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A REPORT

ON

DEVELOPMENT OF PROGRAM AND STAFF OF

THE INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

TO

THE CONSULTATIVE GROUP ON

INTERNATIONAL AGRICULTURAL RESEARCH

JULY 28, 1976

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
IFPRI
1776 Massachusetts Avenue, N.W., Washington, D.C. 20036, U.S.A.

A subcommittee of the Technical Advisory Committee of the Consultative Group on International Agricultural Research, in its eighth meeting 24 July - 2 August, 1974, recommended the establishment of a food policy research institute.

After discussions within the CGIAR and with FAO, three organizations -- the International Development Research Centre of Canada, the Ford Foundation and the Rockefeller Foundation -- established the legal organization and provided the initial funding to implement the TAC recommendation.

After investigating several alternative locations for IFPRI, Washington, D. C. was selected because of the extensive data base and support services available. The International Food Policy Research Institute (IFPRI) was incorporated as a nonprofit research and education institution on March 5, 1975. Dr. Dale E. Hathaway was appointed project development officer in December, 1974 and subsequently director effective August 1, 1975.

As of July, 1976 the members of the Board of Trustees are: Sir John Crawford, Australia, Chairman; Ojetunji Aboyade, Nigeria; David E. Bell, the Ford Foundation; Norman Borlaug, the International Maize and Wheat Improvement Center, Mexico; Ralph Kirby Davidson, the Rockefeller Foundation; Mohamed El-Khash, Syria; Nurul Islam, Bangladesh; Affonso Pastore, Brazil; Puey Ungphakorn, Thailand; Lucio G. Reca, Argentina; Andrew Shonfield, England; Vijayshankar Sangidas Vyas, India; and Ruth Zagorin, the International Development Research Centre, Canada. In addition, Mr. Roger Savary, France, has been nominated and will become a member of the Board at its September, 1976 meeting.

The Board of Trustees meets twice annually. Members of the Board have had extensive experience in both research and policy making positions relating to food and agricultural development policy. Thus, they are in a position to, and do, play an active role in program formulation as well as determining general Institute policy.

The Role and Functions of the International Food Policy Research Institute

The main objective of IFPRI is to further the adoption of improved national and international food policies that will promote increased food production and more equitable distribution of food within and between countries. Of course, national governments, regional and international organizations have the responsibility for adopting such policies. IFPRI hopes to contribute to this process by identifying problems and presenting objective analyses of the implications of alternative actions.

As indicated in the TAC report, dual functions are planned for IFPRI. One is to provide an independent assessment of the current and prospective world food situation and major policy changes, with special reference to the food problems of the poor developing countries. The second is to research selected policy issues crucially affecting the ability of developing countries to obtain increased food supplies for their populations, especially that portion of the population whose current consumption levels are inadequate.

In performing these functions IFPRI will not become a primary data collector on world food statistics. Instead, IFPRI will use statistics generated by national and international organizations for its analysis and research, encouraging where possible the collection of improved statistics on food matters.

To help accomplish its goals IFPRI will issue research reports and periodic "Food Policy Reports" which analyze the current situation and policy changes or lack thereof. In addition, seminars and workshops with scientists and policy makers are planned, whenever possible in collaboration with national, regional or international organizations.

IFPRI has been granted official non-governmental observer status with FAO, the World Food Council and the Consultative Group on Food Production and Investment in Developing Countries. This is one method whereby IFPRI's research output can be used and can enter into the policy discussions by representatives of governments and international organizations. Moreover, this status allows IFPRI representatives to participate in the official meetings of these organizations where food policy issues are identified and discussed.

Research Programs

Given its limited resources, IFPRI's research program has been developed to concentrate on key areas which complement the work of the International Agricultural Centers, national and regional institutions and the international organizations. Each group has been represented in program planning activities, and both informal and formal continuing collaboration is planned.

Four major research program areas have been identified:

1. Analysis of food production, trade and consumption trends in developing countries; the factors underlying these trends; and their policy implications for national and international action.

2. Analysis of policies that will encourage wider adoption of improved production technology and that will increase the effectiveness of public and private investment in food production.

3. Analysis of programs and policies that can improve the distribution of available foodstuffs among populations within countries and between countries, with special attention to those who suffer from inadequate levels of food intake.

4. Analysis of policies that inhibit the ability of developing countries to make effective use of international trade either as a method of increasing their domestic food consumption or contributing to food supplies available for other countries. Trade in important production inputs which are traded in world markets, such as fertilizer, is included in this program.

The focus of the research program is on policies that affect developing countries. These may often be internal policies of developing countries; but they also may be the pricing, trade, import or development assistance policies of developed countries. Thus, the food policies of developed countries are of concern in IFPRI's program only as they affect developing countries' ability to deal with their food problems.

Specific research projects are underway or are being developed under each of the research program areas. The following are illustrative but not exhaustive indications of research underway or about to begin:

A. Analysis of Trends: "Meeting Food Needs in the Developing World: The Location and Magnitude of the Task in the Next Decade, Research Report No. 1," was issued in March, 1976. Further work is continuing on factors underlying recent production trends.

B. Technology and Investment: Basic analysis of relative returns to alternative investment in food production is underway, and collaborative research on policy constraints on the utilization of new technology is planned with one or more of the International Agricultural Research Centers. Concurrently a comparative analysis of the food production strategy of three sub-Sahara African countries is in progress, as is an analysis of food production potential in Brazil under alternative technology and investment strategies.

C. Food Distribution: An analysis of alternative policies and special programs to increase the food intake of disadvantaged populations in developing countries is under active discussion with operating organizations concerned with such problems.

D. Trade: An analysis of the factors limiting the ability of countries to import food is underway, as well as an analysis of the probable impacts on developing countries of the tropical products offers made in the GATT. An analysis of alternative mechanisms to stabilize world rice markets and of alternative stocks policies for food grains will begin soon. Work will begin soon on the performance of the world fertilizer markets and ways to improve that performance.

Publications and Information Programs

At present IFPRI plans to issue three types of publications. Staff members are also expected to write for professional journals and other publications.

The IFPRI publications will be:

1. Research reports to be published as parts of or as entire research projects.

2. "Current Food Policy Reports" to be published semi-annually to report world food trends and recent policy changes of significance to developing countries. Special reports in this series may be issued to cover special topics such as the results of UNCTAD IV, trade negotiations or progress on grain reserve negotiations.

3. Occasional papers will include staff papers prepared for special meetings or seminars which appear to be of sufficient interest to warrant wide distribution.

Efforts are underway to increase links to national, regional and international organizations concerned with food policy. Hopefully, through these organizations IFPRI can channel research results to scientists, policy makers, and others concerned with food policy and obtain reactions from such individuals about the issues we should investigate in our research program.

Staffing

The staffing pattern for IFPRI is somewhat unusual for an international research organization. All of the professional staff are on fixed term contracts varying in length from short-term consultants to five-year appointments. Most of the staff are expected to return to research or policy making positions in their countries after completing their IFPRI appointments.

As of July 26, 1976 the professional staff in residence or contracted to arrive by January, 1977 breaks down as follows:

Level of Appointment	Term of Appointment	No. of Persons
Senior Scientists	5 years	2
	3 years	3
	2 years	2
Scientists	2 years	6
Visiting Researchers	2 years	2
	1 year	1
Research Assistants	Indefinite	1
	1 year	2
Consultants		3
		22

These twenty-two individuals come from fifteen countries. Twelve of the sixteen scientists and researchers are from governments, research institutes and university positions in developing countries. In addition to the already contracted personnel, others are under active consideration, and expectations are that one or more visiting senior research fellows will be joining our staff with funding from outside sources.

The staff's professional background ranges from general economics to agronomy and irrigation engineering, with the largest number having some combination of agricultural production science and agricultural economics training.

