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FOOD
POLICY
RESEARCH
INSTITUTE**

REPORT 1981

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IFPRI REPORT **1981**

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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INTRODUCTION

The International Food Policy Research Institute takes an integrated approach to food problems in its research program. This approach recognizes that although agricultural production must be accelerated by using superior technology if developing countries are to end hunger and stimulate economic growth, technology alone is insufficient. To foster a humane and rapid pattern of growth, there must be an understanding of the policy options pertaining to that technology, of the links between agricultural growth and growth in the rest of a country's economy, and of the alternatives for ensuring that increased food supplies meet the needs of the poor.

IFPRI's research is directed to policies for accelerating food production growth and factors affecting the development and adoption of improved technology. It is geared toward understanding the nature of the world food problem. This differs among and within countries and with changing technological possibilities, income, population size, urbanization, food habits, and short-term food emergencies. In some parts of the world the food problem is the result of the slow growth of production; in others it is the result of deficiencies in the purchasing power of consumers and is rooted in poverty, inadequate growth in employment, inadequacies of food distribution systems, and other factors.

At the heart of the Institute's research program is the study of the interactions of food production, consumption, and trade. Research focuses on how these interactions are influenced by international and national policies and how countries, particularly low-income countries, might improve the availability of food.

IFPRI recognizes that the economic growth of the Third World will accelerate during the 1980s. This will increase the effective demand for food, put pressure on food prices to rise, increase agricul-

ture's influence on determining growth rates, change price relationships, and decrease access to food of countries and people not experiencing the widespread increase in productivity.

To address these issues, IFPRI research has emphasized the six problem areas described below. Some specific aspects of food policy research in these areas are described in the director's statement, which follows this introduction.

National and international food imbalances examines emerging world food supply and demand problems and how domestic food production and consumption, international assistance, and trade may be able to alleviate these problems.

Food security is concerned with defining the short- and long-term policy alternatives for ensuring adequate and stable food consumption. It deals with fluctuations in international and national food supplies and the effects these fluctuations have on the food intake and nutrition of the poor.

Accelerating production growth rates through technological change is concerned with determining how research resources can best be used to meet national needs. Because technological change, which is central to increasing production, implies large increases in the use of modern inputs, the institutions and infrastructures that provide these inputs must be designed so they can ensure that the benefits are reaped by the poor.

Optional production patterns is concerned with defining the most effective combinations of crops and livestock production, based on domestic capability, domestic demand, and international trade.

Optional pricing policy attempts to define the price policies best suited to meeting conflicting consumption and production objectives. It examines the factors that determine how price policies affect the food consumption of the poor and how changes in prices affect land allocation, labor practices, the use of

modern inputs, and the development of technology-oriented institutions.

Agricultural growth linkages investigates the links between growth in agricultural productivity and overall economic growth. Policies are examined to see how they contribute to production growth, income distribution, and employment.

Research in these six areas 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 1981.

During the year researchers in these programs initiated, continued, or completed work on some 40 projects. Results were reported in eight research reports and eight issues of *IFPRI Abstract*.

IFPRI publications also included *Some Commentaries on Food*, a series of discussions of food policy issues by senior research staff. In March 1981 Westview Press published *Food Security*, a collection of papers resulting from a conference on that subject held jointly by IFPRI and the International Center for the Improvement of Maize and Wheat (CIMMYT).

During the year IFPRI staff examined specific agricultural development problems at the request of organizations

such as the World Bank, the International Fund for Agricultural Development (IFAD), the United Nations University, the Economic and Social Commission for Asia and the Pacific (ESCAP), the Rockefeller Foundation, the Inter-American Institute for Agricultural Cooperation (IICA), and the governments of Bangladesh, Mexico, and Zambia.

In September 1981, IFPRI sponsored a policy discussion attended by representatives of the Consultative Group on International Agricultural Research (CGIAR) and collaborating institutions. Discussion focused on approaches, findings, and dilemmas in the six research areas.

IFPRI held its Board of Trustees meeting to review its research program in Ibadan, Nigeria, in February 1981. This was the second board meeting to be held in a developing country. As a part of this meeting, IFPRI researchers presented seven papers on food issues in Sub-Saharan Africa for discussion with Nigerian colleagues. These papers were published by IFPRI under the title *Food Policy Issues and Concerns in Sub-Saharan Africa*.

With each year IFPRI expands its research capabilities and output. In 1981 IFPRI staff members continued to increase their understanding of key food policy problems and the capacity of national and international institutions to solve them.

FOOD POLICY AND THE RESEARCH AGENDA: SIX AREAS OF CONCERN*

We at the International Food Policy Research Institute are pleased to see increasing attention being paid at the highest levels of government to the importance of food production, perhaps most recently exemplified by its high place on the agenda at the Cancun meetings. We also sense a growing recognition that new technical possibilities are central to solution of global food problems, although they create complex, new policy problems.

Nevertheless, I sense that misunderstanding of the nature of global food problems and of the available policy options is leading to inadequate policies and misdirection of resources. In view of this, I would like to make unequivocal statements (which economists don't do very often) about six aspects of food policy I believe to be of particular concern, based on the results of our research projects. I will not obscure these statements with the qualifications and "on the one hand and on the other hand" statements dear to my fellow economists. That may get me in some difficulty because obviously the things I am going to say need to be qualified around the edges. Nevertheless, I am going to pass over that in order to avoid obscuring the key points.

OUTLOOK First, in commenting on the global food situation, I want to present a somewhat different picture from the standard one of the last few years. Third World countries will increase

their food imports in the next few decades by so much that they themselves will bring about tight global supplies and rising real food prices.

This situation is the result of rapidly rising real incomes. I think it is important to keep in mind that this income growth is what will dictate the food problem in the next few decades. Currently, some 700 million people in Third World countries are experiencing an extraordinary 4 percent or more growth rate of per capita income. That is more rapid growth than Europe was able to sustain in the post-World War II recovery period. The portion of the population sharing in this rapid growth could easily double in the next few years.

Demand for food in these countries is growing at 4-6 percent a year. I am talking about effective demand—what people are able and willing to pay—and about rates of growth of demand that are rarely exceeded, even in countries that have good agricultural research systems and are following optimal agricultural development policies.

IFPRI research shows that, as a group, the countries achieving the highest growth rates in basic food staple production are also increasing their imports of those foods. In other words, success in agricultural development is not going to ease the pressure on trade in agricultural commodities much. There are very sound economic reasons for that. When we are dealing with countries in which the laboring class of people is spending 60-70

* Statement to the members of the Consultative Group on International Agricultural Research for CGIAR Centers' Week, November 9-13, 1981.

percent of increments of income for food, anything we do to raise income, including accelerating agricultural production, increases the demand for food. And when we have the linkage processes that I want to talk about in a moment, demand tends to increase faster than supply. Obviously, at the income levels of Western Europe and North America these relationships change.

We can expect, in this context, explosive growth in the feeding of basic food staples to livestock. Demand for livestock products is growing rapidly. Because this demand is being disproportionately met by concentrate feeds, the base on which high growth rates are imposed is becoming substantial.

We are consistently taken by surprise when we see developing countries, such as Taiwan, suddenly moving explosively into the import market. Taiwan, which was a net exporter of basic food staples in the early 1950s, now imports half of all the grain consumed in the country, despite having one of the most successful agricultural production records of any Third World country.

As incomes go up, a ceiling on direct consumption of grain by human beings is reached very quickly. Then the use of concentrate feeds for livestock grows rapidly and continues for a long time. It doesn't have much effect for quite a while because the base is low. But eventually the base becomes large enough so that rapid and continuing growth of feed-grain use begins to overwhelm the slackening in growth for direct human consumption, resulting in explosive growth in the demand for concentrate feeds.

The most rapidly growing forms of livestock consumption are those that are raised at the margin on concentrate feeds—namely, poultry and pigs. This is important, and I hope no one thinks I am making a judgment as to whether it is good or bad. I am simply stating what is happening.

I want to comment now on some of the implications. First, there will be a much

greater urgency to raising aggregate food production in the coming decades than there was in the 1950s, '60s, and '70s. More explicitly, paying lip service to the expansion of agricultural production in Africa in the 1980s will be far more costly to those countries than was lip service paid to agricultural production in Asian countries in the late 1950s or early 1960s. I'm perhaps being a little rude, but I think there were a number of Asian countries in the 1950s and 1960s in whose rhetoric one could find all one would want to find about the importance of agriculture, but not in their actions. Much of that has turned around now, of course.

I would also make that statement for Africa at the present time. In general, there is plenty of rhetoric about the importance of agriculture; everybody has learned their lessons and can recite them, but there is not much action. This is going to be far more costly to African countries in the next two decades than what many of us would call the errors in policy of the Asian countries in the earlier period.

Incidentally, maybe they weren't errors. If the United States and some other countries were so eager to dump surpluses of foodgrains, perhaps it wasn't an error to neglect agriculture then. But it certainly will be an error the next time around.

I might mention something I want to come back to: on a micro level we find a much closer relationship in African countries than in Asian countries between aggregate growth in agricultural production and the nutritional status of infants and poor families. There is a whole economic system in Africa that feeds the benefits of agricultural growth to lower income people more rapidly than in Asia, and hence a food production drive in Africa will do relatively more to directly alleviate poverty than it did in Asia.

The second implication is that those people and countries left out of the growth processes will suffer much greater privation in the future than in the past. I am

basing what I am saying on growth processes and rising incomes. People experiencing income growth are going to eat much better in the next couple of decades. Those who are left out are going to be much more severely squeezed than was the case in the past few decades. That is why our research program at IFPRI devotes nearly half our resources to finding policies to expand the secondary employment effects of food production growth and to increase the efficiency and reduce the cost of food and employment subsidies designed to fill gaps left by the processes of agricultural growth.

Food scarcity is going to increasingly push countries to invest their resources in those elements of agriculture that will give them more growth and production. Countries will have to do that, in many cases, simply to deal with the poverty problem. If they don't, food prices are going to rise so much that their low-income people will be severely squeezed.

With a greater emphasis on moving the production resources of agricultural production toward the somewhat more responsive regions of countries, one must look for secondary means for dealing with poverty in the other regions, and one is going to have to turn more to direct food subsidies. I say that, recognizing that we are in a political environment in much of the world, and probably increasingly so, in which converting vast governmental resources into subsidies is not going to be politically acceptable. Despite a change in the political wind, I would state flatly that we are going to see more food subsidies in developing countries, not less, because the pressures are going to be much greater in the coming decades.

The third implication is that domestic food production will occur in a rapidly growing and shifting trade regime. We are going to have more trade in agricultural commodities among developing countries and between developing countries and other countries, resulting in substantial inefficiency in use of agricultural research resources, unless the trade

regime is understood and adaptations made to it. We are disappointed that cutbacks in our expected funding will delay by an additional three years the definitive results and leadership IFPRI should be providing in this key area.

I want to emphasize the dynamics of what is happening in the world at the present time. We cannot expect efficiency in research systems or fertilizer distribution systems or agricultural plants unless we look at the trade regime that fosters efficiency.

We can take a specific example that came up in discussions in Nigeria last February. When it is said that "Nigeria is going to be self-sufficient in food in 5 years' time and is going to plan research allocation and production processes to be consistent with that," realities are being ignored. Nigeria will be importing several million tons of grain, not only 5 years from now but 10 years from now, and must adjust production patterns to that.

Now, I have no problems with anyone who says that Nigeria should become self-sufficient in grain. That's a fine idea, but it is a long-range objective. It isn't going to happen in the near future, and in the meantime resources should be allocated realistically. I am ignoring the difficult political problems in explicitly recognizing these facts. I realize, of course, that one has to compromise somewhat, but as I said, I am removing the qualifications in this statement.

FOOD SECURITY

The second policy area I want to talk about is food security. In the context of rising real prices of food and the special burden they place on the poor, we can expect increased fluctuations in food production in the next few decades as compared to the unusual stability of recent years.

Contributing to this, the processes of agricultural modernization are in many

complex ways serving to increase variability in production. I realize this is a slightly controversial point, and I have been rather careful in my choice of terms. I said the process of agricultural modernization is causing increased fluctuation. The term modernization, as used here, refers to the technologies that the CGIAR researchers and their colleagues in developing countries are turning out and the whole set of changes that goes along with them. Looking at that, it seems pretty clear that the fluctuations in production are increasing. I don't want for a moment to imply that we have gone down the wrong road. The gross benefits of the production increases are very, very large. All I want to point out is that we have created a small additional policy problem, and we need to have measures to deal with that. In other words, we need to take some of the gross returns from research and turn those to dealing with one of the problems that comes from it.

We will need to hold larger stocks of food in the future than in the past, and holding those stocks will be considerably more expensive. Thus, we must search diligently for means of minimizing the extent and hence the cost of stocks. Financial resources can substitute for physical stocks to a substantial degree, but not entirely.

We believe that IFPRI research; a conference sponsored jointly by CIMMYT, the United Nations Development Programme, and IFPRI; and intensive consultative follow-up by IFPRI staff helped convince policymakers of the net benefits of a financial facility to meet a portion of that need. We are impressed by the extraordinarily short period from conception to realization of the IMF food facility. This is one of the major contemporary innovations whose benefits must inevitably go to the poor.

Frankly, it was rather widely believed that a financial facility to finance imports of food when there was a crop failure at home could not work unless it was backed up with stocks, and it looked as though

the international system—the wheat agreement and so on—was not going to come up with the stocks.

Our research shows clearly that there is a substantial task that can be performed by a financial facility, and we like to think that being out front on that research played a small role in accelerating its birth. I certainly would never be so foolish as to claim one research institute largely influenced this project, but we believe IFPRI had a small part in it.

AGRICULTURAL PRICES

Third, a comment on agricultural prices. (I was told last year by someone at the Philippines CGIAR meeting that "that was a wonderful statement you made on agricultural prices, but you realize it lost you half your supporters for IFPRI.") We note that slow growth in Third World food production is frequently associated with relatively low food prices. That is a fact. However, we also note that relative food prices are, generally speaking, most out of line when other policies and programs, especially agricultural research capability, are also out of line.

Thus, the potential for accelerating agricultural production growth rates through price policy alone is limited. I think it is important to realize that the lovely panacea of raising food prices by 10, 20, 80 percent, or whatever, to get off the ground just doesn't work by itself, unfortunately.

The role of prices is further limited by the clear relationship in Third World countries between higher agricultural prices and increased privation for the lowest income people. At the more emotive level, we can see a relationship between real agricultural prices and death rates, particularly among infants in developing countries. The data are quite evident on this in Bangladesh. We can show it in African countries, also.

The conclusions from these observations about prices are clear. First, efforts

to raise agricultural prices must emphasize increasing the effective demand for food by raising the employment and incomes of the low-income people who spend a high proportion of their income on food. As these efforts place upward pressure on food prices, we need ancillary efforts to protect those who are not participating in the benefits from the effects of higher agricultural prices.

