the national and international policymaking communities. During 1982 extensive preparations were made for a series of seminars on agricultural price policies, trade and exchange rate issues, food subsidy programs, and food aid policy issues.

In addition to the conference on agricultural risk held in Costa Rica, plans were completed for an international conference to address the problem of accelerating the rate of agricultural growth in Sub-Saharan Africa. This meeting will be cosponsored in 1983 by IFPRI and the Department of Land Management, University of Zimbabwe. A small group of senior scholars, officials, and individuals from international institutions who are professionally concerned with food policy issues in the region will assess current knowledge about African agriculture in order to define research requirements for effective food policy decisionmaking. IFPRI plans to publish the papers presented at this conference.

In-house seminars are held periodically to discuss recently completed IFPRI studies or research in progress. They are attended by Washington area scholars and visiting officials. Informal meetings involving IFPRI researchers and food policy experts from the developing countries numbered 20 during 1982.

# 1982 PUBLICATIONS

## RESEARCH REPORTS

### Research Report 30

*Instability in Indian Foodgrain Production*, by Peter B. R. Hazell, May 1982.

### Research Report 31

*Sustaining Rapid Growth in India's Fertilizer Consumption: A Perspective Based on Composition of Use*, by Guntvant M. Desai, August 1982.

### Research Report 32

*Food Consumption Parameters for Brazil and Their Application to Food Policy*, by Cheryl Williamson Gray, September 1982.

### Research Report 33

*Agricultural Growth and Industrial Performance in India*, by C. Rangarajan, October 1982.

### Research Report 34

*Egypt's Food Subsidy and Rationing System: A Description*, by Harold Alderman, Joachim von Braun, and Sakr Ahmed Sakr, October 1982.

### Research Report 35

*Policy Options for the Grain Economy of the European Community: Implications for Developing Countries*, by Ulrich Koester, November 1982.

### Research Report 36

*Agriculture and Economic Growth in an Open Economy: The Case of Argentina*, by Domingo Cavallo and Yair Mundlak, December 1982.

## OTHER PUBLICATIONS

*Food and the Structure of Economic Growth: Its Relevance to North-South Relations*, by John W. Mellor. Paper presented at the Symposium on the World Food Problem and Japan, sponsored by the Japan FAO Association on the occasion of World Food Day, October 16, 1982.

*IFPRI Research and the Creation of the IMF Cereal Import Facility*, by Richard H. Adams, Jr., August 1982.

*Looking Ahead: The Development Plan for the International Food Policy Research Institute*, June 1982.

### RICE POLICIES IN SOUTHEAST ASIA PROJECT, WORKING PAPERS

*Irrigation and Rice Production in the Philippines: Status and Projections*, Number 3, Pat S. Ongkingco, José A. Galvez, and Mark W. Rosegrant.

*Status and Performance of Irrigation in Indonesia and the Prospects to 1990 and 2000*, Number 4, by Albert J. Nyberg and Dibylo Prabowo.

*Staple Food Consumption in the Philippines*, Number 5, by Ma. Eugenia C. Bennagen.

*Food Consumption Patterns and Related Demand Parameters in Indonesia: A Review of Available Evidence*, Number 6, by John A. Dixon.

*An Economic Analysis of a Reserve Stock Program for Rice in the Philippines*, Number 7, by Amanda Tan.