Support Staff and Services

Because of the difference in method of research, physical location and relatively small size, IFPRI has a modest support staff and uses external commercial services to perform many functions.

For instance, our computer and programming services are purchased at cost from the Brookings Institution on an as-needed basis. We rent a remote terminal facility which allows our statistical assistant to input, calculate and print our results via our regular telephone line. We are able to use local commercial travel and moving agents, payroll service provided by a local bank, and an external computerized accounting system. All of these reduce the cost of administrative support structure relative to the expenditures on research personnel. This method of operation requires time to establish services that meet our specific needs, but on balance it appears as a feasible and efficient method of operation in our location.

Summary

The International Food Policy Research Institute was created as a legal entity just over one year ago and has been functioning as an international research organization for little more than ten months. In its first year IFPRI has established and furnished its physical facilities, hired its basic support staff and has employed most of the professional staff included in its original planning budget. It is proceeding with the establishment of a statistical base to analyze international food policy issues, using FAO, USDA, World Bank and IMF data. The first research report and the first "Current Food Policy Report" have been issued, and research is underway on several issues. In the meantime, research planning and coordination with other organizations continues and will insure that our program both avoids duplication of other efforts and concentrates upon the issues of major importance in meeting the food problems of developing countries.

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Research Directions in Income Distribution, Nutrition, and the Economics of Food

Lance Taylor

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INTERNATIONAL
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New
and important
from IFPRI

Intersectoral Factor Flow and Agricultural Growth

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Intersectoral Factor Flow and Agricultural Growth

BY YAIR MUNDLAK

The development of a rural economy is largely related to the development of its agricultural sector. The interdependence that exists between the agricultural sector and the rest of the economy must be taken into account in making policy decisions.

If it is to serve as a basis for policy decisions, an economic analysis of the process of growth and development should do more than identify the qualitative relationships that exist among economic variables in the economy. It should provide the quantitative consequences of important measures, and, more importantly, indicate how fast the economy will react to the contemplated measures.

In this forthcoming research report, *Intersectoral Factor Flow and Agricultural Growth,* Yair Mundlak offers an approach to the study of rural economies and illustrates the applications with empirical analysis. He points out that in any point in time, factor prices differ among sectors and that movement of factors from a sector of low returns to a sector of high returns often takes several generations before achieving equality of factor prices, a basic assumption in neoclassical economic models.

In this analysis Mundlak considers the rate of mobility a separate economic variable. Consequently, in addition to various technological changes, economic growth is generated not only by increasing the amount of resources in the economy, but also by improving the organization and efficiency of the utilization of these resources.

Mundlak's model starts with resource allocation, technology, and product supply as given. Consumption and investment demands determine product prices, which, in turn, determine factor prices. Resources flow from a sector of low factor prices to one with higher factor prices. This resource flow, along with population growth and capital accumulation, determines the allocation of resources among sectors during the next time period. The new allocation of resources and any changes in technology dictate the new product supply conditions, and thus the process repeats itself through time.

Mundlak fits functions to describe the intersectoral resource flows, the key relationships in this model. This study about the migration of labor and savings empirically tested and supported the assumption that the ratio of intersectoral flows are motivated by differential returns.

Using data for Japan for the prewar period 1910-40 and the postwar period 1951-72, the model was applied to evaluate the effects of resource flows out of agriculture on Japanese growth. It has been generally thought that the flow of savings out of agriculture was an important factor in the development of Japan's nonagricultural sector. Mundlak's analysis indicates that the quantitative effect of the savings outflow was far less important than labor migration. It is possible that the savings flow and capital accumulation did influence technical change in the two sectors, a process outside the scope of this model, and furthermore technical change undoubtedly had a large effect on Japan's development, if only because it made labor migration possible.

In general, Mundlak's findings support the thesis that any reallocation of resources commensurate with relative returns is conducive to economic growth, and the larger the intersectoral difference in returns, the greater the potential contribution of resource reallocation to growth.

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I would like to receive a copy of Yair Mundlak's forthcoming publication, *Intersectoral Factor Mobility and Agricultural Growth.* Please send it to:

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Lance Taylor*

RESEARCH DIRECTIONS IN INCOME DISTRIBUTION, NUTRITION, AND THE ECONOMICS OF FOOD†

The number of potentially researchable questions about how income distribution, food production and consumption, and nutritional status work themselves out together is large. This paper attempts to chart the terrain and identify some interesting specific topics. The criteria of selection are that the problems be amenable to policy intervention, that they bear on the welfare of poor people in poor countries, and that they can be effectively studied by fairly small research teams with major specialization in economics.

Chart 1 shows in diagrammatic form some of the causal links among agricultural, food processing, and nutritional variables. The diagram is far from complete, but it makes the point that interactions among these variables are elaborate and complex. Of course, many relationships have been investigated extensively over the years (for example, the link between income flows and household consumption patterns à la Engel's Law), but others are virtually untouched. Details are given shortly.

In an amplification of Chart 1, Chart 2 outlines relationships among nutritional status and other socioeconomic variables. While the central part of the first diagram contains linkages traditionally studied by economists, those in Chart 2 are usually investigated by members of other disciplines—public health, nutrition, anthropology, and psychology especially. There is room for interdisciplinary research along Chart 2 lines.

In the remainder of this section, the general structure of the two diagrams is discussed and prominent sets of relationships pointed out. In succeeding sections, possible research topics focusing on each set are analyzed in more detail.

Beginning at the left of Chart 1, arrows 1 through 11 deal with the agricultural sector of the economy. A number of factors determine what animal and vegetable products will be produced. They include government crop price and acquisition