In such a development context, food subsidies will continue to be an important means of dealing with those problems. Our research program is probably doing more work on food subsidies and how to maximize their benefits to the poor and minimize their detriment to production than any research institution in the world.

Second, increased incentives to food production must come substantially from cost-decreasing technological change of precisely the type that the CGIAR system was set up to instigate. What farmers respond to is incentives, the difference between their costs and returns, and this system is concerned with bringing down costs of production, which is to everybody's benefit, particularly the poorest people in the world.

I want to emphasize that developing countries and the donor community are underallocating resources to agricultural research for optimal growth and especially for poverty alleviation. There is widespread recognition of the problem among developing countries; there needs to be much more concerted effort on this front.

AGRICULTURALLY

LED GROWTH Increased food production does not directly stimulate demand adequate to maintain food prices. Or to put it differently, increases in food production depress prices. Obviously, this price-depressing effect is unfortunate from the point of view of the incentives for adopting technology.

Fortunately, growth in agricultural income has large multiplier effects on other sectors. We find that for each dollar increase of income from food production, we can expect to stimulate at least another dollar's increase in production of other goods and services, with much of the potential in the rural nonagricultural sectors. That growth can provide the employment needed to maintain farm prices and additional production income to pay for rural services.

There is no element of growth economics less understood than the linkages between technology-induced agricultural growth and growth in other sectors. And yet the bulk of Third World poverty alleviation during the next few decades will occur through those processes, not through direct attacks on poverty.

We have no doubt that current IFPRI research will lead to policies ranging from altered agricultural research allocations to increased allocations to rural road systems and market facilities, which significantly augment the linkage effects. And let me also say as a professional economist that we know a lot about the processes of growth, which start with the industrial sector and follow capital-intensive processes. We can lay out a plan, tell what the results will be and where it may go wrong. But we can tell very little about a growth process that starts with the agricultural sector, except to rely on intuition. I think it is important for getting the full benefits of the output from this system that we understand those processes and begin to find better policies.

FERTILIZER A quick comment on fertilizer. We have something that I think is very exciting coming out in the fertilizer area, and I want to just titillate you a bit with it. We will soon complete research that will clearly call for major changes in fertilizer supply policy for developing countries, including the efficacy of long-term supply arrangements.

It is clear that an already dominant and still rapidly increasing proportion of increments to food production in the Third World are derived from the use of inorganic fertilizers. This will continue for at least the next decade or decade and a half. The interaction of fertilizer with new high-yield crop varieties is well known. We find, however, that fertilizer supply factors, including domestic production, import and stock policy, and the policies of foreign aid donors, play a major role in growth rates of fertilizer and hence food production. We find the fluctuations in growth rates in fertilizer use not as closely related to demand factors as they are to decisions about building fertilizer factories and import policy. To put it another way, the growth in fertilizer use is closely tied to countries' foreign exchange constraints.

AGRICULTURAL RESEARCH RESOURCES

The last comment I want to make is on research resources. There is continued underestimation of the crucial foundation role of agricultural research in moving agricultural development processes. It is striking, in the face of high marginal returns to investment in research, that policymakers after policymaker compromises in allocation of scarce resources to research. Despite the general underallocation to agricultural research, there is great variability in the efficiency with which research resources are used. It is unfortunate that IFPRI's resource constraints continue to delay the major long-term, in-depth research that the importance of this topic demands.

As we continue our research on such work as nutrition, trade, price policy, and inputs, we will also redouble our efforts to expand into the highly complementary analysis of research allocations and management. For example, if a relatively small country with three or four different

kinds of regions has a limited number of research people, how should they allocate them between central and regional stations? That is a question that needs in-depth economic analysis. It isn't being done and it should be done, but it has to be done at an institution that can bring together the complementary research on a wide range of other issues from fertilizer policy to nutrition policy, which bear on it.

We are delighted with our collaborative efforts with the International Service for National Agricultural Research (ISNAR). We will benefit greatly from their action orientation, and we hope our in-depth research effort will be useful to them.

CONCLUSION

Just a brief concluding comment. The six policy areas mentioned are ones in which IFPRI has made substantial research contributions. We think that our strength lies in being able to attack diverse problems, which interrelate with each other. Obviously, when we talk about them, they come out one at a time. But I hope the interrelations among these parts can be seen.

These emphases derive from examination of the underlying data and through interplay with policymakers from all parts of the world. Each of the points I made is drawn from many different research projects, emphasizing that IFPRI's primary contribution is bringing together a diverse group of researchers from diverse backgrounds in diverse parts of the world to interact on diverse problems.

It is the complementarity of those parts that allows us to move to clear policy conclusions. It is the diversity of experience that allows us to understand variability and the qualifications that must be made.

John W. Mellor

Washington, D.C.

FOOD TRENDS ANALYSIS PROGRAM

Studies in the Food Trends Analysis Program assess the current and prospective food situations in developing countries by building on food and agricultural data from other international organizations, especially the Food and Agriculture Organization of the United Nations (FAO). By analyzing food trends in developing countries, the composition and dynamics of food problems in the Third World can be diagnosed. Specifically, the program examines the historical trends of food production, consumption, and trade in the developing countries and, on the basis of these trends, projects their food output and requirements for selected time horizons. In addition to a global assessment, the program also undertakes detailed studies on food trends for specific countries and country groups. Research results provide indications of the possible extent and locations of future serious food imbalances in the Third World, which help to identify the areas for further research on food policies by other IFPRI programs.

FOOD GAP ANALYSIS

The 1976 IFPRI assessment of the food situation in the developing world, its first, analyzed the production and consumption trends of cereals in about 80 developing-market-economy countries and projected their prospective output and demand to 1985. Although succeeding food gap studies have employed essentially the same basic approach, the country and commodity coverage has been enlarged. The present analysis covers more than 100 Third World countries, including the People's Republic of China, and includes, in addi-

tion to cereals, the major noncereal food crops and primary livestock and poultry products. It examines the trends of production, consumption, and trade of these commodities during 1961-77 and develops projections to the year 2000.

MAJOR FOOD CROPS

Despite the significant gains in food output that can be attributed to the advances in agricultural technology during the past two decades, the 2.6 percent annual growth of production of major food crops in Third World countries barely exceeded the population growth during 1961-77. (The period 1952-77 was used for the People's Republic of China, which had far-below-normal output in the early 1960s. China accounts for about a third of food production in the developing countries, and the use of Chinese data from 1951 greatly exaggerates the 1961-77 food output trend, causing it to rise to 3.0 percent a year.) Food production expanded faster than population in Asia and Latin America, just kept pace with population growth in North Africa/Middle East, and lagged far behind population increases in Sub-Saharan Africa, as can be seen below.

Region	Population	Food Production
Asia	2.4	2.6
North Africa/ Middle East	2.6	2.6
Sub-Saharan Africa	2.7	1.6
Latin America	2.7	3.2
Total	2.5	2.6

Improvement in crop yields contributed more than area expansion to the growth of food production in Third World countries during the 16-year period. The output per hectare of major food crops increased by 1.9 percent a year and accounted for more than 70 percent of production growth. Increases in crop yields were most pronounced in Asia, where they contributed more than 80 percent to the expansion in food output. In North Africa/Middle East the larger role of output per hectare (56 percent) is also indicated. Growth in harvest area, on the other hand, was largely responsible for the food production gains in Sub-Saharan Africa and Latin America. With growth in crop yields almost stagnant, Sub-Saharan Africa's 1.3 percent annual growth in area sown with food crops accounted for 80 percent of the increase in food production in the region. In Latin America, where food output increased most rapidly among the developing regions, area expansion contributed 56 percent of production growth.

Historical trends show that food consumption in the developing countries has expanded much faster than food production. A comparison of the averages of consumption data for 1961-65 and 1973-77 shows that the domestic utilization of major food crops rose an average of 3.0 percent a year during the intervening period. Although the bulk of increases in food consumption was due to population growth, nearly one fifth of the total increase in food demand in those years could be attributed to the rapid growth in incomes, especially of the oil-exporting countries and those economies in a more advanced stage of development. Among the developing regions, the annual growth rates of consumption of major food crops for the period were 3.6 percent in Latin America, 3.5 percent in North Africa/Middle East, 2.9 percent in Asia, and 2.3 percent in Sub-Saharan Africa. (Figure 1 shows the 1966-77 production and consumption of major food crops in the developing regions and in the Third World as a whole.)

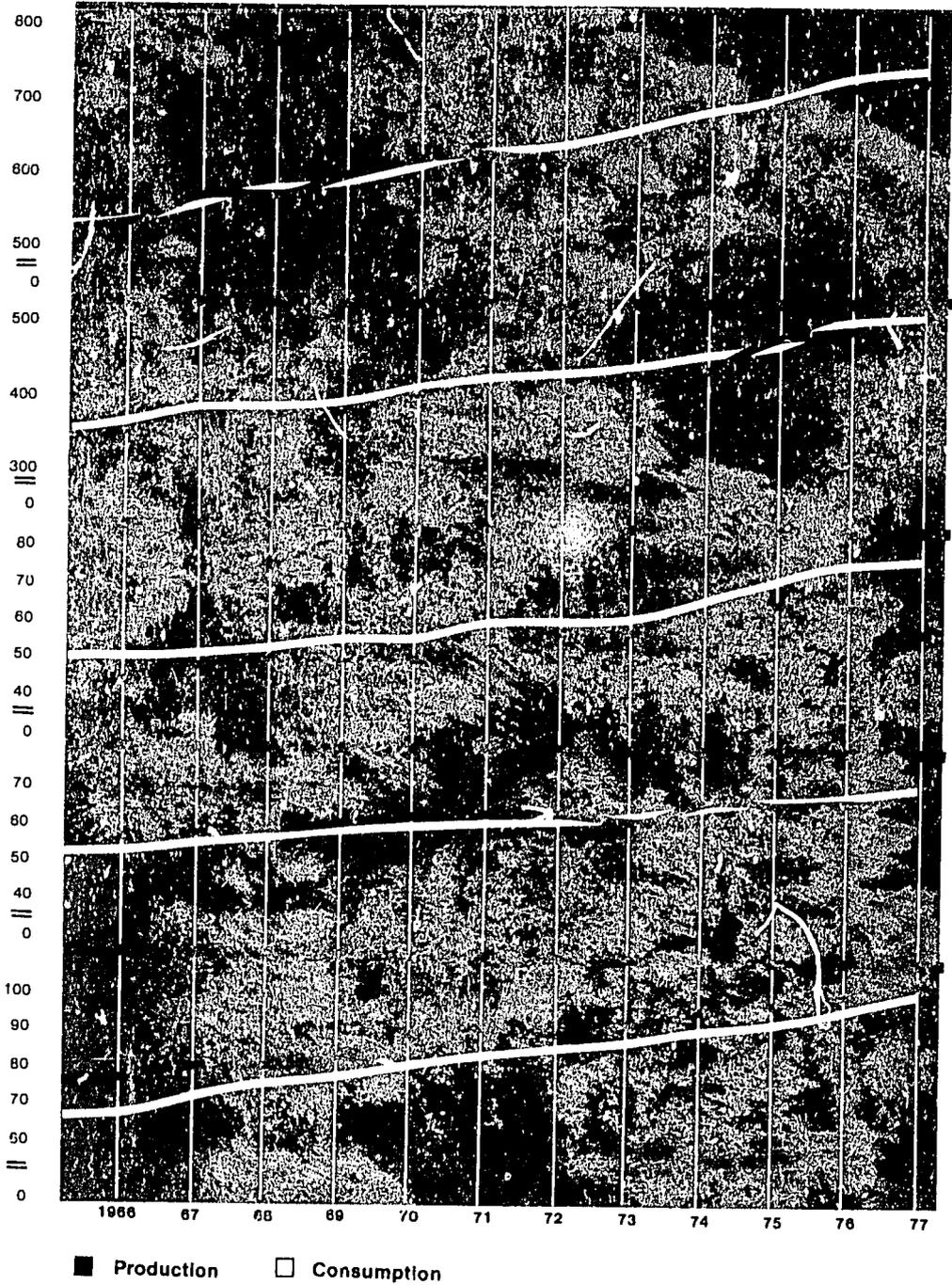
The significant shift in developing countries toward the consumption of more livestock and poultry products may be inferred from data that show the rapid growth in the domestic utilization of major food crops, especially cereals, for animal feed. Feed use of these commodities in Third World countries expanded at a yearly average of 3.7 percent between 1961-65 and 1973-77, increasing its relative share in the total domestic use of major food crops from 18 percent to 20 percent. Growth in the use of these commodities for feed purposes was particularly rapid in Latin America (5.4 percent) and North Africa/Middle East (3.8 percent) but also significant in Asia and Sub-Saharan Africa (both 3.1 percent). In Sub-Saharan Africa, however, the level of feed use is still low, representing less than 6 percent of total domestic use during 1973-77.

Net imports of the major food staples by Third World countries rose from a yearly average of about 10 million metric tons in 1961-65 to 28 million metric tons in 1973-77, or an annual increase of more than 9 percent (see Table 1). Food exports increased by about a third while food imports expanded nearly 80 percent, indicating average annual growth rates of 2.4 percent and 5.0 percent respectively. The threefold increase in the net food imports of North Africa/Middle East arose from accelerated food demand due to rising incomes, whereas the shift of Sub-Saharan Africa's food trade position is largely the result of the region's poor food production performance. Despite remarkable growth in food production in Latin America, increases in food demand induced by income growth have caused food imports to grow much faster than food exports. Net food exports declined by nearly 8 percent a year between 1961-65 and 1973-77.

LIVESTOCK AND POULTRY PRODUCTS

The output of livestock and poultry products in Third World countries has generally

Figure 1
Major food crop production and consumption in developing countries, 1966-77
 Million metric tons



Sources: Food and Agriculture Organization of the United Nations, "FAO Production Yearbook Tape, 1978," Rome, 1979; and Food and Agriculture Organization of the United Nations, "Global Agriculture Programming System Supply Utilization Accounts Tape," Rome, 1980.

Table 1—Foreign trade of major food staples in developing countries by region, 1961-65 and 1973-77

	(million metric tons)					
Asia	9.0	13.0	19.8	29.1	-10.8	-16.1
North Africa/ Middle East	1.4	1.1	5.0	11.6	-3.6	-10.6
Sub-Saharan Africa ^a	2.9	1.7	2.0	4.5	+0.9	-2.9
Latin America	10.0	15.3	6.3	13.9	+3.7	+1.4
Total	23.3	31.1	33.1	59.2	-9.8	-28.1

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

^a Exports minus imports.

increased at a faster rate than population. Between 1961-65 and 1973-77, the growth of production of meat, milk, and eggs averaged 3.3 percent, 2.6 percent, and 3.9 percent, respectively, compared to an average annual population growth of 2.4 percent. Growth in meat production outpaced population increases in all regions except Sub-Saharan Africa. On the other hand, increases in milk output lagged behind population growth in all regions except Latin America. The growth of milk production was particularly slow in Sub-Saharan Africa, where it expanded by only 1.5 percent a year. In the case of egg production, growth from the early 1960s to the mid-1970s was much higher than increases of population in all four regions, especially in North Africa/Middle East and Latin America, which showed average annual increases of 6.2 percent and 5.5 percent, respectively.