# REPRINTS

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- Delgado, Christopher L. (With John McIntire) "Constraints on Oxen Cultivation in the Sahel." Reprinted from the *American Journal of Agricultural Economics* 64 (May 1982): 188-196.
- Elias, Victor J. "Variable Parameters Models Applied to Agricultural Production Functions." Reprinted from *Contributed Papers of the 43rd Session of the International Statistical Institute*, pp. 117-120. Buenos Aires: ISS, November 30-December 11, 1981.
- Gonzales, Leonardo. (With David E. Kunkel and Jesus C. Alix) "MAAGAP: The ADAM National Model of the Philippines." Reprinted from *Agricultural Sector Analysis in Asia*, pp. 3-26. Edited by Max R. Langham and Ralph H. Retzlaff. Bangkok: Singapore University Press, 1982.
- Hazell, Peter B. R. "Application of Risk Preference Estimates in Firm-Household and Agricultural Sector Models." Reprinted from the *American Journal of Agricultural Economics* 64 (May 1982): 384-390.
- Huddleston, Barbara. "World Food Security and Alternatives to a New International Wheat Agreement." Reprinted from *New International Realities* 6 (March 1982): 1-10.
- Mellor, John W. "Third World Development: Food, Employment, and Growth Interactions." Reprinted from the *American Journal of Agricultural Economics* 64 (May 1982): 304-311.
- Quinlivan, Thomas. "A Case Study in Human Ecology: The Amazon Indians." Reprinted from *Ceres* 15 (March-April 1982): 18-23.
- Tsuji, Hiroshi. "A Quantitative Model of the International Rice Market and Analysis of the National Rice Policies, with Special Reference to Thailand, Indonesia, Japan, and the United States." Reprinted from *Agricultural Sector Analysis in Asia*, pp. 291-321. Edited by Max R. Langham and Ralph H. Retzlaff. Bangkok: Singapore University Press, 1982.

# OTHER WORKS BY IFPRI RESEARCHERS PUBLISHED IN 1982

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- Ahmed, Raisuddin. "Foodgrain Distribution Policies within a Dual Pricing Mechanism: The Case of Bangladesh." In *Development Issues in an Agrarian Economy—Bangladesh*, pp. 98-122. Edited by Wahid Uddin Mahmud. Dacca: Center for Administrative Studies, 1982.
- \_\_\_\_\_. "Structure and Extent of Marketable Surplus of Rice in Bangladesh." *ADAB News* 9 (January-February 1982): 10-16.
- Braun, Joachim von. "Möglichkeiten und Probleme von Nahrungsmittelhilfeprogrammen—Erfahrungen in ausgewählten Ländern—(Ägypten, Bangladesch, Haiti)." In *Möglichkeiten und Grenzen der Nahrungsmittelhilfe für Entwicklungsländer*, pp. 16-27. Arbeitsgemeinschaft für Rationalisierung des Landes Nordrhein-Westfalen, Nr. 215. Dusseldorf: Minister für Wissenschaft und Forschung, 1982.
- \_\_\_\_\_. (With Hartwig de Haen) "Egypt and the Enlargement of the EEC: Impact on the Agricultural Sector." *Food Policy* 7 (February 1982): 46-56.
- Desai, Guntant M. *Sustaining Rapid Growth in India's Fertilizer Consumption: A Perspective Based on Composition of Use*. Reprint of the International Food Policy Research Institute's Research Report 31. Bombay: Centre for Monitoring the Indian Economy, 1982.
- Hazell, Peter B. R. (With C. L. G. Bell) "Measuring the Indirect Effects of an Agricultural Investment Project on its Surrounding Region." In *Agricultural Sector Analysis in Asia*, pp. 231-254. Edited by Max R. Langham and Ralph H. Retzlaff. Bangkok: Singapore University Press, 1982.
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- Valdés, Alberto. "Agricultural Protection: The Impact on LDCs." *Ceres* 15 (November-December 1982): 13-18.
- \_\_\_\_\_. (With Grant M. Scobie) "Food Imports, Government Policy and the Balance of Payments: The Case of Wheat in Egypt." *Cuadernos de Economía* 19 (December 1982): 325-355. (In Spanish.)
- Wanmali, Sudhir. (With B. H. Farmer) "Service Provision in Rural India." *Development Research Digest* 8 (Winter 1982): 29-33.