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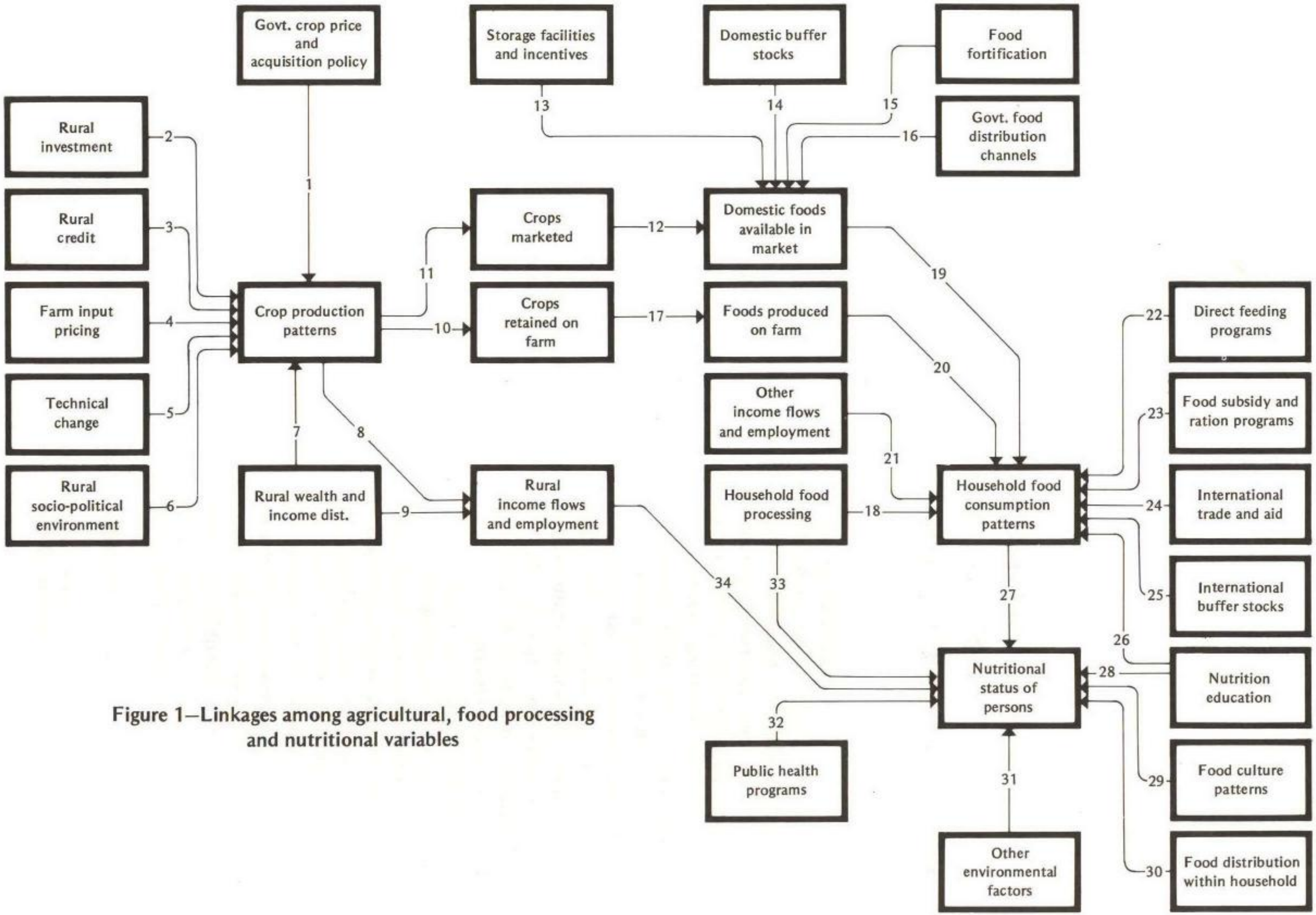
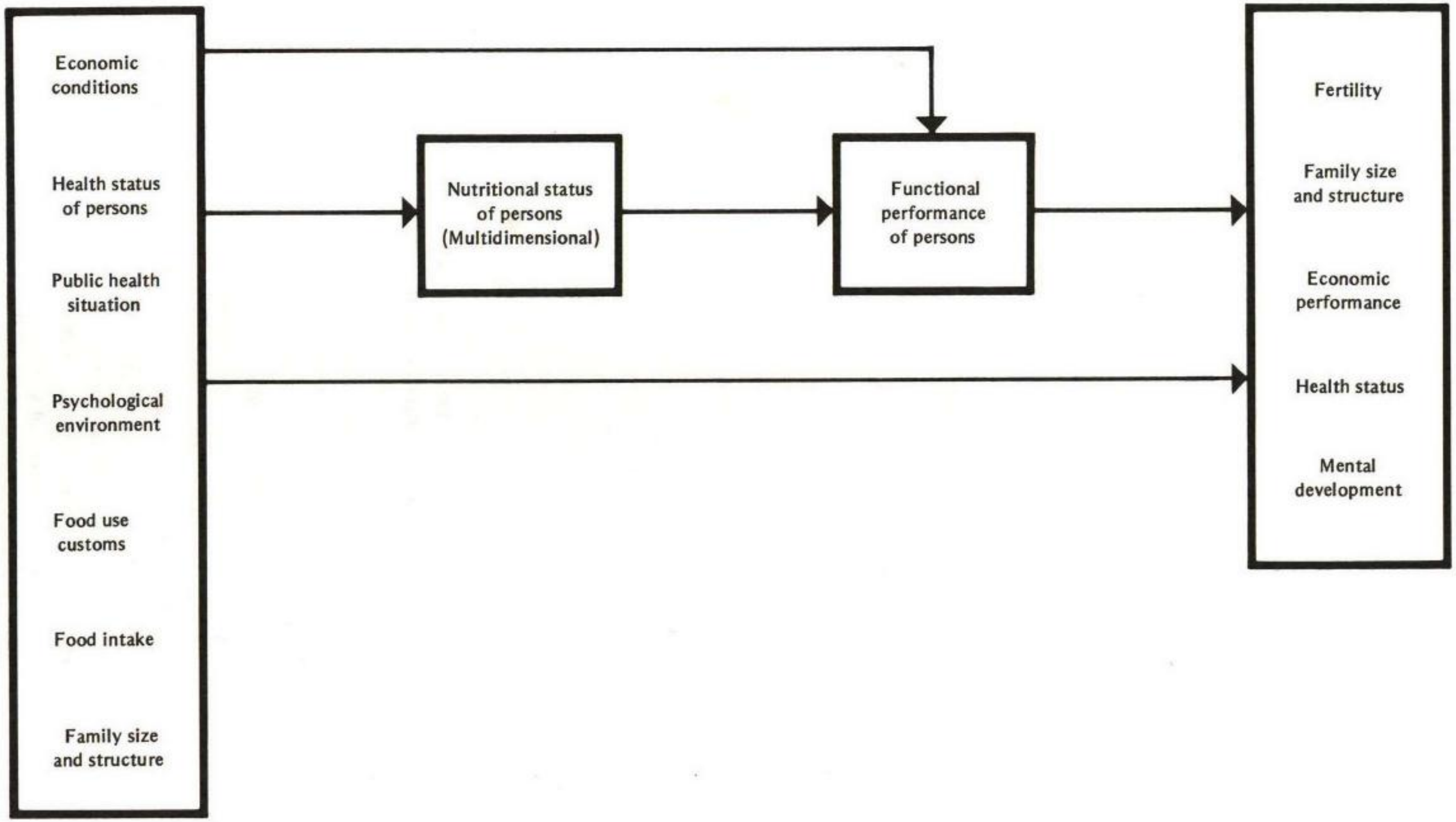


Figure 1—Linkages among agricultural, food processing and nutritional variables

Figure 2—Relationships among nutritional status
and other variables



policies (including official restrictions on the cropping pattern and compulsory deliveries), rural investment programs, farm credit, input pricing policies (for example, fertilizer and water subsidies), the general technological level of agriculture, the rural sociopolitical environment (for example, power relationships in the countryside), and rural wealth and income distributions. The distinctions drawn by arrows 10 and 11 between crops entering the market and those retained at home are important in both nutritional and income distribution terms.[1] On the nutrition side, marketed and non-marketed crops are processed into "foods" in different ways. In terms of income distribution, typically the larger and richer farmers benefit more than do smallholders or landless laborers from policies aimed at increasing marketed surplus through either technical change or price manipulation. Finally, crop production, the pre-existing wealth distribution, and, more generally, power relationships within the countryside and within the city determine rural income flows (*11*, *9*). On the right side of the diagram, income is a major determinant of food consumption and nutritional status.

Causal arrows 1 through 11 traditionally fall into the domain of the agricultural economist or rural sociologist and have been investigated extensively in many countries. However, other variables not in the agricultural scientist's bailiwick intervene between farm output, food supply, and nutritional status and the whole package has not been adequately studied. For example, there is very little in the literature about linkages between the mode of production in agriculture and the distribution of food consumption within the family. Peasant and especially plantation agricultural techniques in poor countries are often built around large inputs of human labor requiring high calorie expenditure. When total calorie intake is limited by poverty, such a technology automatically creates great risk of destructive competition for food within the family between workers and non-workers. Infant, female, and child malnutrition can be a natural consequence of this particular micro mode of production (*12*).

After crops leave the field, they are transported, processed, and stored before they are eaten. Traditional processing techniques and a host of cultural patterns influence final nutritional status. In a poor country, a very large share of production may be consumed in the farm household or distributed by non-market mechanisms. For example, in Pakistan the marketed surplus of grain may amount to a third or less of total production. What happens to non-commercialized food is clearly influenced by economic variables (the government price and acquisition policy for the staple crop is a clear example), but cultural practices and known processing techniques are at least equally important. Economic anthropological research into non-food channels could help in the design of nutritional education programs and introduction of new storage and food-processing methods at the household level.