Pork and poultry production grew relatively faster than the output of other meats in Third World countries. The relative share of pork in meat production increased from 37 percent to 40 percent and that of poultry from 13 percent to 17 percent. Growth of pork production was particularly rapid in Asia and poultry output expanded rapidly in the other three regions, especially in North Africa/Middle East and Latin America, where their rela-

tive shares doubled during the period. The growth of milk production just slightly exceeded population growth in developing countries. The relative shares of milk sources remained largely the same for the Third World as a whole. Expanding buffalo milk output resulted in a significant decline in the relative share of cow milk in Asia, but this was offset by the increased shares of cow milk in the other three regions, especially North Africa/Middle East.

The consumption of livestock and poultry products in the Third World has been increasing rapidly, particularly in the oil-exporting economies. Between 1961-65 and 1973-77, annual meat and egg consumption increased by 3.4 percent and 4.0 percent—significantly faster than population growth. Growth in milk consumption was much slower (2.6 percent) but still slightly exceeded population increase. The North Africa/Middle East region had the most rapid increases in meat and egg consumption, whereas Latin America led other regions in the growth of milk consumption. Consumption growth rates, however, were less than the population increase for milk in Asia and for meat and milk in Sub-Saharan Africa.

The demand for poultry grew faster than for other meats in all developing

regions. Of the total increase in meat consumption from 1961-65 to 1973-77, poultry accounted for 40 percent in North Africa/Middle East, 35 percent in Latin America, 30 percent in Sub-Saharan Africa, and 20 percent in Asia. Because of the established importance of pork in Asia and of beef in Latin America, their shares in the increase of total meat consumption in these regions were still the highest.

Third World countries as a whole were net exporters of meat and net importers of eggs and milk products in 1973-77 (see Table 2). Net meat exports had, however, declined by half from the 0.9 million metric tons exported during the early 1960s. Net milk imports had increased from 4.9 to 9.4 million metric tons, and the trade position of eggs had shifted from surplus to deficit.

Between 1961-65 and 1973-77, the North Africa/Middle East region expanded its net meat imports almost fivefold, while Asia shifted from a marginal net meat exporter to a marginal importer. Latin America, which accounts for more than 60 percent of meat exports of Third World countries, had a slight decline in net exports. Sub-Saharan Africa was the only region whose meat trade position improved during the period, with its net

meat exports increasing by 35 percent. All four regions have been consistent net importers of milk products. From 1961-65 to 1973-77 net milk exports rose three-and-a-half times in North Africa/Middle East, two-and-a-half times in Sub-Saharan Africa, and about one-and-a-half times in Asia and Latin America. Net imports of milk products accounted for 7-8 percent of their domestic consumption in the developing countries. In the case of eggs, developing countries traditionally rely on domestic output to satisfy domestic demand. For the Third World as a whole, the net imports of eggs represent less than 1 percent of consumption. However, trade data show that net egg imports of the North Africa/Middle East region increased tenfold between 1961-65 and 1973-77 and accounted for more than 10 percent of domestic egg consumption in the 1970s.

FOOD SITUATION IN NORTH AFRICA/MIDDLE EAST

Program research in 1980 also examined closely the North Africa/Middle East food situation, which has changed dramatically in recent years. Sustained mainly by the in-

Table 2—Net trade of livestock and poultry products in the developing countries, 1961-65 and 1973-77 averages

	(1,000 metric tons)					
Asia	15	(16)	(2,004)	(3,186)	15	12
North Africa/ Middle East	(99)	(481)	(667)	(2,302)	(7)	(65)
Sub-Saharan Africa	68	92	(456)	(1,201)	(a)	(2)
Latin America	895	859	(1,810)	(2,729)	(1)	(6)
Total	879	454	(4,936)	(9,419)	8	(60)

Source: Food and Agriculture Organization of the United Nations, "Agriculture Towards 2000," Rome, 1979.

Note: Net trade refers to exports minus imports; net imports are enclosed in parentheses. Regional figures may not add to totals due to rounding.

^a Less than 500 metric tons.

fusion of oil revenues and earnings of migrant labor, rapidly rising demand has created widespread food shortages throughout the region, particularly among the oil- and labor-exporting countries. The regional oil exporters are Algeria, Iran, Iraq, Kuwait, Libya, Oman, and Saudi Arabia, whereas the labor exporters are Egypt, Jordan, Lebanon, the Yemen Arab Republic, and the People's Democratic Republic of Yemen. Characterized by a meager endowment of agricultural resources, the oil economies accounted for nearly two thirds of the regional food deficits in 1977.

Results of the study suggest that by the turn of the century the consumption of cereals and of livestock and poultry products will be three times greater than in 1975-77. Data show that between the early 1960s and the mid-1970s the average growth rate of output of major food crops (2.6 percent) barely kept pace with the population increase. Rapid increases were attained in the production of meat (3.5 percent) and eggs (6.2 percent), but milk output (2.3 percent) lagged behind population growth. In comparison, however, the corresponding growth rates in consumption showed a considerable rise in all of these commodities and resulted in a discernible upward trend in per capita food consumption throughout the region.

Aside from the effects of population growth, rapidly rising per capita incomes have caused considerable shifts in food consumption toward the preferred cereals and the highly income-elastic livestock and poultry products. The increased consumption of the latter commodities has in turn caused a substantial rise in the utilization of animal feed. Between 1961-65 and 1975-77 the use of major food crops for feed increased by 75 percent compared to 50 percent for direct human consumption.

With consumption outpacing domestic production, the food trade position of the region deteriorated rapidly, resulting in an increase of cereal imports from 5 million metric tons in the early 1960s to 13.4 mil-

lion metric tons during the mid-1970s. Particularly among the oil-exporting countries, grain imports increased four-fold. Similarly, imports of livestock and poultry products rose considerably.

Although the decline in the growth rate of food production in some countries of the region during the 1970s was possibly influenced by the higher cost of inputs due to the energy crisis and/or the loss in momentum of the "green revolution," the adverse effect of climatic conditions on production fluctuation and, consequently, on the size of the region's deficit remained formidable. In addition, just as the demand for poultry and livestock products was growing, grazing lands were dwindling due to the expansion of urbanization and rainfed cultivation.

Preliminary projections indicate that, if past trends continue, the North Africa/Middle East region will face deficits of 57 million metric tons in major food crops, 6.8 million metric tons in meat, 20 million metric tons in milk, and 0.5 million metric tons in eggs by the end of the century. Compared to 1977 levels, the projected food gaps will increase more than three-fold for major food crops, meat, and eggs, and fivefold for milk. Thus, self-sufficiency in these major food commodities appears highly unlikely, as rising demand continues to propel the region into a larger dependency on food imports. In order to attain food self-sufficiency, the output of major food crops would have to increase by about 5 percent a year, and the production of meat, milk, and eggs would require annual growth rates of 6.0, 4.7, and 6.6 percent, respectively.

CHINESE AGRICULTURAL STATISTICS

In 1981 work continued in collecting, checking, and systematizing national data series from 1949 to the present for the People's Republic of

China. Analysis of Chinese farmland data reveals the findings presented below.

As Figure 2 indicates, the total sown and cultivated areas have yet to reach 1957 levels. Some of the major causes of area decline are salinization, alkalization, and general soil depletion and erosion, which outstripped reclamation progress in several periods. Others are

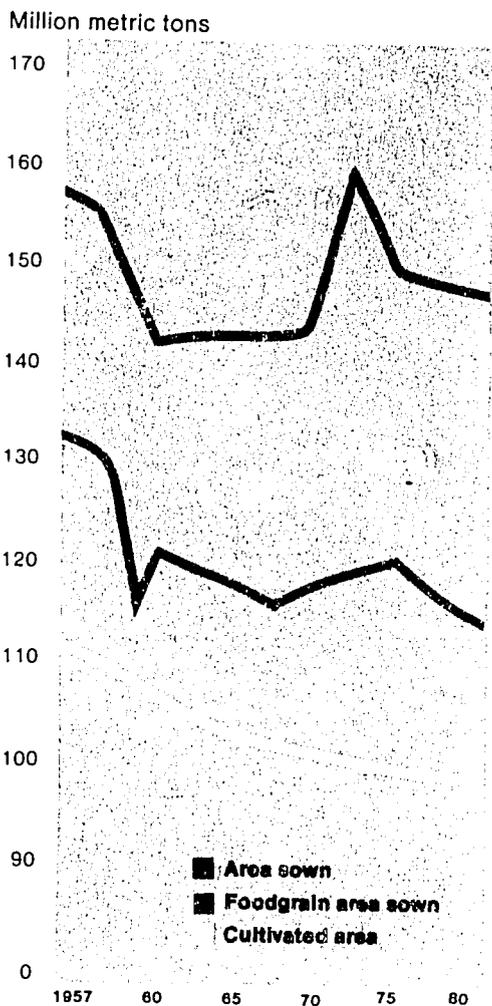
the displacement of farmlands by industry, commerce, and housing construction and the development of road, railroad, and irrigation networks.

Large declines began in both sown and cultivated area in the late 1950s. Multiple cropping recovered rapidly in the late 1960s and early 1970s, reaching a maximum in the 1975-78 period. Total sown area also rose rapidly in the early 1970s but in the second half of the decade declined to what it had been in the mid-1950s. Foodgrain sown area also declined markedly in the late 1950s and early 1960s. Current Chinese agricultural policy favors retiring marginal farmlands, relaxing multiple-cropping pressure, and shifting acreage away from grain toward croplands and pasture. This resulted in a fall of 5.3 million hectares (4.4 percent) in foodgrain sown area between 1978 and 1980. Recent satellite-based Chinese research suggests that official estimates of cultivated area and, therefore, total and foodgrain sown area are low, but the magnitude of the implied underestimation is open to question.

Some of the difficulties China has faced with soil deterioration have been particularly severe on the North China Plain. By 1962, of the roughly 20 million cultivated hectares in Hebei, Henan, and Shandong Provinces, the area designated saline had risen from 1.9 million hectares, the 1950s figure, to 3.2 million hectares. Other lands were retired from production altogether. This extreme deterioration was closely associated with massive, hasty, and poorly controlled irrigation projects on the Plain, especially in the Yellow and Huai River Basins during the Great Leap Forward (1958-59). Cultivated area today in these three provinces is roughly 75 percent of the 1957 level.

In the 1970s foodgrain production growth was rapid in these provinces, averaging 6 percent per year. This growth is strongly associated with antiwaterlogging and antisalinization efforts (reducing saline farmland to 1.4 million

Figure 2
Farmland in use in the People's Republic of China, 1957-79



Source: Reconstructed official Chinese figures.

hectares) and with rapid development of reservoir storage and tubewell irrigation over the last 15 years. Although the effect has been neither as drastic nor as immediate as during the Great Leap Forward, the tubewell and reservoir irrigation efforts have been similarly accompanied by saline deterioration. By the late 1970s, cultivated area designated saline in these three provinces had risen again to 1.9 million hectares, and soil salinity was increasing on 80 percent of saline farmland nationwide.

Among the environmental difficulties identified in a study of two proposed canals to transfer water from the Yangtze to the North China Plain, the most serious was salinization. This IFPRI study was part of an investigation of massive inter-basin water transfer in North China, sponsored by the Chinese Academy of Sciences, the United Nations University, and a number of cooperating universities and research institutions. The basic cost of each canal project was estimated conservatively to be twice the current state budget for capital construction in agriculture. Each canal extended more than 1,100 kilometers. The study concluded that even without a crash program to supply Yangtze water to North China and despite a slowdown in starting basic irrigation projects since the mid-1970s, the projected changes in the gap between supply and demand for food through most of the 1980s are likely to be small enough to be handled adequately by adjustments in internationally traded quantities. In the 1990s, however, the North China Plain is still likely to be a re-

gion of critical importance to aggregate food production growth in China.

Research indicates that water requirements for this effort may be mitigated by current cropping shifts and more careful attention to water management. Some of the supply may be provided by more intensive use of several surface resources and by improvements in flood storage facilities and procedures. Effectively irrigated area may increase in the 1980s if existing projects that are currently operating well below design capacity are completed. But the 1990s will call for a sizable complement of water supplies to improve quality and expand area of irrigation. Because these supplies must come from the Yangtze, the Yellow River, or underground sources, administrative and research priorities must be adjusted to reduce the risks and costs associated with using these resources. The exploitation limits of North China's massive and heavily used underground aquifers must be ascertained more accurately, and more effective means must be sought to control pumping. Measures of the volume of irrigation and water fee schedules should be established over broader areas. The risk of salinization on the North China Plain and Yellow River irrigation in general poses management and technical problems that must be addressed aggressively. Stronger administrative machinery for resolving conflicts between provincial governments and other institutions must be made. Finally, the system that collects, verifies, and analyzes local farm production and cost-function data must be improved.

FOOD PRODUCTION POLICY AND DEVELOPMENT STRATEGY PROGRAM

The research objective of the Food Production Policy and Development Strategy Program is to generate information about how to improve policies and strategies for food and agricultural production in developing nations. Three premises underlie the setting and design of research to meet this objective. First, the process of growth must be consciously guided to ensure maximum participation of the poor in its benefits. Second, the forces governing agricultural growth are complex, relating agriculture to other sectors. Third, technological change is central to the process of accelerating food and agricultural production. In order to generate conclusive evidence and conceptualize policy issues and development strategies on the basis of Third World realities, the program has been involved increasingly in regional research collaboration and dialogue with policymakers.

During 1981 members of the production program conducted research on 14 projects falling in three areas: specific production policies, development strategies, and linkages between agriculture and nonagricultural sectors.

In addition, researchers assisted other organizations in evaluating food policies and strategies. Work was conducted with IAD on the formulation of a labor-intensive agricultural development program in Bangladesh. An examination of agricultural research and extension pro-

grams in India was conducted at the request of the World Bank. Other collaboration with the Bank included developing a framework for monitoring and evaluating agricultural development projects in Liberia. The Mexican government's Sistema Alimentario Mexicano (SAM) requested the assistance of IFPRI staff in the planning of a government agricultural insurance scheme. IFPRI staff was also requested by ESCAP to review the production, consumption, and trade of coarse grains, pulses, and roots and tubers in the region.