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- Braun, Joachim von. "Equity Implications of Food Policies for the Rural Population in Egypt." Presented at the International Conference of Agricultural Economists, Jakarta, Indonesia, August 24-September 2, 1982.
- Eliás, Victor J. "The Effects of Government Expenditures on Agricultural Production and Productivity in Latin America." Presented at the Third Latin American Regional Meeting of the Econometric Society, Mexico City, July 19-22, 1982.
- Hazell, Peter B. R. "Barriers to Adoption of New Technologies at the Farm Level." Presented at the conference on Technological Change and Rural Development in Developing Countries, University of Delaware, Newark, May 3-4, 1982.
- Huddleston, Barbara. "Food: A New Human Right?" Presented at the World Food Conference, Northampton, Massachusetts, October 16, 1982.
- ... "The Case for Increasing Food Aid: How Much and to Whom?" Presented at the meeting of the International Wheat Council's Food Aid Committee, London, December 2, 1982.
- ... "Training Needs of Mid-Level Food Policy Managers in Sub-Saharan Africa." Presented to the Rockefeller Foundation, New York, December 21, 1982.
- Koester, Ulrich. "EC-Trade Preferences for ACP Countries and International Income Distribution—The Case of the EC Sugar Protocol." Presented at the 18th International Conference of Agricultural Economists, Jakarta, Indonesia, August 24-September 2, 1982.
- ... "Has the Common Agricultural Policy Failed?" Presented at the conference on Agricultural Policy in the Enlarged Community, organized by Friedrich-Ebert-Stiftung, Brussels, November 24, 1982.
- Mellor, John W. "Agricultural Growth—Structures and Patterns." Presented to the International Association of Agricultural Economists, Plenary Session III, Jakarta, Indonesia, August 24-September 2, 1982.
- ... "Food and Agriculture in Planned Economies—The Case of India." Presented at the annual meeting of the Allied Social Sciences Associations, New York, December 27-30, 1982.
- ... "Food Prospects for the Developing Countries." Presented at the annual meeting of the American Economic Association during the annual meeting of the Allied Social Sciences Associations, New York, December 28-30.
- ... "Trends in Third World Fertilizer Consumption: Relation to National Policies." Presented at the 8th Enlarged Council Meeting of the International Fertilizer Industry Association, Geneva, December 1, 1982.

- \_\_\_\_\_. (With Leonardo A. Paulino) "Overview to the Food Situation for Developing Countries to the Year 2000." Prepared for the Rockefeller Foundation's Conquest of Hunger Program Review Workshop, New York, May 21, 1982.
- Oram, Peter. "Strengthening Agricultural Research in the Developing Countries: Progress and Problems in the 1970s." Presented at a meeting of the Consultative Group on International Agricultural Research, Paris, May 24-26, 1982.
- Paulino, Leonardo A. (With John W.iviellor) "Overview to the Food Situation for Developing Countries to the Year 2000." Prepared for the Rockefeller Foundation's Conquest of Hunger Program Review Workshop, New York, May 21, 1982.
- Pinstrup-Andersen, Per. "An Analytical Framework for Assessing the Nutrition Effects of Policies and Programs." Presented at the Rockefeller Foundation workshop on Strengthening National Food Policy Capability, Bellagio, Italy, November 1-4, 1982.
- \_\_\_\_\_. "Export Crop Production and Malnutrition." Presented for the H. Brooks James Memorial Lecture, North Carolina State University, Raleigh, October 21, 1982.
- \_\_\_\_\_. "Food Policy and Human Nutrition." Presented at an ICARDA workshop on The Interfaces between Agriculture, Food Science and Human Nutrition in the Middle East, Aleppo, Syria, February 21-25, 1982.
- \_\_\_\_\_. "Incorporating Nutritional Goals into the Design of International Agricultural Research." Presented at the meeting of the directors of the International Agricultural Research Centers, Washington, D.C., November 5, 1982.
- Valdés, Alberto. "Agriculture in Trade Negotiations: Issues of Interest to the Third World." Presented at the Conference on Protectionism sponsored by the Central Bank and Universidad Católica, Santiago, Chile, March 23, 1982.
- \_\_\_\_\_. A discussion paper on "The Role of Trade in Food Security and Agricultural Development," by Robert L. Thompson. Presented at the conference on The Role of Markets in the World Food Economy, Minneapolis, Minnesota, October 14-16, 1982.
- \_\_\_\_\_. "Food Imports and Food Security: A Stabilization Problem for Developing Countries." Presented at the conference on International Food, Finance, and Agricultural Trade: Critical Issues in the 1980s, sponsored by the Global Interdependence Center, Minneapolis, Minnesota, September 12-14, 1982.
- \_\_\_\_\_. "Research to Improve Food Policy Analysis." Presented at the Rockefeller Foundation workshop on Strengthening National Food Policy Capability, Bellagio, Italy, November 1-4, 1982.
- Yadav, Ram P. "Implications of Education for Economic Development in Nepal." Presented at the 11th Annual Conference on South Asia, University of Wisconsin, Madison, Wisconsin, November 5-7, 1982.