As a country becomes richer, food shifts from non-market to market channels, and the value added along the latter increases until farmgate prices make up a very small share of food costs, as in Europe and the United States (*16*, ch. 5).

The government can intervene in market distribution of foodstuffs in several ways. Examples are the storage of grains and animal products as insurance against

[1] Intermediate products such as hay or other fodder crops are not shown in this simplified diagram.

shortages; provision of roads, marketplaces, slaughterhouses, public storehouses, and other structures to facilitate distribution; food fortification programs which in effect put new products on the market; and setting up its own distribution channels such as government-subsidized supermarkets or ration shops in urban areas. Also, in a mixed economy, private initiatives in processing and packaging can be expected (for example, sale of canned baby foods, expansion of frozen food products, and more elaborate packaging). For good or ill, such entrepreneurial innovations can be influenced by tax and subsidy policy.

Use of food in the household is influenced by another set of variables. The government can attempt to modify food intake by programs to distribute food directly to members of some target group within the population (direct feeding programs) and food subsidy or ration schemes; outside agencies enter through international trade and aid, and international buffer stocks. More generally, the trade strategy of a country may largely determine its food consumption patterns. For instance, Egypt exports cotton and may increasingly export vegetable and fruit products to pay for cereal imports. Should it continue with this strategy, or shift toward autarchy and use its limited land for cereal self-sufficiency? Nutrition is not the least important factor which should influence such a decision.

Finally, the nutritional status of individuals is affected by another set of factors, including the cultural influences on food consumption mentioned previously: public health activities, the overall health status of the population, other environmental factors, and accepted rules about food distribution within the family.

Factors influencing the incidence of malnutrition range from the economic condition of the population down through customs governing breast-feeding and cooking practices. The degree and nature of malnutrition is also important. Is it overnutrition or undernutrition? If the latter, is it shortage of protein or calories, or shortage of essential vitamins and minerals? If malnutrition is only moderate, perhaps subclinical, what are the prospects for remission or worsening?

Whether or not being malnourished affects a person's functional role in his society is the next question. The answer will again depend on specific conditions. Having iron deficiency anemia may be economically dysfunctional for workers in some environments (*3*), but not in others where different factors are limiting productivity. (For example, the widespread tropical disease, schistosomiasis, may cause negligible productivity losses in the environments where it is endemic (*2*). Similarly, the common assertion that infant protein-calorie malnutrition leads to mental retardation has to be analyzed in terms of a model of mental development in a given environment, à la Piaget or otherwise (*21*). Finally, improved nutrition may widen or narrow birth intervals, depending on the circumstances (*25*, *1*). To summarize, a particular set of conditions may induce malnutrition in some and not in others; the degree and nature of the malnutrition can differ greatly in the individuals suffering from it; malnutrition may not be dysfunctional in a given environment; and the extent of dysfunctionality depends on a host of other factors. There are ample research bones to chew on in this set of interactions.

MACROECONOMIC RESEARCH TOPICS

There have been few attempts to investigate food production, distribution, and consumption as a system. The macro food system comprises the agricultural sector treated as an aggregate producer of crops and associated income flows, food processing and distribution channels, and food consumption behavior of easily manageable groupings of households. So defined, the food system does not encompass interrelationships among food intake, other variables, and nutritional status. For normative purposes food consumption at the household level is often taken as a convenient indicator of nutritional status.

Aggregate flows of crops and foods are usually analyzed with food balance sheets. These can be interpreted as demand-supply balances for a number of food products, and are usually used to point out rather roughly inconsistencies between apparent food supplies and food consumption levels in the future. Evidently this crude methodology can be extended, perhaps by a fairly small group. Some possible research topics include the following:

1. Improvement and coordination of data. For example, food balance sheets are usually estimated from agricultural production statistics together with foreign trade data and a set of more or less arbitrary guesses about use of grains for seed and feed and storage losses. Consumption (or "disappearance") is the residual item. Where independent estimates are available for food consumption, production and consumption data sets are often inconsistent conceptually and contradictory in their implications. One illustration involves pulses in Pakistan, where during the early 1970s supply-side data indicated that their production was increasing, while without apparent imports household expenditure surveys showed their consumption decreasing. The inconsistency in Pakistan is not easily resolved with existing data, but the existence of a problem somewhere is known only because there are two data sets. If it were possible to integrate both sources of information into overall demand-supply balances, then so much the better. A good statistical description of the food system in several countries would open the doors to much fruitful research.

2. Calculation of worldwide calorie or protein gaps. A recent example is the World Bank-sponsored exercise by Reutlinger and Selowsky (23), who used Engel functions for food consumption plus estimated income distributions to calculate calorie consumption distribution on a country level. An estimate of the malnourished population was then derived by integrating the intake distributions up to the required level of calorie consumption as specified by the Food and Agriculture Organization. This exercise can be faulted on several grounds, such as lack of reliable data. Another, emphasized by Sukhatme (29), is that the population distributions for income, caloric intake, and caloric requirements are bound to be correlated, making a calculation based on marginal distributions of the Reutlinger-Selowsky type almost surely biased. The quantitative importance of Sukhatme's reservation could easily be assessed by computer simulations, though no one has apparently done any as yet.

3. With baseline supply-demand balances in hand, a number of other problems can be tackled. For example, what would be the impact of shifts in any of the variables affecting production, marketing, or food consumption patterns on nutritional status, at least as measured by household consumption levels dis-

aggregated by income level, region, or other attributes, in some policy-relevant way? The standard approach to answering these questions is partial equilibrium. How, for instance, does marketed surplus respond to price incentives? The answer might say something about food availability in the market, but nothing about nutritional status. Or to follow a tack laid out long ago in the field of computable planning models and recently followed by Pinstrup-Andersen et al. (20), how might tax and subsidy policy affect nutrient consumption by using some complete system of consumer demand equations à la Frisch or Stone-Geary? But this approach says nothing about consumers' incomes (by income class) or food availability. Partial equilibrium questions give partial answers. Sometimes the answers are policy relevant, as in the fertilizer demand-supply model by Timmer (31), but their limited scope should be acknowledged.

4. The obvious extension is to some sort of general equilibrium model. The importance of general equilibrium for food and nutrition policy is heightened by some of the macroeconomic implications of Engel's Law. In a supply shortfall, for example, low income and price elasticities for staple foods mean that food prices in an uncontrolled market would rise by far more than their consumption would decline. Real consumer income would of course drop because of the inelastic quality response to price increases, and the reduction would spill over into other markets. Further, there would be significant macro repercussions because the food sector in poor countries is large compared to the rest of the economy.

Recent research on Egypt and Pakistan by Desmond McCarthy and the author at the Massachusetts Institute of Technology illustrates the magnitude of some of these macro effects. In Taylor (30), it is shown that staple food subsidies in Egypt in 1975 amounted to about 500 million Egyptian pounds (£E), over 11 percent of the 4.417 billion gross domestic product (GDP). The agricultural and food-processing sectors also loom large, accounting for 42 percent of total value-added. Table 1 presents numerical simulation results from a general equilibrium macro model of Egypt incorporating rural, urban, and food-processing sectors.[2] The table shows how the economy might respond to an attempt to reduce food subsidies by £E200 million ex ante by increasing subsidized food prices about 29 percent.

In the second column, it can be seen that the food price increases would drive up the cost of living for separate rural and urban income recipient groups by about 2.2 and 8.2 percent, respectively (rural people consume less processed food). Because of low food demand elasticities, much of the real income loss would spread into the urban sector—the resulting multiplier contraction would reduce real GDP by about £E 240 million. Food imports would fall from an initial £E 569 million by no more than £E 60 million, although the overall balance of payments would improve by £E 114 million because of the economic contraction from the subsidy cut.