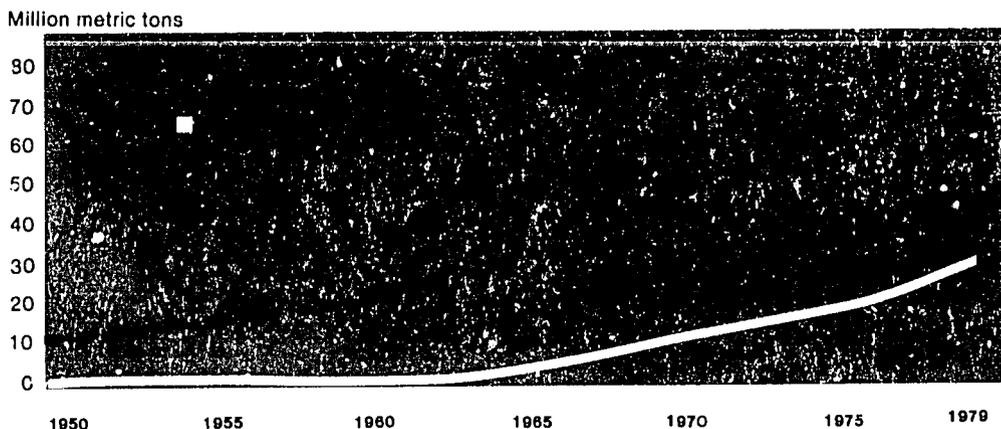
SPECIFIC PRODUCTION POLICIES

Research in this area was concentrated on four topics: fertilizer, irrigation, agricultural research, and crop insurance.

FERTILIZER

Research completed on fertilizer draws attention to the vast growth in developing countries' use of fertilizer and their performance in sustaining it (see Figure 3). Between 1950 and 1980, fertilizer consumption of these countries increased from about 1 to 32 million metric tons. This is impressive when considering that about 85 percent of the growth in the current consumption of the developed countries occurred only after the 1940s

Figure 3
Fertilizer consumption of developed and developing countries, 1950-79



Sources: The figures for 1950-75 are from International Fertilizer Development Center and United Nations Industrial Development Organization, *Fertilizer Manual* (Muscle Shoals, Ala.: IFDC, 1979), p. 8. The figures from 1976-79 are from Food and Agriculture Organization of the United Nations, *FAO Fertilizer Yearbook*, vol. 30 (Rome: FAO, 1981).

when their economies were already advanced and developing rapidly.

The need to sustain rapid growth in the fertilizer consumption of developing countries is underscored by various estimates of fertilizer requirements to achieve the need-based targets of agricultural production. For instance, according to FAO, the use of fertilizer in developing countries would have to grow to about five times what it is now by the year 2000 to raise their food production enough to reduce the effects of famine and malnutrition and accommodate the food demand arising from higher incomes.

Research under way on India and Nigeria and data from other countries indicate that a number of factors will be crucial in determining whether developing countries will be able to sustain the past rapid growth in fertilizer consumption. These are accelerated growth in fertilizer availability through developing-country production and excess supply in the developed countries; rapid development of efficient fertilizer distribution systems in developing countries; accelerated diffusion of fertilizer use by area and crops

within developing countries; rapid growth of irrigation; and breakthroughs in crop production technologies, particularly for crops and agroclimatic situations not covered by the available new technology.

IRRIGATION

Research on irrigation development and food production policies was conducted as part of a collaborative project on rice policies in Southeast Asia. A report on this project is included in the Regional Projects section.

AGRICULTURAL RESEARCH

Continued technological development is a key requirement for sustained growth in agricultural production in most developing countries. National and international research systems provide this new technology; however, many developing nations frequently fail to appreciate the crucial role of agricultural research.

During 1981 IFPRI, in collaboration with the International Service for National Agricultural Research, completed a preliminary paper on agricultural research

in the Third World. This paper, "Resource Allocations to National Agricultural Research: Trends in the 1970s," by Peter A. Oram and Vishva Bindlish, assesses the progress of the development of the agricultural research systems in the Third World during the last 10 years and identifies issues requiring further study.

The report, which presents data on about 80 developing countries, notes that there was substantial growth in many national agricultural research systems during the 1970s and that in about 50 comparable countries many more resources are being invested in national agricultural research systems now than a decade ago. It points out, however, that there is an uneven distribution of research resources in the Third World, with 90 percent of the expenditures and 85 percent of the scientists confined to 15 countries. It also notes that, although donor funding of agricultural research increased during the last decade, real support from several bilateral donors has declined since 1978. The report identifies a massive training and retraining need that could cost about \$4 billion.

Some questions identified for further study include: What are the main factors influencing the returns to research? What is the optimal size and reasonable degree of dispersion of a system? What are the scientific and technical manpower constraints? And how can data on national systems be collected, tabulated, and kept up to date? These questions will be addressed in future IFPRI research projects.

CROP INSURANCE

Agricultural production is typically a risky process in which farmers are confronted by numerous natural and economic sources of uncertainty. Much empirical evidence suggests that these risks can have important consequences for farmers' decisions and welfare, especially among small farms in developing countries. In order to reduce risks, farmers tend to use a broader mix of crops than they would in

the absence of risks, and they may be more reluctant to use modern inputs (such as fertilizer) or to adopt higher yielding crop varieties because of the increased risks associated with their use. Banks also tend to be less willing to supply credit to farmers confronting risky situations.

Crop insurance can spread agricultural 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.

During 1981, IFPRI research on price stabilization and crop insurance continued. It indicates that well-conceived insurance schemes promoting stable incomes may have far-reaching effects. Initial results from a joint project with IICA using a model of Guatemalan agriculture showed that insurance policies to stabilize bean revenues could significantly reduce farm income fluctuations and increase national bean production by about 5 percent.

Work began or continued on a number of other projects, including a collaborative effort with IICA on the economic evaluation of a crop insurance scheme in Panama and a collaboration with Mexican economists from SAM on the design of a risk-sharing program for farmers in the temporal, rainfed areas in Mexico.

With IICA, IFPRI sponsored a joint conference on Agricultural Risks, Insurance, and Credit in Latin America, held at IICA's headquarters in Costa Rica in early 1982. This conference was attended by researchers and policymakers from many Latin American countries.

DEVELOPMENT STRATEGIES

The rationale of development strategy research is based on the strategic importance of certain factors and issues in the reconciliation of

conflicting policy objectives and resource uses. Identification of such strategic areas with an improved understanding of their roles in promoting agricultural growth and equity is considered extremely productive and therefore useful in the formulation of policies for economic development. A number of projects of this nature currently are in progress.

GROWTH AND STABILITY

Providing stability in food production by relying on crop insurance schemes or buffer stocks can be costly. In some cases, encouraging stability through appropriate production strategies may be an attractive option. This requires improving our understanding of the relationship between rapid growth in agricultural production and year-to-year production fluctuations. In *Instability in Indian Agriculture in the Context of the New Technology*, Research Report 25, Shakuntla Mehra examines the processes that might reduce or increase instability in the production of various crops in various states of India. The analysis in the report considers all possible associations between technology and yield variance by comparing fluctuations in yield with and without the new crop technology under normal weather conditions.

The report indicates that the increase in the standard deviation and coefficient of variation of production was much more pronounced for foodgrains than for non-foodgrains, which is especially meaningful because most high-yielding varieties (HYVs) are foodgrain varieties, and foodgrain yields have increased far more than nonfoodgrain yields. Also, production variability was dominated by the variability of yield per unit of area, both before and after the new technology was introduced. Although an increase in the mean yield of foodgrains led to an increase in their yield variance, the rise in mean yield of nonfoodgrains led to a decrease in variance. Finally, area not only fluctuated less than yield, but area variability declined even when area increased.

Production variability, which tends to be dominated by yield variability, increased for all 18 crops examined except those with stagnant production—gram (chick-peas), tur (pigeon peas), and sesamum (sesame seeds)—or those that benefited from expansion of irrigation along with the spread of HYVs (rice and wheat).

For a number of other crops, several states had a significant increase in the standard deviation of yield while the mean yield stagnated. These appear to reflect the play of forces other than new technology in increasing the variance of yield. And yet a pattern emerges in this diversity when the irrigation base of these crops in different states is taken into account.

The study addresses the fact that irrigation has the effect of limiting the variance-increasing tendencies of new technology; however, it points out that irrigation, when accompanied by input intensification in the form of better seeds and a large application of fertilizer per unit of area, tends to aggravate the problem unless combined with a high degree of water control and management.

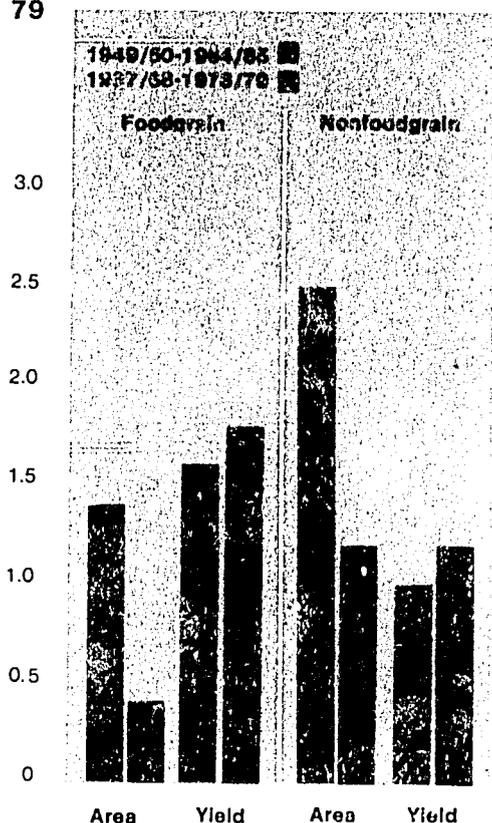
Further work on decomposition of total variance in production by sources and their interactions is in progress.

GROWTH AND EQUITY

The conflict between growth and equity has long been a dilemma to policymakers. IFPRI has attempted to learn by studying India's efforts to solve the dilemma. In *Growth and Equity: Policies and Implementation in Indian Agriculture*, J. S. Sarma reviews post-Independence agricultural policies as they evolved in India and analyzes their effects on agricultural growth and on interpersonal and inter-regional disparities.

The study concludes that, although achieving social justice has always been a goal of Indian policy, increasing agricultural production has been the primary emphasis. Following the adoption of the

Figure 4
Compound rates of growth of area under crops and of yields, in India, 1949/50-1964/65 and 1967/68-1978/79



Source: J. S. Sarma, *Growth and Equity: Policies and Implementation in Indian Agriculture*, Research Report 28 (Washington, D.C.: International Food Policy Research Institute, 1981), p. 19.

new technology in the mid-1960s, the rate of growth for foodgrains was 2.8 percent, with yield per hectare contributing more to growth than area (see Figure 4). The new technology encouraged productivity-based increases in food production but caused disparities to widen in the incomes of large and small farmers.

The study indicates that not only large farmers but small and marginal farmers (those with 2 hectares or less) can benefit from the new technology. Although they hold less than one fourth of the area, small and marginal farmers account for

one third of the area irrigated, fertilizer used, and institutional credit borrowed. In numbers, however, these farmers account for 70 percent of the holdings.

The report identifies the two most important causes of rural poverty as low agricultural productivity and a lack of adequate employment opportunities in the rural areas. Unless these two problems are tackled through appropriate agricultural policies and programs, no significant alleviation of rural poverty and unemployment is possible.

The report identifies some growth-oriented policies that adversely affect equity unless adequate precautions are taken. In the exploitation of groundwater, the larger farmers, with their better access to institutional finance and their greater political influence, preempt water, unless government-sponsored agencies undertake the construction and even operation of small irrigation projects (such as tubewells) and make the water available to small farmers on a priority basis. The conflict between growth and equity resulting from adoption of unrestricted and indiscriminate mechanization, particularly in a labor-abundant economy, is obvious. Even here selective mechanization can increase output without displacing labor. Lastly, a concentration of efforts in irrigated areas and promotion of yield-increasing technology through large farmers has the obvious advantage of creating large foodgrain surpluses, though they inevitably widen interregional and interpersonal disparities.

PUBLIC RESOURCE ALLOCATION TO AGRICULTURE

Government expenditures are used extensively to influence a country's agricultural sector. The composition of the government budget is one of the most significant reflections of a government's policies. In Research Report 23, *Government Expenditures on Agriculture in Latin America*, Victor Elías assembles data showing the size and composition of

government expenditures from 1950 to 1978 in nine Latin American countries: Argentina, Bolivia, Brazil, Chile, Costa Rica, Colombia, Mexico, Peru, and Venezuela. The report identifies expenditure policies for the agricultural sector, measures this in relation to the total government budget and agricultural output, analyzes the trend and variability of agricultural expenditures, and looks at some of the effects these expenditures have on agricultural production.

The report indicates that expenditures on agriculture rose sharply after 1964 in all countries except Argentina. This represented an average aggregate increase of 8 percent per year. However, the share of agriculture in the gross domestic product declined in all countries except Chile. The average share of government expenditures on agriculture in the total government budget was 5 percent, which was much smaller than that held by the education, health, transport, and communications sectors.

The study analyzes the determinants of government expenditure policy for agriculture by regression analysis. Three variables—the total government budget, the value added of agriculture (output), and gross domestic product (income)—account for about 90 percent of the changes in government expenditures on agriculture in the nine countries.

The report estimates that 10 percent of the growth in agriculture is explained by government expenditure policies. It suggests that there is a relationship between increased government expenditures and increased agricultural output for the period of study.

PRICE AND INCENTIVES POLICY

Encouraging agricultural production through pricing policies and incentives associated with technological advances continued to be a focus of research in the Food Production Policy and Development Strategy Program during 1981. Particular attention was given to studies on Bangladesh, Southeast Asia, and the Sahelian

region of Africa.

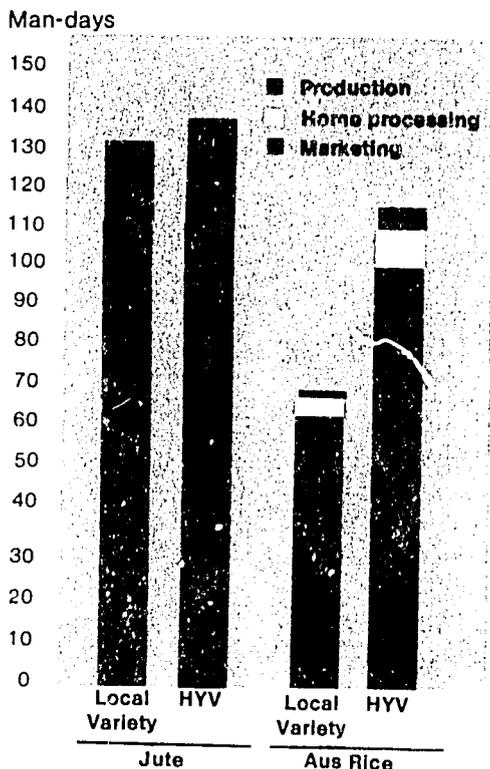
In a detailed study entitled *Agricultural Price Policies Under Complex Socio-economic and Natural Constraints: The Case of Bangladesh*, Research Report 27, Raisuddin Ahmed measures the effects of staple food prices on agricultural production and nonagricultural employment. The study indicates that although prices are important policy instruments, the emphases on prices, technology, infrastructure, institutions, and other elements of incentive structure must be balanced carefully, even if there are large socioeconomic and natural constraints.