# PERSONNEL, 1982

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# FINANCIAL STATEMENT

## INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

### BALANCE SHEET as at December 31, 1982 and 1981

#### ASSETS

	<u>1982</u>	<u>1981</u>
<b>Current Assets:</b>		
Cash and short-term investments	\$350,551	\$135,152
Accounts receivable - grants	25,687	51,496
Employee and other receivables	25,602	28,704
Contracts-in-process	66,064	50,054
Prepaid expense and advances	44,279	74,634
	<u>512,183</u>	<u>340,040</u>
<b>Property and Equipment:</b>		
Furniture and equipment	181,175	228,729
Leasehold improvements	34,614	30,317
Capital leases on equipment	33,439	-0-
	<u>249,228</u>	<u>259,046</u>
Less - accumulated depreciation and amortization	133,987	167,134
	<u>115,241</u>	<u>91,912</u>
<b>TOTAL ASSETS</b>	<u>\$627,424</u>	<u>\$431,952</u>

#### LIABILITIES AND FUND BALANCE

<b>Current Liabilities:</b>		
Accounts payable and accrued expenses	\$285,686	\$119,981
Advance payment of grant funds	178,000	-0-
Advance payment of contract funds	139,035	190,295
Current portion of capital lease obligations	9,977	-0-
	<u>612,698</u>	<u>310,276</u>
<b>Long-term Liabilities:</b>		
Obligations under capital leases	30,533	-0-
Less - current portion above	9,977	-0-
	<u>20,556</u>	<u>-0-</u>
<b>Fund Balance</b>	<u>(5,830)</u>	<u>121,676</u>
<b>TOTAL LIABILITIES AND FUND BALANCE</b>	<u>\$672,424</u>	<u>\$431,952</u>

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, 1982 and 1981

	1982	1981
<b>Revenues:</b>		
Grants	\$3,149,718	\$2,754,188
Contracts	789,629	412,467
Investment, expense reimburse- ment and other income	127,945	111,683
	<u>\$4,067,292</u>	<u>\$3,278,338</u>
<b>Expenses:</b>		
<b>Personnel:</b>		
Salaries	1,884,724	1,526,652
Consultants	470,662	282,091
	2,355,386	1,808,743
<b>Personnel Related Costs:</b>		
Employee benefits	452,510	329,901
Recruitment and relocation	109,641	46,094
Travel	300,909	241,670
	863,060	617,665
<b>Communication and Computer Services</b>	394,695	324,838
<b>Office Operation and Administration:</b>		
Depreciation	42,227	34,484
Equipment rental	22,539	20,160
Office and other operating expenses	108,195	62,813
Professional fees	53,447	30,304
Rent	198,435	160,768
Telephone and telegraph	49,146	39,482
Temporary and clerical services	11,327	15,225
Trustees expenses	96,312	59,661
	581,657	422,897
	<u>4,194,798</u>	<u>3,174,143</u>
<b>Excess of Expenses Over Revenue</b>	(127,506)	104,195
<b>Fund Balance, Beginning</b>	121,676	17,481
<b>FUND BALANCE, ENDING</b>	\$( 5,830)	\$ 121,676

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, 1982 and 1981

	<u>1982</u>	<u>1981</u>
<b>Source of Funds:</b>		
Excess of expenses over revenues	\$(127,506)	\$104,195
Items not affecting working capital:		
Depreciation	42,227	34,484
Long-term obligation under capital leases	20,556	-0-
	<u>( 64,723)</u>	<u>138,679</u>
<b>Use of Funds:</b>		
Additions to property and equipment	<u>65,556</u>	<u>36,242</u>
<b>(DECREASE) INCREASE IN WORKING CAPITAL</b>	<u><u>\$(130,279)</u></u>	<u><u>\$102,437</u></u>
<b>(Decrease) Increase in Working Capital:</b>		
Cash and short-term investments	\$215,399	\$123,206
Accounts receivable - grants	( 25,809)	8,541
Employee and other receivables	( 3,102)	3,610
Contracts-in-process	16,010	50,054
Prepaid expense and advances	( 30,355)	62,724
Accounts payable and accrued expenses	(165,705)	44,597
Advance payment of grant funds	(178,000)	-0-
Advance payment of contract funds	51,260	(190,295)
Current portion of capital lease obligations	<u>( 9,977)</u>	<u>-0-</u>
<b>(DECREASE) INCREASE IN WORKING CAPITAL</b>	<u><u>\$(130,279)</u></u>	<u><u>\$102,437</u></u>

The accompanying notes are an integral part of these statements.

# INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

## NOTES TO FINANCIAL STATEMENTS December 31, 1982 and 1981

Note 1. Summary of Significant Accounting Policies.

Organization

By Executive Order 12359 of April 22, 1982, the Institute is a public international organization entitled to enjoy certain privileges, exemptions and immunities conferred by the International Organizations Immunities Act, including exemption from Federal income tax.

Prior to April 22, 1982, the Institute was 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 organization to which contributions are deductible by other individuals and organizations.

Property and Equipment

Property and equipment is stated at cost. Depreciation is provided over an estimated useful life of 3 to 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 related accumulated depreciation are removed from the respective accounts and the resulting gain or loss is reflected in earnings.

Note 2. Leases.

Operating Leases

The Institute occupies office space under various leases expiring through August 31, 1987. The leases provide for rent increases based on increases in building operating costs and increases in the Consumer Price Index.

Capital Leases

The amount capitalized under capital leases is the fair value of the leased equipment at the beginning of the lease term. Interest rates applicable to capital leases are 17.4% and 20.2%. Obligations paid under capital leases amounted to \$5,795 in 1982.

Minimum Lease Payments

Minimum lease payments for all noncancellable operating and capital leases having a remaining term in excess of one year at January 31, 1983, are as follows:

	Capital Leases	Operating Leases
1983	\$14,923	\$ 244,185
1984	14,923	253,943
1985	9,128	237,576
1986		169,898
1987		119,605
	<hr/>	<hr/>
Total minimum lease payments	38,974	\$1,025,207
Less-amount representing interest	<hr/> 8,411	
Present value of minimum lease payments	<hr/> \$30,533	

# INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

## NOTES TO FINANCIAL STATEMENTS December 31, 1982 and 1981 (continued)

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 \$235,370 and \$199,137 for 1982 and 1981 respectively.

Note 4. Grant income is core program support received from agencies participating in the Consultative Group on International Agricultural Research. Funds were received in 1982 and 1981 as follows:

	<u>1982</u>	<u>1981</u>
January	\$ 221,997	\$ 577,571
February	131,028	410,000
March	164,163	426,361
April	550,576	-0-
May	297,733	100,000
June	80,315	220,921
July	662,722	-0-
August	150,000	80,926
September	2,267	467,042
October	169,685	21,367
November	647,367	350,000
December	46,178	48,504
	<u>3,124,031</u>	<u>2,702,692</u>
Grants receivable	25,687	51,496
<u>Grant Revenue</u>	<u>\$3,149,718</u>	<u>\$2,754,188</u>

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

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February 2, 1983

Officers and Trustees  
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We have examined the balance sheet of the INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE as at December 31, 1982 and 1981, 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, 1982 and 1981, 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.

*Raymond E. Lang & Associates, P.A.*

The International Food Policy Research Institute was established to identify and analyze alternative national and international strategies and policies for meeting food needs in the world, with particular emphasis on low-income countries and on the poorer groups in those countries. While the research effort is geared to the precise objective of contributing to the reduction of hunger and malnutrition, the factors involved are many and wide-ranging, requiring analysis of underlying processes and extending beyond a narrowly defined food sector. The Institute's research program reflects world-wide interaction with policymakers, administrators, and others concerned with increasing food production and with improving the equity of its distribution. Research results are published and distributed to officials and others concerned with national and international food and agricultural policy. The Institute receives support as a constituent of the Consultative Group on International Agricultural Research from a number of donors including the governments of Australia, India, Italy, the Federal Republic of Germany, the Netherlands, the Philippines, and the United States of America; the International Development Research Centre (Canada); the Ford Foundation; the Rockefeller Foundation; the World Bank; and the International Fund for Agricultural Development. In addition, a number of other governments and institutions contribute funding to special research projects.

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