In real income terms, poor people would be hurt more than rich people because

[2] The model resembles the "closed" Leontief input-output system, except that prices are determined endogenously by sectoral mark-up rates in the manner of Kalecki, instead of being held fixed as in most macro models. Consumer demand responses to price and income changes are modeled with the Stone-Geary linear expenditure system, with parameters calculated from income elasticities and a guess at the income flexibility of demand. The approach is basically similar to that used by Pinstrup-Andersen (20) and a host of previous model builders in the planning field.

of the relatively high proportion of their budgets devoted to food. A calculation along the lines of Pinstrup-Anderson (20) suggests that the price increases might reduce food energy intake by about 200 calories per person per day on the part of rural poor, and 100 calories for urban poor (with less income-elastic demand).

Political repercussions of such large income changes could be profound—witness the food riots in Egypt in January 1977 after a policy similar to the one studied here was proposed. The announced food price increases were soon rescinded, but even less violent responses than riots could divert their goals. Suppose that money wages rose enough to offset the real income loss caused by more costly food. The third column of Table 1 shows what would happen if the wage increases were passed on in higher prices—this is in fact a description of the first round of a wage-price spiral which might be touched off by the reduced subsidies. A price index weighted by initial value-added levels in the three sectors would go up by 4.5 percent, with extra costs for rural and urban consumption baskets of 3.8 and 3.4 percent, respectively. The wage increases would generate enough demand to restore 1.75 of the 5.37 percent contraction in GDP resulting from higher food prices. Further rounds in the wage-price spiral would close the gap by more, but only at the cost of a significant inflationary burst.

A second way to offset the subsidy decrease would be to increase aggregate demand—say by more investment. The last column of Table 1 shows what would happen if enough capital formation were forthcoming after the wage increased to restore GDP to its initial level. The important point is that there still would be significant distributional effects, since investment activity employs urban workers preferentially. Rural real income still would fall by about 6 percent from the initial situation, enough to reduce energy intake by 200 calories or so for the poor. This could be potentially fatal for a child already on the verge of starvation.

5 Extensions of either partial or general equilibrium models of the food system to take into account a number of potential government policy interventions—such as direct feeding programs, domestic buffer stocks, and international trade policy—are in principle straightforward. Some of these policies affect demand-supply balances directly. For example, a single crop such as wheat would enter on the supply side of balances for non-marketed and marketed foods like bakery bread, chapatis, or tortillas. These foods would in turn flow to various consumer groups in quantities determined by their income levels and socioeconomic characteristics. Wheat imports or releases from a government wheat-stocking agency would affect this set of interrelated demand-supply balances by increasing total supply available for the diverging flows of wheat and its products. A direct feeding program might affect the supply of one of the products. Price policies and nutrition education would affect flows along various distribution channels. Many conceptual models of this type may be set up and the cost-effectiveness of different possible interventions aimed at the same general target even determined, but careful specification of how markets operate is necessary before sensible conclusions can be drawn.

6. An example of the analysis of price effects is provided by the debate over the impacts of commodity food aid of the PL 480 type. Schultz pointed out long ago that if the donated food enters unobstructed market channels it may reduce domestic prices, producer incentives, and the overall level of food availability

TABLE 1.—ECONOMIC IMPACTS OF AN ATTEMPT TO REDUCE 1975 EGYPTIAN FOOD SUBSIDIES BY £E 200 MILLION[a]
(billion Egyptian pounds)

	Base	With price increase	With price and wage increases	With price, wage, and investment increases
Gross domestic product in base prices	4.42	4.18	4.26	4.42
Percent change in real gross domestic product		−5.37	−3.62	0.01
Percent changes in costs				
Rural			2.73	2.73
Urban			5.56	5.56
Food			0.70	0.70
Total			4.52	4.52
Total imports	1.62	1.51	1.54	1.63
Food imports	.57	.51	.53	.53
Trade deficit	.50	.39	.42	.51
Government expenditure	1.79	1.55	1.65	1.65
Government expenditure on food subsidies	.49	.26	.28	.28
Percent changes in cost of living				
Rural		2.17	5.99	5.99
Urban		8.23	11.66	11.66
Percent changes in real income				
Rural		−6.77	−7.19	−6.20
Urban		−13.98	−8.80	0.60

[a]The consumer food price increase is from 0.59 to 0.75. Wage increases are rural sector, 0.19 to 0.20; urban sector, 0.45 to 0.48; food sector, 0.54 to 0.58. Gross capital formation increases from 0.84 to 1.00.

(26). On the other hand, since most governments intervene massively in food markets anyway, they might be able to rig distribution channels in such a way as to create enough aggregate demand from the poor to absorb the extra food without depressing prices. There is conflicting evidence, reviewed by Isenman and Singer (15), about the extent to which governments in the Indian subcontinent have been able to carry through such a policy.

An alternative way of looking at the impact question is to ask how total food imports respond to an extra ton (or dollar's worth) of commodity aid. Here, econometric evidence summarized by Sarris, Abbott, and Taylor (24) suggests that in most poor countries (with India a partial exception), food aid imports may substitute roughly on a dollar-for-dollar basis with commercial food imports. In other words, food aid does not represent an addition to national food supplies, and provides neither disincentives to producers nor extra calories to poor consumers. This result can be questioned, both in its short-term econometrics and lack of consideration of long-term effects such as reduction of government effort in agriculture due to reliance on donated food (32), but the result and the points raised above suggest that the macro and nutritional impacts of food aid are still poorly understood. In a time of burgeoning grain surpluses, the policy pay-off to research about these issues may be substantial.

MICRO ISSUES: FROM FOOD CONSUMPTION TO NUTRITIONAL STATUS

So far, nutritional status has been gauged from the input side—how much food of what kind are people actually consuming? Such an approach is misleading. There are many complex linkages between what a person eats and performance of his socioeconomic role. Along this route from food to function are a number of topics researchers might want to explore. A few are discussed here.

Nutrition Standards

As the debate about the size of the world "calorie gap" mentioned above demonstrates, there is much interest in the policy implications of nutrient requirement standards. However, the whole field is a mare's nest, especially for somebody without biomedical credentials. In the past, recommended nutrient intakes have been dictated by the doctors' main notion about social functionality—a person should eat well enough to avoid getting recognizably sick. In practice, this criterion is reduced to setting calorie requirements high enough to support normal growth and development in average children and energy use in average adults, protein requirements high enough to keep 99 percent of the population from having net nitrogen losses over the long term (at least theoretically), vitamin requirements several multiples of the levels which seem to preclude overt deficiency disease in most of the population, and so on. These rather purist standards side-step all issues of "scaling" the severity of malnutrition in a given environment—how great is the social, economic, or even personal loss if individual A is somewhat malnourished during season X in region Y of country Z? Answering such questions requires value judgments and technical competence in a wide (and expensive) range of fields.

Even if the political issues are ignored, a thorough analysis of a sociocultural system is something an economist cannot do; nor are biomedical assessments of nutritional debility within a social scientist's skills or research funding. Any serious rescaling of nutritional standards in socioeconomic terms relevant to poor countries will be a long and combative process (27), and it is not clear that a small research group should put many eggs in such a basket.

Monitoring Changes in Nutritional Status

For immediate policy purposes, another set of questions becomes relevant—how is the nutritional status of important groups within the population monitored on a continuous basis to check if there is improvement in the medium run or incipient deterioration from currently achieved levels due to short-run problems? Two difficulties arise here. First, policy makers have to know how to measure the nutritional status of the population. Some of the conceptual pitfalls into which this apparently simple activity can head have been noted here. Second, even if a set of standards is agreed upon, there must be some base level to which they can be compared in order to measure change. On the measurement issue itself, some sort of rough and ready agreement regarding techniques and standards is perhaps possible. Furthermore, there are methods for detecting protein-calorie malnutrition and some nutrient deficiencies which can be used in the field in poor countries. Anthropometric measurements are usually feasible, and biomedical techniques based on very small blood samples may soon prove so. Establishing accurate reference data about the extent and severity of malnutrition in policy-relevant groups of the population is an information-gathering activity similar to those already discussed. Not much is known beyond anecdotal evidence about either the macro food system or the micro details of nutritional status in most underdeveloped countries. Yet this information is critical.