The study considers a number of policy options. Withdrawing the export tax on raw jute—which accounts for about half of the value of the nation's exports—would raise farm jute prices 9-13 percent and thus would benefit long-run growth of agricultural production and employment. Production and marketing of jute are more labor-intensive than rice (see Figure 5). For every 10 percent increase in rice prices, rice production increases by 1.8-2.6 percent. If the price of rice, which is grown on about four fifths of the total cropped area, were set at the 1976/77 level relative to the 1976-79 average jute price, the rice-jute price relationship would be optimal.

The study concludes that about half of the production response to price incentives was realized through the response in the use of modern inputs, but the intensity of the use of inputs was influenced by the extent of various parts of the rural infrastructure. In an analysis of differences in fertilizer use between districts, for example, Ahmed finds that the appropriate interaction of paddy prices and improved technology, transportation and storage infrastructures, and other institutional and natural factors resulted in fertilizer use that was five times higher than if only the price of paddy was adjusted.

The study also examines the effects on the poor of raising foodgrain prices. It finds that when rice prices rise, the ability of the poor to substitute inferior grains

Figure 5
Employment generated by an acre of
land allocated to jute and to Aus rice,
Bangladesh, 1979



Source: Raisuddin Ahmed, *Agricultural Price Policies Under Complex Socioeconomic and Natural Constraints: The Case of Bangladesh*, Research Report 27 (Washington, D.C.: International Food Policy Research Institute, 1981), p. 60.

diminishes because prices of these substitutes rise faster than rice prices. In the long run low-income food consumption is less of a problem because wages eventually rise along with prices, although there is a time lag.

Finally, the study indicates that price policy measures for agricultural production in Bangladesh should be concentrated on developing marketing systems and rural infrastructures, supporting income through rural construction projects, and selectively choosing labor-intensive agricultural products for price

supports. These instruments and a judicious policy for importing foodgrains should be preferable to direct public marketing for price support.

Related research on credit policies and fertilizer subsidies in the Philippines completed in 1981 examined the effects of credit and fertilizer subsidies on input choices, production, and income, using a dynamic farm decisionmaking model. It finds that credit and fertilizer subsidies implemented between 1972 and 1978 induced a yield increase of 21-30 percent for a set of farms representative of those in Central Luzon. Research suggests that the effect of a fertilizer subsidy depends on the availability of credit. The greatest effect of the credit program is in releasing the credit constraint; the independent effect of interest rate reduction is small. This confirms the importance of increasing the quantity of credit to farmers so they can use modern inputs.

PRODUCT MIX AND PRODUCER INCENTIVES IN THE SAHEL

Continued work on product mix and producer incentives in the Sahel examined how producer incentives, including technological change in West African agriculture, affect competition for resources between food crops, cash crops, and nonagricultural activities.

Ox-powered cultivation techniques are frequently proposed innovations for the cash and food crop farms typical of the African Sahel. These techniques are common where a relatively high proportion of export crops such as cotton and peanuts are grown, yet most farmers in the Sahel continue to cultivate manually.

The results of this work, which compares insights from oxen farms in Mali to nonadopting farms in Upper Volta, show that oxen-driven technology may shift labor as well as save it. Small farms have difficulty overcoming the costs of labor and capital invested in maintaining a

plowing unit throughout the year. Results indicate that individual team ownership is particularly difficult on farms that specialize in the main subsistence food crops of the region, millet and sorghum. The best case for individual plow team ownership occurs where there is the possibility of expanding the area sown with cash crops, such as peanuts, cotton, and irrigated rice (the latter usually is sold in the Sahel). Nevertheless, whole-farm simulations suggest that even here innovations to boost labor productivity in peak periods are required if adoption is clearly to be profitable, because the opportunity cost of resources in nonagricultural pursuits is high.

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 sector, and demand linkages, which comprise farmers' demands for farm inputs and marketing and processing facilities and rural household demands for consumer goods and services.

Research has shown that the roles of these linkage mechanisms change during the process of economic development. In the lower-income stages of development, technologically induced increases in agricultural productivity can be a prime source of economic growth. Expanding agricultural output speeds up the process of farm commercialization and generates demands for outputs of other sectors. At the same time, agriculture can generate the capital surplus necessary for nonagricultural investments to meet those demands. As industrialization proceeds,

agriculture plays a diminishing role in providing a market for the products of the nonagricultural sector and the size of the work force available to agriculture eventually begins to decline, requiring labor-saving investments, such as mechanization, to increase the average productivity of labor.

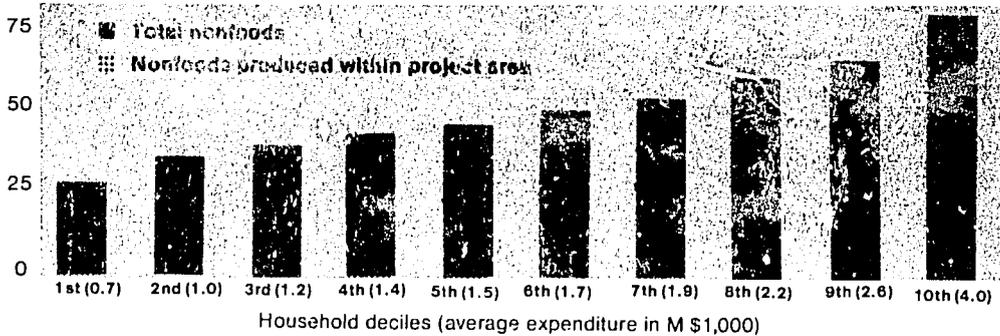
During 1981 IFPRI continued its major research effort on growth linkages, which involves field projects in Bangladesh and India and analysis of data from Argentina, Nigeria, and Malaysia.

Work on resource transfers comprises a series of historical (but quantitative) studies of the intersectoral resource flows that occur between agriculture and the rest of the economy during the process of economic growth. Research efforts are directed at clarifying the roles of agricultural investment and technological change in enhancing long-term, national economic growth by selecting countries at different levels of agricultural success. Research on sectoral growth in Argentina was continued and nearly completed using a conceptual framework previously applied to Japan.

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 only responsible for 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 was initiated in Tamil Nadu, India, to determine if similar results would occur under different social and economic conditions.

Research indicates that most of the multiplier effects seem to occur within the rural areas. They focus on such consumer-oriented sectors as transport,

Figure 6
Marginal budget shares for nonfood goods and services by farm household in
Muda irrigation project area, Malaysia, 1973
 Percent



Source: Calculations by Peter B. R. Hazell.

entertainment, health, and housing, which tend to be labor intensive and require only limited capital, thereby providing rounds of growth that are beneficial to the rural poor.

Although IFPRI recognizes the importance of a macroeconomic approach to the growth linkages issue, research has focused on the regional development of rural areas and on determining how government policy can be used to enhance secondary growth effects of increases in agricultural output in these areas. Projects to investigate three aspects of the rural linkage question continued during 1981.

Investments in infrastructure is one area of investigation. Work in Bangladesh is exploring the roles of such investments in an effort to determine the levels necessary for agricultural growth. Investments in irrigation, roads, and transport systems help increase agricultural productivity. Others in roads, banks, and markets are necessary to aid the flow of commerce without which the growth of the local economy is inhibited.

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. Research being conducted in Andhra Pradesh and Tamil Nadu, India, is addressing these issues.

Targeting investments to specific income groups is the final aspect of investigation. Ongoing work at IFPRI with farm household data from Malaysia and Nigeria shows that larger shares of incremental income are spent on locally produced nonfood goods and services as incomes increase (see Figure 6). Research suggests that because the demand for those goods and services creates the largest multiplier effects, a successful growth strategy led by agriculture may require a 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.

One of the complexities of aiding the rural poor directly is that they have consumption patterns that generate less employment as well as a greater propensity to consume food. When food supplies are tight, then redistributing income to the lower income groups may simply serve to raise food prices and reduce employment opportunities in the nonfarm sectors. On the other hand, rapid increases in agricultural output may serve to depress farm prices unless the lower-income group also benefits from increased incomes. The conflict between growth and equity is an important concern in IFPRI's growth linkage research.

FOOD CONSUMPTION AND NUTRITION POLICY PROGRAM

The overall objective of the Food Consumption and Nutrition Policy Program is to contribute to the knowledge and understanding of how selected public policy measures affect real incomes, food consumption, and nutrition of low-income households and their members. The strategy for reaching this objective includes the generation of new conceptual and empirical knowledge and the development and testing of innovative and sound methodological approaches.

Research emphasizes national policy issues, while focusing on low-income households. Studies are conducted in locations providing empirical results that can be applied in a more general framework. The impact of consumption and nutrition policies on such things as food production, agricultural sector incomes, employment, foreign exchange earnings, and cost effectiveness is also considered, often in collaboration with research efforts in the other Institute research programs.

During 1981 research efforts in the Food Consumption and Nutrition Policy Program were conducted in two areas: selected market intervention policies and technological change in agriculture.

EFFECTS OF SELECTED MARKET INTERVENTION POLICIES

In many developing countries policymakers are searching for ways to reach the poor through food

policies that do not affect foreign exchange levels, government spending, and domestic food production unacceptably. Work is aimed at achieving a better understanding of the principal processes and factors that determine the effects of various market intervention policies on the poor and enhancing existing knowledge relevant to policy. Also, work involved with the developing and testing of appropriate analytical methodologies is expected to facilitate future research.

FOOD PRICE SUBSIDIES IN EGYPT

The Government of Egypt operates an extensive government intervention program in food pricing and distribution. It is one of the largest schemes in any market-oriented economy. In a special study funded by the U.S. Agency for International Development, researchers in the Food Consumption and Nutrition Policy Program are analyzing Egyptian food price and rationing policies in a six-phase project.

The scheme is complex and has a number of types of outlets, prices, quotas, and regulations, many of which vary among commodities, geographical locations, and over time. During 1981 a descriptive analysis of the system was completed.

Some food commodities in Egypt are sold at three price levels: a highly subsidized price that carries quota restrictions, a less subsidized price with or without quotas, and an open-market price.

Wheat in the form of flour or bread is the only food commodity available to all

consumers in unlimited quantities at directly subsidized prices. Flour and bread prices are fixed uniformly by the government at a heavily subsidized level. Sugar, beans, lentils, tea, cooking oil, and rice are provided to approximately 90 percent of the population at low prices in fixed monthly quotas. For some commodities the quotas are determined on the basis of family size; for others, each household has access to the same amount regardless of size. Some households are excluded from participating in the scheme, but quotas do not differ among participants according to income. They vary between urban and rural areas and among governorates.

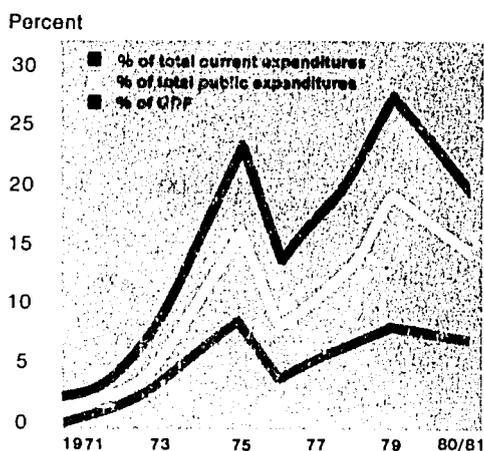
These commodities are also available at higher, less subsidized prices. Quantity restrictions vary among geographical locations and according to availability. As a general rule, the lower of the subsidized prices for a given commodity is about one third of the higher one.

Since 1975 the quantities of food commodities distributed at the lower subsidized price have been constant; however, increasing quantities have been distributed at the higher price. Thus, for sugar, distribution at the lower price fell from 47 percent of total public distribution in 1975 to 33 percent in 1980. In cooking oil the decrease was from 76 percent in 1975 to 61 percent in 1980. Both price levels for the commodities mentioned were constant from 1975 to 1981 in nominal terms but fell considerably in real terms.

Frozen meat, poultry, and fish are available at subsidized prices and at highly regulated open-market prices. Quantity restrictions exist, but their enforcement varies considerably.

The cost of food subsidies is increasing and is estimated at about U.S. \$1.5 billion for 1980/81. This accounts for 20 percent of the total government current expenditures and about 7 percent of the GDP (Figure 7). Information about the benefits of the subsidies and their distribution

Figure 7
Share of food subsidies in total Egyptian government current expenditures and gross domestic product, 1971-81



Source: Harold Alderman, Joachim von Braun, and Sakr Ahmed Sakr, *Egypt's Food Subsidy and Rationing System: A Description* (Washington, D.C.: International Food Policy Research Institute, forthcoming).

among population groups is scarce. Although attempts to target the scheme to the most needy have not been successful, it is clear that benefits to the absolute poor have been substantial. Also, the subsidies undoubtedly contributed to the fact that per capita calorie consumption in Egypt in 1977 exceeded that of any country with per capita income less than double that of Egypt and was exceeded by only three nations with incomes up to three times that of Egypt.

A number of unanswered questions regarding the implications of the Egyptian food price subsidies remain. Research is in progress to analyze the distribution of benefits and the impact on foreign trade, public finance, and domestic agriculture.

EFFECTS OF ALCOHOL PRODUCTION IN BRAZIL

Policies that effect changes in incomes and food prices may influence human nutrition. Work in the Food Consumption and Nutrition Policy Program is concerned with determining how households at risk

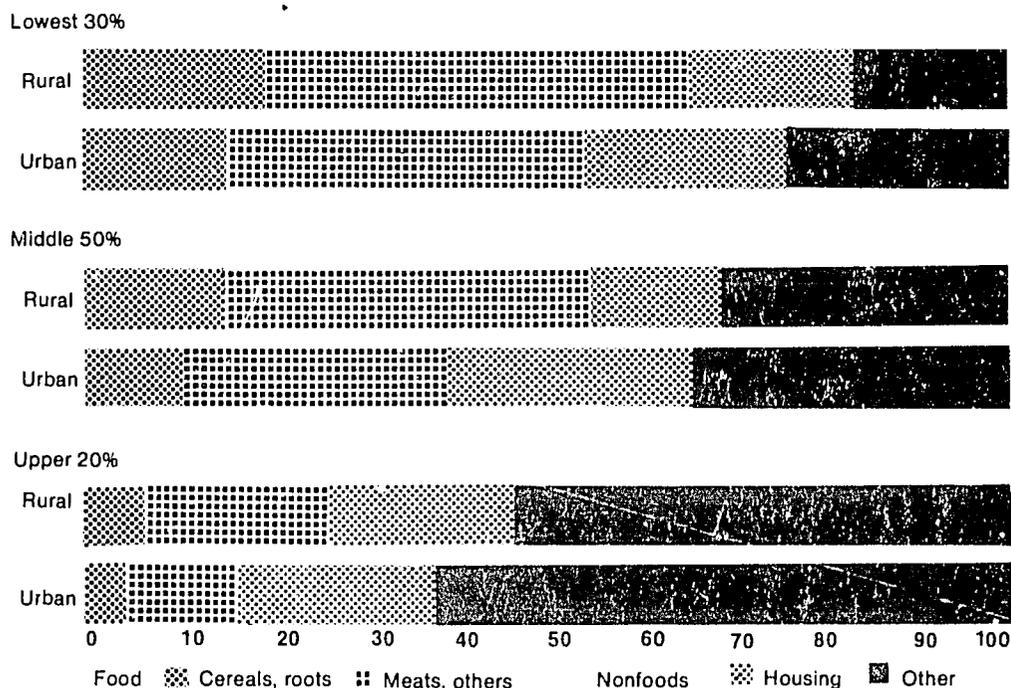
of malnourishment respond to price and income changes. This response is reflected in food consumption parameters disaggregated by population groups according to nutritional status or income level. A study completed in 1981 estimated such parameters for Brazil and illustrated their utility for policy analysis through a study of the effects on nutrition of alternative formulations of the Brazilian fuel alcohol program.

Study results indicate that the rural and urban poor spent 65 and 51 percent of their total incomes on food, respectively. Among nonfoods, housing accounted for a large budget share, particularly among the urban poor (Figure 8).

Income and price elasticities were estimated for various calorie sufficiency groups and income strata. Among the urban and rural poor, income elasticities

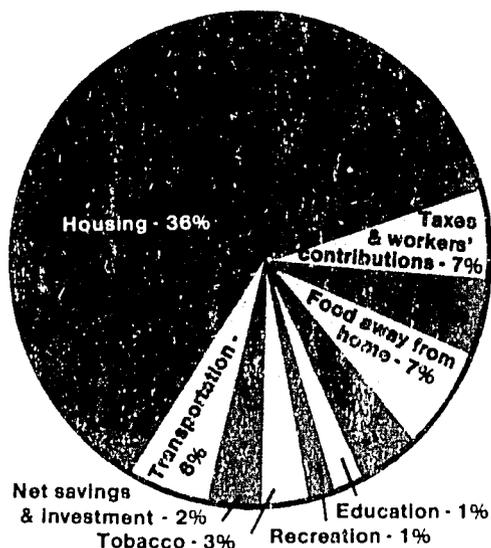
were high for cereals, dairy products, vegetables, and oils and fats and were negative for root crops and legumes. Overall income elasticities for calories were 0.28 for the urban poor, but a considerably higher 0.47 for the rural poor. The income elasticity for food expenditures among the urban poor was considerably higher than the income elasticities for calories because of shifts from lower to higher priced calories as incomes increased. Thus, among households with calorie-deficient members, higher priced calories were substituted for lower priced ones even at the expense of more calories. Income elasticities for nonfoods were high among the urban poor. However, due to low current expenditures on most of these items except housing, the marginal budget shares were low. For each additional dollar obtained, results indicated that the urban poor would spend 36 cents on housing and 19

Figure 8
Average Brazilian budget shares by income group



Source: Cheryl Williamson, *Disaggregated Food Consumption Parameters and Their Relevance for Policymaking in Brazil, With Emphasis on the Nutrition Effects of Alcohol Production* (Washington, D.C.: International Food Policy Research Institute, forthcoming).

Figure 9
Allocation of additional income by the urban poor in Brazil



Source: Cheryl Williamson, *Disaggregated Food Consumption Parameters and Their Relevance for Policymaking in Brazil, With Emphasis on the Nutrition Effects of Alcohol Production* (Washington, D.C.: International Food Policy Research Institute, forthcoming).

cents on food consumed in the home (Figure 9).

The study shows that the urban and rural poor are responsive to changes in food prices. A particularly strong price response was found for rice, indicating that targeted price subsidies for rice are likely to be effective in increasing calorie intake among the poor and malnourished.

Although the food production policies presently directed toward basic staples can contribute to the alleviation of malnutrition, present food consumption policies do not appear to be efficient in helping the poor improve their nutritional status. The commodities whose prices are generally subsidized tend to be consumed primarily by the well-nourished, upper-income population.

The study estimated the nutritional effects of food price and income changes resulting from alternate formulations of the alcohol program. Because the price

effect is a function of the foreign trade policies, two scenarios—free trade and a closed economy—were considered. Under the free-trade scenario it was assumed that the alcohol program would have no effect on food prices. Thus, the nutritional effects caused by changes in food prices referred to the closed-economy scenario only.

Two points emerge from this brief analysis. First, at current yields cassava-based ethanol production requires more land per liter of alcohol, but the opportunity cost of such land is significantly less than that of the land required for an equivalent output of sugarcane-based ethanol. Sugarcane production is more likely to displace food crops than cassava cultivation, leading to a greater rise in food prices and a more negative nutritional impact per liter ethanol produced. Displacement of rice production is more likely to have a negative nutritional impact than displacement of either maize or wheat.

Second, expanded alcohol production may expand rural incomes and decrease rural malnutrition. The critical determinants of employment creation and income generation are the location, the size characteristics, and the degree of mechanization of the farms producing the raw material. The program is likely to reach the greatest number of malnourished rural families if it includes small-scale producers as raw material suppliers. If the distilleries run their own farms, productivity might be higher, but employment is likely to decline. If such farms are mechanized, employment could drop by at least one half, and income generation and resulting nutritional benefits would drop accordingly.

It should be stressed that those likely to benefit from any income-generation effects of the alcohol program are families living in rural areas, whereas urban residents are most likely to be hurt by any increases in food prices resulting from the program. Thus, positive and negative effects may partially cancel out each other in the aggregate but are unlikely to

do so for the individuals involved. Unfortunately, more malnutrition seems to occur in urban areas, where any negative impacts are most likely to be felt.

COLLABORATIVE POLICY STUDIES

Research continued on two collaborative studies during 1981. Field work proceeded in Zambia on a project to assess the price and marketing policies for maize. Undertaken with Zambian institutions and funding from the Government of The Netherlands, the study centers on determining the factors that affect utilization of the food marketing and distributive services, which in turn affect real incomes, food consumption, and nutrition of low-income rural households.

In Bangladesh work continued in conjunction with the World Food Program on the Bangladesh Food-for-Work Project to assess the nutritional improvement for the poor resulting from changes in agricultural productivity and employment activities.

NUTRITION-RELATED POLICY RESEARCH: THE PRIORITIES

Other work completed in the Food Consumption and Nutrition Policy Program during 1981 identified priorities in nutrition-related policy research. At the request of the United Nations Administrative Coordinating Committee's Subcommittee on Nutrition, the available information on nutritional implications of government policies and programs was examined, and the principal gaps in the policy-related knowledge were located.

Four types of programs and policies were identified for future research: agricultural and rural development programs and policies; food price policies; income and food transfer programs; and integrated health and nutrition programs.

The primary goal of research in these areas should be to improve the un-

standing of how key factors and relationships influence the performance of various programs and program components within various socioeconomic and political environments. It should also suggest how such understanding may be used in the choice and design of effective programs and policies.

Four principal research issues that cut across the programs and policies were identified. These are: household food acquisition and nurturing behavior; food market behavior; program and policy implementation aspects; and economy-wide implications.

EFFECTS OF TECHNOLOGICAL CHANGE IN AGRICULTURE

Although considerable research has been done on the effects of technological change on income and asset distribution in the rural sector, very little is known about the effects of technological change on food consumption and nutrition among low-income households.

Decisionmakers in agricultural research concerned with technology-related policies who want to incorporate nutritional goals into planning and designing activities lack data, workable analytical approaches, and supplementary research on the topic.

Three projects were initiated during 1981 to develop a framework for estimating and assessing the effects of technological change on the consumption of calories and proteins in calorie-deficient households. One project is concerned with a staple food cash crop, one with a mixed food and nonfood cropping system, and one with a nonstaple food cash crop. Respectively these are the examination of an irrigation/double-cropping scheme for rice in Malaysia, a farm input and technical assistance scheme in Nigeria, and a technical assistance and marketing assistance scheme in India.

INTERNATIONAL FOOD TRADE AND FOOD SECURITY PROGRAM

The International Food Trade and Food Security Program evaluates the effects of trade and aid policies on food consumption 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.

The approach adopted by the program considers three conditions faced by developing countries. First, developing-country trade and exchange rate policies profoundly affect food consumption and agricultural production strategies. Second, the agricultural sectors of most developing countries greatly influence and are greatly influenced by their overall economies. Third, the world market plays a major part in determining domestic food strategies.

DEVELOPING- COUNTRY POLICY ISSUES

An increasing inability to meet consumption needs from domestic food supplies is the major food problem in developing countries. National food policies designed to improve production and consumption are hampered by general trade policies and balance-of-payments constraints. They are inextricably related to food import policies. In developing countries where agriculture is an important part of the general economy, there are many policies, both in and

out of the agricultural sector, that affect food consumption and agricultural growth.

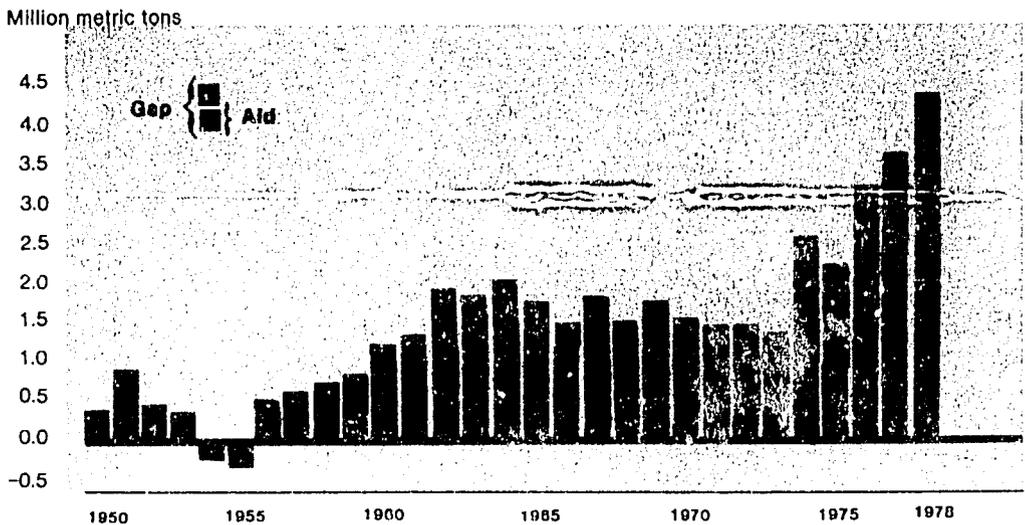
During 1981 research on developing-country systems examined issues of food security and self-sufficiency and trade. Studies were continued on food strategies in Egypt and India and their implications for import policies, stabilizing food supplies in the Sahel, and agricultural incentive and commercial policies in Colombia.

FOOD SECURITY AND SELF-SUFFICIENCY

IFPRI research was completed on cereal-import management in Egypt and on short-run food-supply management for food security in the Sahel. In addition, work began on supply management policies for wheat in India.

Government Policy and Food Imports: The Case of Wheat in Egypt, Research Report 29, by Grant Scobie, examines the growth of wheat imports in Egypt, where 70 percent of all wheat consumed is imported and where unlimited quantities of bread are made available to most of the population at extremely low prices. Wheat imports claim a major share of foreign exchange reserves and receipts, even though in some years a significant share has been provided as aid (see Figure 10). The study notes that the subsidies on wheat shelter consumers from much of the short-run variability in world wheat prices. However, long-run trends in world prices have influenced domestic prices, and during the period studied, a sustained 10 percent increase

Figure 10
Aid and the gap between production and consumption of wheat in Egypt, 1949-78



Source: Grant M. Scobie, *Government Policy and Food Imports: The Case of Wheat in Egypt*, Research Report 29 (Washington, D.C.: International Food Policy Research Institute, 1981), p. 25.

in world prices resulted in a 5 percent increase in domestic prices. Nevertheless, real consumer prices remained far below the cost of imported wheat.

Farm prices for wheat have also been insulated from variability in world price to some extent and have been consistently below world prices, but the degree of protection varies with Egypt's reliance on payments. To encourage import substitution, the farm prices for wheat and maize have been kept closer to the world prices than the prices of Egypt's export crops, rice and cotton. Therefore, policies to encourage grain production have reduced the output and exports of cotton.

In Egypt bread is subsidized to the extent that a rise in its price would drastically reduce the real incomes of poor Egyptians. The government has been reluctant to reduce wheat imports when foreign exchange receipts decline. For every change in foreign exchange receipts of one dollar, expenditures on wheat imports have changed only five cents. This means that Egypt would rather reduce the share of nonfood imports than

food imports. This has probably contributed to the slow growth of employment in the nonfood sector.

The study concludes that continued trends in consumer subsidies and producer taxes probably will have to be reevaluated, even though the present flow of exchange receipts permits increased wheat imports. Egypt's domestic wheat policies in the past were not implemented in isolation from the foreign sector. A closer alignment of producer and consumer prices to the cost of imported wheat would relieve the budgetary pressure of the subsidy scheme and lessen its destabilizing impact on the importation of other goods. The social and economic effects of a wheat policy more aligned to the true costs of consuming additional wheat could be alleviated in the long run by directing wheat subsidies to the poorest Egyptians and in the short run by using the compensatory food financial facility of the International Monetary Fund (IMF). Such a strategy would adhere to the "open door" economic policies the country has been fostering since the mid-1970s.

model simulations indicate the demand for wheat that the grain management system of India is likely to make on world supplies.

There is an important difference in the way this study and the Egyptian study treat the foreign exchange variable. Because the cost of food imports is a large part of Egypt's total import bill, the Egyptian study treats the balance-of-payment adjustment as an endogenous variable, whereas the Indian study treats it as an exogenous variable. Both studies stress that the adjustment process is simultaneous so that food imports are related to domestic production and consumption policies. Both follow the workings of the adjustment mechanism in the domestic wheat economy when faced with exogenous shocks. For Egypt these shocks are changes in wheat import prices and changes in the supply of foreign exchange. For India the major shocks studied are drought and the shortage of foreign exchange.