Consequences of Malnutrition

Related to the issue of setting standards is assessment of the impacts of malnutrition on economic productivity, fertility, resistance to infection, and mental development—and vice versa. All of these linkages are controversial. All that can be presented here is a brief review of conflicting claims, plus some suggestions as to how they might be resolved.

Some nutritionists and economists claim that better infant nutrition is likely to reduce mortality and lead to reductions in birthrates as more children survive. At the same time, if infants survive longer they are likely to be breastfed longer which may reduce fertility. How does one distinguish between these two effects? Nutritionists also assert that better nutrition for mothers will increase fertility and perhaps the birth-weight and health of their children. The interactions between food flows into the nuclear family and its fertility performance become complex. Keeping up to date with all claims and counterclaims is time consuming in itself; testing them on the basis of existing data is virtually impossible. An economist armed with faith that households really maximize utility functions in determining how many sound children to rear might rush in where more sensible people fear to tread—those who return with more than a slew of ambiguously signed second partial derivatives are rare.

A considerable amount of theoretical economic effort has gone into investigating the effect of improved nutrition on worker productivity and on the market for unskilled labor. The major conclusion—that such a productivity effect may stabilize the real wage—is ably reviewed by Bliss and Stern (7). They go on to discuss the more interesting policy issue of how much in fact better nutrition adds to productivity. A good deal of additional empirical work by teams of economists and nutritionists could prove to be useful here.

Over the years, medically trained nutritionists have built up a large body of knowledge (and prejudice) about mother-child relationships. Much emphasis has been placed on the importance of breast-feeding as a means both to maintain nutritional levels among infants and to delay additional conceptions. There have also been large-scale longitudinal studies of interactions among nutrition, infection, public health, fertility, and other variables at selected village locations in various corners of the world (for example, the Khanna and Narangwal studies in India and the Instituto de Nutricion de Centro America y Panama three village study in Guatemala). Finally, there has been practical experience in attempting to influence nutrition and health status among mothers and infants in "mothercraft centers," maternal and child health centers, and similar agencies throughout the world. The microeconomics of none of these activities has been seriously investigated. There are hints about the economic importance of breast-feeding (5, 23), but they are mostly impressionistic. Perhaps such knowledge can be built up by economists working on the fringes of large medical projects; the studies by Levinson (17) and Heller and Drake (14) of infant morbidity in the face of protein-calorie malnutrition and other insults, and by Popkin (22) of vitamin A deficiency make a beginning. Similarly, existing work by medical people on such activities as mothercraft centers could be built upon. For example, see Beaudry-Darisme and Latham (4).

Finally, one can study relationships among food customs and the structure of cultures anthropologically à la Julian Steward and followers (10). This approach attempts to encompass all of the determinants and consequences of nutritional status in one whole model of a society, and makes a good deal of methodological sense. Unfortunately, it is more easily applied in the context of a static, "primitive" culture than in changing circumstances in an underdeveloped country attempting to modernize. Nonetheless, such ecological investigations probably hold keys to an understanding of how nutrition fits into socioeconomic systems and can avoid the errors of omission which arise when analytical investigators focus on one link in a complex pattern (as amply illustrated by the inconclusive quality of debates about malnutrition versus fertility, morbidity, or mental development).

MICRO ISSUES: DETERMINANTS AND CONSEQUENCES OF FOOD CONSUMPTION BEHAVIOR

Issues more amenable to economists and marketing experts are examined here. First, some data gaps are summarized which might usefully be filled, and then a few conceptual problems are considered.

Distribution Within the Family

As hinted above, the most important conclusion from past debates about nutritional status is that certain groups are likely to be especially vulnerable to food deprivation—infants and small children and pregnant and lactating mothers are the target populations usually cited. If a planner wanted to avoid the worst long-term effects of malnutrition, he would direct food distribution programs preferentially toward children and expecting or recent mothers. The major problem for planners is that extremely little is known about distribution of food and nutrition *within* the family. Consumer budget surveys typically collect data at the household level; partial information from nutritionists about breast-feeding and weaning practices does not take into account the full complexity of food allocation practices among all family members. Comprehensive studies of food use within the family (based either on recall procedures or from placing an observer in the household) would be extremely useful, both scientifically and for the design of programs for intervention. Gathering and analyzing such data is difficult, but probably feasible in underdeveloped countries with good statistical services.

Nutritional Implications of Economic and Technical Change

Economists emphasize the importance of income and prices in determining consumer behavior; other social scientists stress sociocultural conditioning variables, and in addition there are always advertising and education. More research may be counseled, but yet another standard household expenditure survey in a country where two or three have already been done will not add much to our knowledge of consumer responses to possible policy interventions.

More helpful would be delineation of the linkages between the nutritional status of specific groups within the economy and government policies intended to influence various other economic variables. Retrospective studies might be of interest. For example, the effects on employment and income distribution of the Green Revolution have been well documented in some areas. What were the probable linkage effects to nutrition within the effected populations? Looking to the future, it is now becoming customary to try to say something about the income distributional impacts of investment projects, rural development schemes, or "small farmer strategies" in general. The usual research focuses on relationships between farm size and productivity, new technological options, employment and income distribution, and so on. A natural extension would be to trace probable shifts in income distribution and employment through to possible shifts in consumption patterns, food intake, and nutritional status.

Evaluation of Nutrition Programs

Next, there is the problem of trying to measure benefits from policies aiming to shift food consumption patterns. Some studies have been made using traditional benefit-cost techniques (*3*, *28*); but their results are not completely convincing for two reasons. First, the accepted benefit-cost methodology bogs down in endless discussion of "welfare weights" and other intangibles when it is applied to public expenditure programs focusing on income distribution. What is needed is a simpler set of tools to cut through the theoretical rococco. Secondly, when dealing with nutritional issues, how far does the distribution of food intake across the population go toward satisfying the distribution of nutrient requirements required to support some standard of well-being?

Both of these distributions can presumably be shifted by policy—such as food distribution programs for the intake distribution and public health measures for the requirements distribution. The question is, how does one find a simple benefit measure, sensitive to income distribution, which can measure the impacts of policies aimed at shifting one or both distributions? One approach might be to choose policies which lead to a high level of consumers' surplus under the food demand curve while insuring that, say, every person but one in a hundred receives enough food to be at or above his "safe" nutrient requirement level. The theory of such benefit-cost assessment has not been worked out fully, although there are some tantalizing suggestions (*33*). An analytically able but policy-oriented economist could usefully bring the theory down to earth, extending tentative beginnings (*23*).

Finally, with or without newly sharpened benefit-cost tools, something can be learned from failed attempts to alter food consumption patterns in the past. There are already useful reviews of the history of protein-supplemented foods for children (*18*), fish-protein concentrates (*19*), and the Chilean milk distribution program (*13*). Food fortification schemes of one kind or another beg for similar treatment, as do the few serious nutrition education programs that have been carried out. Such studies require a lot of legwork and in economists' terms are not particularly glamorous. But this is another area in which a modest research effort could bring a fairly high and rapid return.

MICRO ISSUES: FOOD PROCESSING AND DISTRIBUTION AND AGRICULTURE

Earlier there was some discussion about gaps in our knowledge of food processing and distribution practices in underdeveloped countries. As pointed out, most development economists understand very little about the food industry. Perhaps experts on marketing in advanced countries who occasionally show up in poor country capitals as advisers on advertising and nutrition education know even less about what they are talking about. For this reason, a good deal of methodical gathering of facts and a feel for local institutions are necessary before generalization is possible. Some areas of interest are suggested below.