Another study on food security examines alternatives for stabilizing food supplies in the Sahelian countries. *Food Security in the Sahel: Variable Import Levy, Grain Reserves, and Foreign Exchange Assistance*, Research Report 26, by John McIntire, compares the costs and stabilization effects of the three approaches named in the title when ample foreign exchange or financial assistance is available and when a foreign exchange constraint limits cereal imports to no more than 10 percent of the trend food import bill. The study finds that, if there were no financial constraint, the coastal countries—the Gambia, Mauritania, and Senegal—could stabilize consumption by using only an import levy. As a result of transport constraints, the interior countries—Chad, Mali, and Niger—could experience consumption shortfalls if no stocks were held, even with adequate financing.

With no financial assistance available, the probability of consumption shortfalls increases dramatically for all countries,

even if as much as 20 percent of trend consumption is held as a grain reserve.

This research does not substantiate the claim that reserves help conserve foreign exchange. The costs in foreign exchange of importing grain to maintain large reserves are higher than those of financial assistance schemes. McIntire recommends a judicious combination of variable import levy, foreign exchange assistance, and grain reserves for the Sahelian countries.

The International Food Trade and Food Security Program continued its portion of the research for the Rice Policies in Southeast Asia Project. The trade component of this work is concerned with the short-run management of the rice supply through trade policies and changes in stocks. Results are discussed in the Regional Projects section.

During 1981 work was also conducted at the request of IICA on the nature of food security in Latin America. Six areas for regional cooperation were identified. These include international credit for investment in irrigation, agricultural research and diffusion of new technology, support of the IMF food financial facility, food aid for the Caribbean and Central America, political initiatives to block potential export embargoes by major cereal exporters, and physical and financial infrastructure improvements to promote food trade in Latin America.

GOVERNMENT INTERVENTION IN TRADE

Sometimes, even in countries where food production can assure stable consumption, the desire to encourage import substitution to promote self-sufficiency leads to policies that implicitly tax export activities. *The Effects of Exchange Rates and Commercial Policy on Agricultural Incentives in Colombia: 1953-1978*, Research Report 24, by Jorge García García, traces the effects on agriculture of tariffs, severe import restrictions, an overvalued national

currency, and export subsidies.

The study notes that a tariff on imports affects exports, either by raising prices of imports and domestic goods or by lowering the exchange rate. This analysis shows that 90 percent of a tariff on imports falls on exporters. On the whole, incentives for exports failed to compensate for the tariffs on imports. Agricultural exports such as bananas, coffee, cotton, tobacco, and flowers, which often are labor intensive, were discouraged. When the emphasis shifted to export promotion after 1970, the performance of agriculture greatly improved, thus indicating that the general equilibrium implications of a policy should be considered in addition to the policy's direct effects.

INTERNATIONAL POLICY ISSUES

Because food deficits must be filled by imports, solutions to food supply problems in developing countries have international overtones. Schemes to stabilize world prices can lessen the impact of fluctuating import prices, and a system that provides financial resources to purchase needed imports can greatly benefit developing countries.

There are no simple solutions, however. Stable prices can lead to a reduction in carryover stocks, and even if financial resources to purchase imports are available, imports might be unavailable when they are most needed.

The International Food Trade and Food Security Program has assessed some of the options for food security and trade reforms. Some of the program's studies are specifically concerned with a food financial facility, food aid, and the world wheat and rice markets.

FOOD SECURITY

Research in the area of food security focuses on assessing the nature and

magnitude of food insecurity in developing countries and the role international approaches play in alleviating it. During 1981 *Food Security for Developing Countries*, edited by Alberto Valdés, was published by Westview Press. This book was the result of an international conference sponsored by IFPRI and CIMMYT on the topic. The book attempts to clarify the issue of food security, identify sources of insecurity, and assess the magnitude of the problem in Asia, Africa, the Middle East, and Latin America. It explores some international and national solutions.

Food Financing Facility. The economic justification for creating an international facility for financing food imports has been debated frequently in recent years. A special study on financial arrangements for food security, funded by the Rockefeller Foundation and undertaken by researchers from IFPRI, the World Bank, and the University of Chicago, was completed in 1981. It examines different approaches for implementing such a facility and assesses the merits and possible consequences of the facility adopted by the IMF in 1981. The study also suggests complementary steps to help stabilize consumption.

The simulation experiments for this research show that food consumption stability will increase if countries have access to the IMF financial facility, whether or not they try to attain food security. However, if a country does not insulate its internal food price from fluctuations in the international price and gives low priority to food imports in its foreign exchange allocation, some food insecurity will persist even if the country has access to a financial facility. These results show how much the effectiveness of the facility depends on the policies for food security pursued by governments.

When cereals are scarce worldwide, the increase in imports financed by the facility will be small relative to the volume of international trade. But at such times the ratio of world stocks to demand will probably be low, and the shock of an

additional 10-20 million metric tons of demand could affect prices noticeably. In most years, however, neither the size of stocks nor demand is likely to shift much, and the effect on world prices will be small. For individual countries receiving assistance, however, the additional imports can be significant.

Food Aid. To better understand how food aid can help finance food import requirements of developing countries with foreign exchange constraints, IFPRI undertook a study of cereal food aid flows. A food aid data base was created covering cereal food aid shipments from the United States, Canada, Australia, and the European Economic Community (EC) between 1955 and 1978. It contains annual volume data for each recipient developing country, indicating the cereal and the donor and whether it was grant or concessional aid. This data base is now available to outside users at cost.

The results show the striking decline in total cereal food aid from 11.5 million metric tons in 1961-63 to 6.9 million metric tons in 1976-78. (These figures do not include bulgur, rolled wheat, or blended products.) In contrast, commercial cereal imports increased threefold in the same period, from 19 to 58 million metric tons. Whereas cereal food aid accounted for nearly 40 percent of total imports in the 1950s, it is now about 10 percent and still declining.

Yet food aid is increasingly important to some countries, particularly in Sub-Saharan Africa. Of 39 countries in that region, 12 depended on cereal imports for more than 10 percent of total staple consumption in 1976-78, and 8 of the 12 required food aid in amounts ranging from 6 to 21 percent of total cereal imports. Food aid dependence increased during the past two decades for another 16 countries, though imports accounted for less than 10 percent of total staple consumption. Most aid was given as grants to meet emergencies and thus was vital for sustaining minimum nutritional standards. Concessional aid could increase in the coming decade if countries

need additional imports to satisfy growing demand and do not have enough foreign exchange to finance these imports on commercial terms.

In addition to compiling the volume data series, the grant element of concessional aid was calculated and subtracted from the total value of concessional aid, giving the true cost of cereal food aid to recipient countries. The cost of commercial cereal imports was calculated and added to the true cost of cereal food aid, giving the true cost of cereal imports. These data have made it possible to study relations between food aid flows and other economic and social welfare indicators. For example, a comparison of the true cost of cereal imports with the real value of export earnings shows that in 9 of 21 large-volume importing countries the share of cereal imports in total exports has increased.

In projections to 1990, trend export earnings for individual countries are compared with total cereal import requirements. To determine the size of the food aid requirement in a normal year by 1990, it was assumed that concessional financing or grant aid would be needed only when the value of import requirements exceeded 5 percent of earned foreign exchange. The amount of food aid required can be determined by comparing the value of the total import requirement under each of three projected demand scenarios of export earnings. Under market-oriented demand scenarios, eligible developing countries would require an average of 14 million metric tons, but under a nutrition-based demand scenario, the amount rises to 34 million metric tons. Bangladesh, India, and Sub-Saharan Africa account for most of the difference.

Food aid channeled to poor families can supplement income and be a temporary source of additional calories, providing immediate nutritional benefits to the poor and adding to the longer-run development potential of the recipient country. But in many countries, particu-

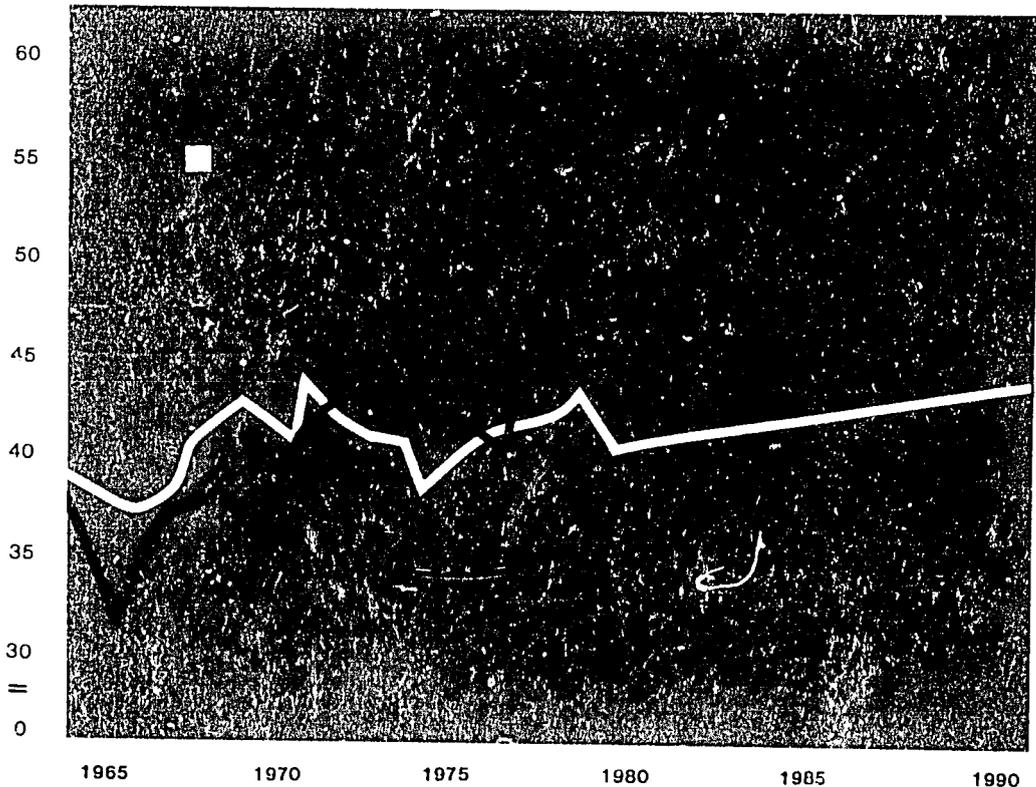
larly in Africa, institutions must be developed to use food aid effectively before supplies are significantly increased.

IFPRI staff also participated in research in the food aid area at the request of the U.S. National Research Council's Subcommittee on Nutritional Analysis. Work centered on how PL 480 Title II food aid (donated food) can be used more effectively to combat hunger and poverty in developing countries. Most food under the Title II provision is distributed by private relief agencies. The budget for the program is currently \$750 million. Preliminary results indicate that the value of the food to the recipients could be increased by 50 percent if changes were made in the kind of food distributed.

World Grain Markets: Wheat and Rice. The growth of wheat production in the EC countries surpassed all projections in the 1960s and 1970s, while consumption grew more slowly (see Figure 11). Research completed in 1981 investigating the future role of the EC in grain trade, especially from the point of view of its effects on developing countries, indicates that the EC will be an increasingly important grain exporter. If continued, its present grain policy is likely to lead to a trade surplus in cereals (wheat, maize, barley, and oats) of about 13 million metric tons in 1980. This increase in net trade could, among other things, compensate for the increasing grain deficit of Sub-Saharan Africa.

Figure 11
Production and consumption of wheat by the European Community, 1965-90

1,000 metric tons



Source: Food and Agriculture Organization of the United Nations, *FAO Production Yearbook*, vols. 19-34 (Rome: FAO, 1966-81).

EC grain policy is often criticized for its high trade barriers. This study shows, however, that although liberalization would help most developed and developing-country exporters, it would reduce EC grain production considerably. The production stimulus to the rest of the world would not compensate for the decline. Tentative results indicate that total world production would decrease about 1 percent. This could raise import prices for grain in food-deficit developing countries.

The grain trade and stocks policies of the EC need to be better integrated with the world grain economy. Present policies discourage private stockholding, and public stocks do not respond to changes in total world production. This study includes a proposal to use private stockholders to facilitate this integration.

The study also indicates that there is no functional relationship between EC meat production and feed consumption. This suggests that efforts to project the feedgrain demand of developing countries may be misleading. Europeans feed grain rather than cassava or soya to livestock because it is more cost efficient for them. But cassava, the most important cereal substitute, is competitive as livestock feed when its price is 20 percent lower than the price of feedgrains. Because freight rates increase the import prices for grain in Asia and Africa to more than 20 percent above export prices in Canada, the United States, and the EC, it may not pay to feed grain to livestock in grain-importing countries.

Work on the highly unstable world rice market was also continued in 1981. It has involved using a world rice trade model to search for an equilibrating mechanism in a market where most countries insulate domestic prices from international prices. An examination of data between 1961 and 1978 indicates that only a handful of countries, most of them exporters, respond to world market price changes by varying their import or export volumes. Generally, a \$100 per ton in-

crease in price resulted in an additional 1 million metric tons of net exports, with just over half coming from the People's Republic of China, the United States, and Japan. Total rice production is about 230 million metric tons, with traded volume being about 10 million metric tons.

The question worth answering is not what are the causes of instability, but rather what are the causes of the stability of the market? The answer has to do with the decision by most of the governments in this market not to rely on it much because of its fragility. The response of the volume of imports to domestic supply shortfalls has generally been slight—the marginal ratio seldom exceeds 0.5—particularly for the major producing and consuming countries in South and Southeast Asia. India's marginal ratio, for example, is about 0.

TRADE REFORM

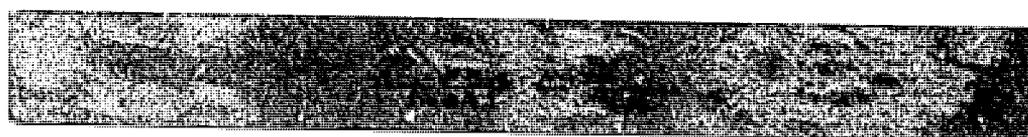
Developing countries may see EC trade preferences for developing countries as an alternative to trade liberalization. Little is known, however, about the specific effects of trade preferences. An IFPRI case study of sugar in 1981 indicates that EC protection depresses world sugar prices by about 12 percent. Because many developing countries are sugar exporters, they are hurt by this. However, for the African, Caribbean, and Pacific countries under the Lomé Convention, this harm may be outweighed by the special trade preferences given to them. A comparison of per capita incomes and transfer effects shows that these transfers do not respond to any objective of development policy. The preferred countries, except for India, stand to gain more than they lose, but the distributional effects are arbitrary.