Many less developed countries have set up some sort of food subsidy or rationing system. The announced goals of these programs vary—helping the poor, stabilizing food prices, and improving nutrition levels—but their general orientation is always toward altering existing markets to increase the availability of food. Non-market schemes have also been attempted, frequently by international agencies such as CARE or the World Food Program which aim their donations at vulnerable groups through school lunch and similar programs. Field studies of successful or unsuccessful food subsidy programs and evaluations would be useful.

There are efficiency issues in food processing and distribution which also appeal to economists. For example, just how extensive are food storage losses in poor countries? Is their reduction only a matter of new technology, or are economic incentives rigged against effective storage procedures? Would domestic buffer stock schemes in fact complement existing private storage, or would they lead to its extinction? All along the food chain similar questions can be posed. What are incentives toward production of high extraction flour? And highly polished rice? These can only be answered by field research, but again economists from developed countries could consider collaboration with local institutions.

SUMMARY

The agricultural sector affects nutrition levels in three main ways: (a) production of crops which are sold and pass through commercial food-processing chains to consumers; (b) production of crops for use at home with their own processing and storage technologies; and (c) generation of income and employment which directly affects the pattern and level of household food consumption.

Marketed foodstuffs can be studied using traditional partial equilibrium economics, and knowledge can be expected to accumulate gradually about this particular set of markets, as it has about others. Household food production for own consumption is less well understood, and some sort of conference or seminar among nutritionists, home economists, anthropologists, and others might clarify the current state of knowledge and point to promising research possibilities. Finally, there is the need to look at distributional impacts of agricultural production patterns, tracing them through to nutritional status. At our present stage of knowledge about income distribution in rural areas, a many-pronged attack on the problem is probably desirable, with the prongs ranging at least from the neoclassicism of Cline (*8*) through the eclecticism of Gotsch (*11*) to the new-Ricardian and neo-Marxian formulations of Bhaduri (*6*) and de Janvry (*9*). One natural line of research would be the development of multisectoral income distribution models parallel to the multi-market analyses of the food system suggested above. Some prototype models of this type exist (most of them supported by the Development Research Center of the World Bank), and their elaboration to deal with the details of the macro food system would be feasible. However, it should be recognized that little enough is known about rural income distribution to make almost all roads to understanding it equally good.

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Notes

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Notes

IFPRI reprints a small number of individual papers prepared by staff members for other publications and conferences. These papers are made available for wider distribution in this form.

Research Report No. 1
February 1976

MEETING FOOD NEEDS IN THE DEVELOPING WORLD:

The Location and Magnitude of the Task in the Next Decade

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PREFACE

This report is the first research report of the International Food Policy Research Institute. As its title indicates, it is a partial analysis of the world food problem which attempts to indicate precisely the location and magnitude of possible food deficits in developing market economies.

The report bears no single author because it is a joint effort. However, Nathan Koffsky carried most of the burden for the analysis and writing. Diane Skellie and Pradeep Kotamraju did most of the statistical analysis. Kenneth Bachman, Felix Nweke, M. S. Rao, and James Gavan all contributed to the planning and development of the analysis.

Special thanks are due to thé other organizations that contributed in various ways. These include the International Monetary Fund, the World Bank, and the United States Department of Agriculture, all of which made data available. Thanks are also due the Brookings Institution which made its computer facilities available.

With this report, IFPRI is inaugurating a research program on international food policy issues and the alternatives that are available to deal with them, especially the issues of major importance to developing countries. The aim of the IFPRI research is to help clarify the problems and identify solutions to prevent the worsening of what is already a serious problem in most of the developing countries.

Dale E. Hathaway
Director

Summary of Findings

1. This report is concerned with the food needs of more than half the people on earth--those who live in developing countries classified as developing market economies (DME), as distinct from those in the People's Republic of China and other Asian Centrally Planned economies. By 1985, their numbers will exceed 2.5 billion people, of whom 2.2 billion may well be living in food deficit countries, if production performance since 1960 is repeated in the next decade. For most, their present situation is precarious. It is likely to turn much more alarming, unless actions are taken to forestall it.

2. Unless the trend of production in DME countries improves in the future, production of cereals, the major food in most developing countries, will fall short of meeting food demand in food deficit countries by 95-108 million tons in 1985/86 depending on the rate of economic growth. This compares with shortfalls of 45 million tons in the food crisis year, 1974/75, and an average of 28 million tons in the relatively good production period, 1969/71. Asia accounts for some 50 percent of the total projected deficits, North Africa/Middle East about 20 percent, and Sub-Sahara Africa and Latin America about 15 percent each.

3. A total cereal deficit of about 100 million tons in DME food deficit countries could well prove conservative. It is based on projection of the production trend of 1960/74, an average increase of 2.5 percent a year, to 1985. During the last half of that period, 1967-74, the rate has slowed to 1.7 percent. This is too short a period and subject to too much variation from year to year to serve as a reliable base for projecting the future. Nevertheless, the pervasiveness of the slackening in production for all regions and cereal crops (except for wheat in Asia, the most visible evidence of the "Green Revolution") suggests that it may well be difficult for DME food deficit countries to maintain their longer term production trends. In the event performance in the future reflects the more recent trend, cereal production could fall short an additional 100 million tons, doubling the cereal deficit to about 200 million tons. Such a large transfer of food, largely from developed countries, could well be unmanageable physically or financially.

Low-Income Food Deficit Countries

4. The core of the food problem is in the low income food deficit countries (i.e., those with per capita incomes of less than $200) where 60 percent of DME population now live and where most of the increase in population will come. They are projected to incur about half of the total deficit, some 42-48 million tons of cereal by 1985. To finance imports of such magnitude would appear to be beyond any prospect of these countries having the foreign exchange to do so. The only feasible way for most of these countries to meet food demand--and the least costly over the long run--is to

increase production more rapidly. It would require increasing the production growth rate from 2 percent a year to almost 4 percent. To approach this goal would require very substantial increases in investment in resources devoted to food production and greatly improved agricultural performance in the countries concerned. This will not be possible without heavy transfers of capital and technology from developed countries.

5. Nevertheless, it would be unrealistic to look for the growth rate to move rapidly from 2 percent a year to 4 percent, considering that agricultural development is a slow and difficult process and the inevitable lags that occur before investments begin to produce. In the meantime, it is clear that there will be need for food aid from the developed world, very likely in larger amounts than heretofore, to help feed these people.

6. Unless such developments are forthcoming, the inevitable result would be a further decline in per capita consumption, either by higher prices or by rationing. Most countries in this category already have average diets which fall below minimum adequate energy levels. Even if the projected consumption levels for 1985/86 were to be attained, they would allow for only 2-4 percent improvement over the 1969-71 per capita levels. Further, inasmuch as projected consumption levels generally reflect market demand, the number or proportion of malnourished people is not likely to be reduced unless there is major restructuring of incomes or other means of redistributing the food supply. This group of countries contains the bulk of the malnourished in the developing world, estimated by FAO to total some 440 million people in 1970.

7. The principal problem countries or groups that come out of the projections are indicated to be:

	Cereal Deficit 1974/75 (million tons)	Cereal Deficit Projected 1985/86 (million tons)
India	6.7	14-17
Bangladesh	2.3	5-5½
Indonesia	1.1	7½-9½*
Nigeria	0.3	6½-7 *
Sub-Sahara Low Income Group	1.2	3½-4½*

* In the case of Indonesia, if the 1967-74 production trend should prevail, the deficit would largely be eliminated. The deficits for Indonesia, Nigeria, and Sub-Sahara low income countries take into account the projected supply of root crops as an alternate source of calories.