Historically, Latin American agricultural imports have been low, while agricultural exports have contributed significantly to Latin America's export income (see Table 4). Other research in the trade liberalization area studied the cost to Latin America of agricultural pro-

tection in Organization of Economic Co-operation and Development (OECD) countries. The study identifies the products with significant potential for Latin American countries and the OECD countries that would experience the major increases in imports (and exports) in those products after liberalization. The effects of liberalizing trade in one commodity on related

products have been studied also, using oilseeds and derivatives as an example. A methodology was developed to examine on a country basis the policy-induced supply and demand shifts and their interdependence. The model accounts for interdependence while giving special attention to commodities at different levels of processing.

Table 4
Agricultural trade as a percentage of total trade for Latin American countries, 1969/70 and 1977/78



	(percent)			
Argentina	84.8	71.3	8.0	6.6
Brazil	75.0	57.4	11.8	8.7
Chile	3.2	9.6	20.2	17.2
Colombia	79.3	81.5	10.8	12.1
Costa Rica	79.2	74.1	10.8	8.6
Dominican Republic	87.3	69.2	15.1	16.0
Ecuador	93.1	48.3	8.7	7.2
El Salvador	65.8	74.9	15.6	9.8
Guatemala	71.8	79.1	10.8	7.1
Mexico	53.0	32.4	7.8	14.4
Peru	17.0	24.4	21.7	16.8
Venezuela	1.2	1.0	12.6	12.9

Source: Alberto Valdés, "Agricultural Protection in OECD Countries: Its Cost to Latin America," paper prepared for the meetings of the Econometric Society of Latin America, Rio de Janeiro, July 14-17, 1981.

REGIONAL PROJECTS

RICE POLICIES IN SOUTHEAST ASIA PROJECT

Since 1979 IFPRI has been studying government policies on rice and how they affect rice production, consumption, price, and trade in four countries of Southeast Asia: Indonesia, Malaysia, the Philippines, and Thailand. This has been a joint effort with the International Rice Research Institute, the International Fertilizer Development Center, and cooperating institutions in the four countries.

Researchers from three of IFPRI's four programs are involved in research on rice policy. One focus is on short-run supply management issues, in particular, the choice between stock movements and trade volume changes to counter fluctuations of rice supplies.

A study for the Philippines compares reserve stocks pegged at different levels. It also considers variations of imports as policy instruments. As the Philippines is a small net trader in the world rice market, combining a small reserve stock of about 150,000-300,000 metric tons (domestic production is about 6 million metric tons) with variations of imports appears to be the best approach to attaining food security. In contrast an import constraint suggests that Indonesia should adopt a different approach. A working paper, *Rice Buffer Stocks for Indonesia: A First Approximation*, by Douglas D. Hedley, released in 1981, concludes that a large reserve stock of 3 million metric tons (domestic production is 20 million metric tons) may be desirable.

A natural follow-up to these studies is to derive an optimal storage rule, which would set the optimal storage level for a particular year, given information about the supply situation in that year. This would be a particularly valuable tool for countries such as Indonesia that can expect to store large amounts of grain. A research effort has been launched with researchers from the Indonesian National Logistics Agency to study this problem.

A second area of study to be conducted in the Philippines and Indonesia will examine how the public sector affects rice procurement and storage during any given season. The hypothesis is that as the gap between the floor and ceiling prices is narrowed by government policy, the burden thrown on government agencies to carry stocks will grow heavier.

Parallel studies are under way in the Philippines, Indonesia, and Thailand to assess the effect of irrigation on the distribution of farm earnings among producers and among factors of production. Preliminary results from the Philippine study indicate that irrigation increases the payments to all factors of production, but that the increase in payments to fixed capital (primarily land) is slightly higher than the increase in payments to labor and management. Thus the relative income share of labor is somewhat lower for irrigated rice than for rainfed rice, but the absolute income of labor is substantially higher. These studies will also attempt to determine whether different types of irrigation systems have different effects on productivity and the distribution of farm earnings.

1981 PUBLICATIONS

RESEARCH REPORTS

Research Report 22

Estimates of Soviet Grain Imports in 1980-85: Alternative Approaches, by Padma Desai, February 1981.

Research Report 23

Government Expenditures on Agriculture in Latin America, by Victor J. Elías, May 1981.

Research Report 24

The Effects of Exchange Rates and Commercial Policy on Agricultural Incentives in Colombia: 1953-1978, by Jorge García García, June 1981.

Research Report 25

Instability in Indian Agriculture in the Context of the New Technology, by Shakuntla Mehra, July 1981.

Research Report 26

Food Security in the Sahel: Variable Import Levy, Grain Reserves, and Foreign Exchange Assistance, by John McIntire, September 1981.

Research Report 27

Agricultural Price Policies Under Complex Socioeconomic and Natural Constraints: The Case of Bangladesh, by Raisuddin Ahmed, October 1981.

Research Report 28

Growth and Equity: Policies and Implementation in Indian Agriculture, by J. S. Sarma, November 1981.

Research Report 29

Government Policy and Food Imports: The Case of Wheat in Egypt, by Grant M. Scobie, December 1981.

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- Hazell, Peter B. R. (With C. L. G. Bell) "Measuring the Indirect Effects of an Agricultural Investment Project on Its Surrounding Region." Reprinted from the *American Journal of Agricultural Economics* 62 (February 1980): 75-86.
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- _____. "Energy Cropping." Reprinted from *Mazingira* 5 (1981): 60-69.
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- _____. "Introducing Nutritional Considerations Into Agricultural and Rural Development." A paper prepared for the Administrative Coordinating Committee Subcommittee on Nutrition, United Nations, July 20, 1981.
- _____. "Ex Ante Assessment of Consumption and Nutrition Effects of Agricultural Research." In *Evaluation of Agricultural Research*. Edited by Walter L. Fishel et al. Minneapolis: University of Minnesota, Agricultural Experiment Station, 1981.
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- Huddleston, Barbara. "World Food Security and a New International Wheat Agreement." Presented at a meeting of the National Planning Association, Food and Agriculture Committee, Des Moines, Iowa, October 8-9, 1981.
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- _____. "AID and the Challenge of World Hunger." Presented at the annual meeting of the Board for International Food and Agricultural Development, Washington, D.C., May 28, 1981.
- _____. "World Food Prospects and the United States." Testimony on world hunger before the U.S. House of Representatives, Agriculture Committee, Washington, D.C., July 22, 1981.
- _____. "Third World Development: Food, Employment and Growth Interactions." Presented at the Allied Social Science Associations Annual Meeting, Washington, D.C., December 28, 1981.
- Mundlak, Yair. (With Domingo Cavallo) "An Econometric Approach to Sectoral Growth: The Case of Argentina." Presented to the Econometric Society in Latin America, Rio de Janeiro, July 14-17, 1981.
- Oram, Peter. "The Economic Cost of Climatic Variation." Presented to the Rank Prize Fund Symposium on Food, Nutrition, and Climate, England, April 5-9, 1981.
- _____. "Recurrent Cost Problems of Agricultural Research and Extension in Developing Countries." Presented at the OECD/DAC workshop on Linkages Between Agricultural Research and Farmers in Developing Countries, Paris, May 9, 1981.
- Pinstrup-Andersen, Per. "Food Policy, Household Behavior and Nutrition." Presented at the Agricultural Economics Society of Southeast Asia, Fourth Biennial Conference, Singapore, November 3-7, 1981.
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- Stone, Bruce. "Issues in Soil Fertility Maintenance in the 1980s." Presented at a workshop on Agriculture and Rural Development in China Today: Implications for the 1980s, Ithaca, N.Y., Cornell University, April 3-9, 1981.
- Valdés, Alberto. "Agricultural Protection in OECD Countries: Its Cost to Latin America." Presented at the annual meeting of the Econometric Society of Latin America, Rio de Janeiro, July 14-17, 1981.
- . "The Scope for Regional Cooperation Towards Food Security in Latin America" (Perspectivas de Cooperación Internacional en Seguridad Alimentaria en América Latina). Prepared for the annual meeting of the Inter-American Board of Agriculture, Inter-American Institute for Cooperation on Agriculture (IICA), Buenos Aires, August 10-13, 1981.
- . "Instability in World Food Trade and its Impact on Food Security for Poor Countries" (Seguridad Alimentaria, Comercio Internacional en Productos Agrícolas y Abstecimiento de Alimentos en Países Subdesarrollados). Presented at the sixth annual meeting of the Argentine Association of Agricultural Economists, Salta, Argentina, October 1981.
- . (With Grant M. Scobie) "Food Imports, Government Policy, and the Balance of Payments: The Case of Wheat in Egypt." Prepared for a seminar of the U.S. Department of Agriculture Trade Research Consortium, Washington, D.C., June 24-26, 1981.
- . "Food Security for Developing Countries: The Scope for International Cooperation." Presented at the joint UNITAR/EDI Seminar on Economic Development and its International Setting, the World Bank, Washington, D.C., March 15, 1981.

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FINANCIAL STATEMENT

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

BALANCE SHEET as at December 31, 1981 and 1980

	<u>1981</u>	<u>1980</u>
ASSETS		
Current Assets:		
Cash and short-term investments	\$135,152	\$ 11,946
Accounts receivable	52,276	42,955
Employee and other receivables	28,704	25,094
Contracts-in-process	49,274	-0-
Prepaid expense and advances	74,634	11,910
	<u>340,040</u>	<u>91,905</u>
Property and Equipment:		
Furniture and equipment	228,729	196,088
Leasehold improvements	30,317	26,716
Library	-0-	2,080
	<u>259,046</u>	<u>224,884</u>
Less — accumulated depreciation and amortization	167,134	134,730
	<u>91,912</u>	<u>90,154</u>
TOTAL ASSETS	<u>\$431,952</u>	<u>\$182,059</u>

LIABILITIES AND FUND BALANCE

Current Liabilities:		
Accounts payable and accrued expenses	\$119,981	\$164,578
Advance payment of grant funds	190,295	-0-
	<u>310,276</u>	<u>164,578</u>
Fund Balance	<u>121,676</u>	<u>17,481</u>
TOTAL LIABILITIES AND FUND BALANCE	<u>\$431,952</u>	<u>\$182,059</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, 1981 and 1980

	<u>1981</u>	<u>1980</u>
Revenues:		
Grants	\$2,754,188	\$2,375,764
Contracts	412,467	-0-
Investment, expense reimbursement and other income	<u>111,683</u>	<u>83,801</u>
	<u>\$3,278,338</u>	<u>\$2,459,565</u>
Expenses:		
Personnel:		
Salaries	1,526,652	1,219,076
Consultants	<u>282,091</u>	<u>161,838</u>
	1,808,743	1,380,914
Personnel Related Costs:		
Employee benefits	329,901	287,150
Recruitment and relocation	46,094	34,910
Travel	<u>241,670</u>	<u>170,693</u>
	617,665	492,753
Communication & Computer Services	317,895	230,862
Office Operation & Administration:		
Depreciation	34,484	38,996
Equipment rental	27,103	25,697
Office and other operating expenses	82,813	42,783
Professional fees	30,304	27,544
Rent	160,768	118,019
Telephone and telegraph	39,482	33,702
Temporary and clerical services	15,225	30,656
Trustees expenses	<u>59,661</u>	<u>44,651</u>
	429,840	362,048
	<u>3,174,143</u>	<u>2,466,577</u>
Excess of Revenue Over Expenses	104,195	(7,012)
Fund Balance, Beginning	<u>17,481</u>	<u>24,493</u>
FUND BALANCE, ENDING	<u>\$ 121,676</u>	<u>\$ 17,481</u>

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

STATEMENT OF CHANGES IN FINANCIAL POSITION For the Years Ended December 31, 1981 and 1980

	<u>1981</u>	<u>1980</u>
Source of Funds:		
Excess of revenue over expenses	\$104,195	\$(7,012)
Items not affecting working capital:		
Depreciation	34,484	38,996
	<u>138,679</u>	<u>31,984</u>
Use of Funds:		
Additions to property and equipment	<u>36,242</u>	<u>37,017</u>
INCREASE (DECREASE) IN WORKING CAPITAL	<u>\$102,437</u>	<u>\$(5,033)</u>
Increase (Decrease) in Working Capital:		
Cash and short-term investments	\$123,206	\$(149,971)
Accounts receivable	9,321	31,832
Employee and other receivables	3,610	3,429
Contracts-in-process	49,274	-0-
Prepaid expense and advances	62,724	9,220
Accounts payable and accrued expenses	44,597	(45,153)
Advance payment of grant funds	<u>(190,295)</u>	<u>145,610</u>
INCREASE (DECREASE) IN WORKING CAPITAL	<u>\$102,437</u>	<u>\$(5,033)</u>

The accompanying notes are an integral part of these statements.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
NOTES TO FINANCIAL STATEMENTS
December 31, 1981 and 1980

Note 1. Summary of Significant Accounting Policies

Organization

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

Income

Grant income is reported as revenue for the time period the grant is required to cover. Income from contracts is recognized as it is earned. Contracts-in-process is income earned but not billed under various contracts. Reimbursement of expenses is included in revenue when services are performed or expenses incurred and the right to reimbursement accrues.

Property and Equipment

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

Note 2. The Institute occupies office space under various leases expiring through September 30, 1985. The leases provide for rent increases based on increases in building operating costs and increases in the Consumer Price Index. Minimum lease payments, net of sublease arrangements made by the Institute as sublessor, for all noncancellable operating leases having a remaining term in excess of one year at January 1, 1982, are as follows:

1982	\$132,189	1984	\$104,496
1983	\$104,496	1985	\$ 78,372

Note 3. The Institute is purchasing retirement annuity contracts for employees under agreement with the Teachers Insurance and Annuity Association and the College Retirement Equities Fund. The cost was \$199,137 and \$158,531 for 1981 and 1980 respectively.

Note 4. Grant income is core program support received from agencies participating in the Consultative Group on International Agriculture Research. Funds were received in 1981 and 1980 as follows:

	1981	1980
January	\$ 577,571	\$ 324,587
February	410,000	260,800
March	426,361	302,474
April	-0-	76,323
May	100,000	175,000
June	220,921	75,000
July	-0-	601,356
August	80,926	180,000
September	467,042	125,000
October	21,367	210,224
November	350,000	20,000
December	48,504	25,000
	2,702,692	2,375,764
Grants receivable	51,496	-0-
Grant revenue	\$2,754,188	\$2,375,764

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March 18, 1982

Officers and Trustees
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We have examined the balance sheet of the INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE as at December 31, 1981 and 1980, 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, 1981 and 1980, 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 worldwide interaction with policy-makers, 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 International Food Policy Research Institute receives support as a constituent of the Consultative Group on International Agricultural Research from a number of donors including the International Development Research Centre (Canada), the World Bank, the Ford Foundation, the Rockefeller Foundation, the United Nations Development Programme, the United Nations University, and the international aid agencies of the following governments: Australia, the Federal Republic of Germany, the Philippines, and the United States.