High Income Countries

8. This group, containing 8 percent of DME population and including the North Africa/Middle East OPEC countries, Venezuela and high growth countries in Asia, such as Taiwan and South Korea, has the capacity to generate foreign exchange to meet food demand by imports. They now import about one-third of cereal requirements. By 1985/86 they may be importing two-thirds of their requirements. This group represents a large and expanding commercial market for 30-35 million tons of cereals by 1985/86.

	Cereal Deficit 1974/75 (million tons)	Cereal Deficit Projected 1985/86 (million tons)
Asia High Income Group	6.7	17-20
NA/ME OPEC Group	4.8	11-11½
Venezuela	1.5	2-3

Middle Income Food Deficit Countries

9. Countries in this group represent the range of circumstances between the poor low-income countries and the high foreign exchange earners. They contain about 20 percent of DME population. The average production rate has been much more satisfactory, increasing about 3 percent per year but has not kept up with demand for cereals in which feed is of increasing importance. A rate of over 5 percent a year would be required to meet cereal market demand. While the total deficit is projected to rise from 17 million tons in 1974/75 to 23-25 million tons by 1985, Mexico's deficit is likely to decrease and Egypt's although sizeable, to remain about the same as in 1974/75. This group represents a mixture of countries, some likely able to import commercially and others requiring some concessional food aid. While the needs of some are somewhat less urgent than for others, there is need in most countries for additional investment in food production.

10. Certain problem areas stand out.

	Cereal Deficit 1974/75 (million tons)	Cereal Deficit Projected 1985/86 (million tons)
Sub-Sahara Higher Income Group (above $200/per cap)	0.6	2
Mid America/Caribbean (other than Mexico)	2.9	4¼-4½
Latin America (except Argentina, Brazil and OPEC countries)	2.3	5¼-5½
Egypt	3.5	3.5

Cereal Exporting Countries

11. Only Argentina and Thailand are currently major cereal exporters. If historical growth trends persist, Brazil and Pakistan, presently in deficit, will move to an export position as well. This group with 13 percent of DME population, has more than enough to feed its people. Whereas, DME cereal exports have been about 10 million tons in recent years, the projection of exportable supplies in 1985/86 is in the range of 25-30 million tons. Since these developing countries are likely to hold to commercial sales, their export surplus will represent a small part of the world supply of cereals available to both developed and developing purchasers.

People's Republic of China

12. At the historical production growth rate of 3.4 percent a year in comparison with population growth of 1.5 percent a year, China appears to have the capacity to become a major cereal exporter in the 1980's if that should be its governmental policy decision. However, the more likely route would be toward improving the diet of its people and meeting the deficits of other Asian Centrally Planned economies. For these latter, production is falling significantly behind population growth.

INTRODUCTION

This report builds on the finding of the United Nation's World Food Conference of November, 1974 that the precarious food situation in many developing countries threatens to become much more difficult during the next decade. The Developing Market Economies (DME), excluding the Asian Centrally Planned Group, containing more than half of the people on earth, are generally characterized by high population growth rates which show little tendency to slacken, and lagging food production which has become more pronounced in recent years. The result has been a widening food gap in DME countries which has required greatly increased imports from developed countries in order to feed their people. Even with larger imports (including substantial food aid), one in four of their population is underfed and their numbers are increasing.

Nor have these disturbing trends been significantly altered by good harvests this year in large parts of Asia, a reflection of extremely favorable weather and growing conditions. While the food crisis of the 1974/75 crop-year brought on by poor crops has been alleviated to some extent, import needs of food deficit countries remain much higher than at the beginning of the 1970's. The underlying trends remain.

A better balance to the food/people equation in the next decade depends almost entirely on increasing the availability of food by accelerating production in DME countries and/or increasing food transfers from developed countries. The time interval precludes the possibility of significantly altering the population factor. At best, programs to limit population growth could have only very marginal effects on the numbers likely to be present in the mid-1980's. This should not minimize the overwhelming importance of slowing the rate of population growth as soon as possible. Otherwise, the task of feeding people beyond the next decade could well turn unmanageable.

The purpose of this report is to put concrete dimensions on the food problem as reflected in cereals, the major staple in most of the developing world; the potential shortfalls that loom ahead if things go on as they have, the geography and magnitude of such shortfalls among DME countries, and the relative economic circumstances of those countries with potential food deficits. For these reasons, potential cereal needs and potential cereal deficits, which have been considered in a global context for all DME countries combined by the World Food Conference, have been disaggregated into 23 categories of countries or groups of countries with similar attributes. By so doing, the process of planning to avert the occurrence of potential food shortages can be facilitated.

In the World Food Conference document, Assessment of the World Food Situation, Present and Future,[1] the Food and Agriculture Organization of the United Nations (FAO) projected for all DME countries

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1/ United Nations World Food Conference, Rome, Italy, 5-16 November, 1974, E/CONF 65/3.

combined a potential net cereal deficit of 85 million tons by 1985 compared with an average of 16 million tons in 1969-71. These are global figures for DME countries wherein the surpluses generated by exporting countries, such as Argentina and Thailand, are deducted from deficits in other countries.

While the potential net deficit of 85 million tons is important from the viewpoint of achieving a global balance in cereals vis-a-vis the rest of the world, food strategy for the individual country evolves from its own deficit position. Further, export surpluses of exporting developing countries may not be available to importing developing countries. For example, Thai maize is largely exported to Japan for livestock feed purposes. Nor are exports of developing countries likely to be available except on commercial terms. Thus, it is important to consider the situation of food deficit countries as distinct from exporting countries and the different circumstances among food deficit countries. Some, that can afford to do so, will likely purchase a substantial part of their food requirements rather than expand domestic production at very high cost. This may well be the case for OPEC countries in North Africa/Middle East where the agricultural resource base is limited and investment is likely to be used more efficiently in other activities. On the other hand, poor countries with large food deficits, such as in South Asia and Sub-Sahara Africa, have little alternative except to try for self-sufficiency by improving output. Otherwise, they must look to large and continuing food aid transfers.

This report takes into account the possible continued retardation of economic growth in much of the developing world stemming from restructuring of oil prices. This has impacted most severely on low-income non-oil exporting countries. Accordingly, consumption (demand) has been projected under high and low income growth assumptions, the former assuming that historical income trends will be resumed and the latter reflecting significantly slower growth.

Meaning and Limitations of Food Deficit Projections

Deficits (or surpluses) as used in this report and in the FAO projection represent the difference between projections of cereal production based on the historical trend and projections of demand arising from increasing population and per capita income growth assumptions. Therefore, the deficits (or surpluses) reflect projected food demand relative to production, if past production trends continue in the future.

Even under existing circumstances, some countries will likely do better than in the past as improved technology takes hold and some will do worse as the land base is exhausted without compensating improvements in other factors of production. These tend to be offsetting in the process of aggregation, but may miss the mark for individual countries. Nevertheless, the historical record provides some statistical basis for assessing the needs for added investment in food production, the requirements of factors such as irrigation, fertilizers, etc., and the improvement in agricultural performance which could lead to attaining specific food targets.

The deficits that come out of such projections indicate the extent of the adjustments faced by the countries concerned; whether deficits will be met by increased production, by commercial imports if affordable or concessionary food aid if not, and/or by reduction of per capita consumption, in many cases at levels already unsatisfactory, either by higher prices or by rationing.

Even if the projected demand for cereals which is largely a reflection of market demand is fulfilled, many people will still be below an adequate food intake as a result of low incomes and inadequate food distribution systems.

According to the World Food Conference Assessment document, some 440 million people in DME countries were underfed in 1970. Of the number, 70 percent were in the Far East, 15 percent in Africa, eight percent in Latin America, and seven percent in the Near East. These figures give some appreciation of the additional problem involved in providing all the people with an adequate diet; a task which goes beyond meeting the food demands projected in this report. However, the state of knowledge is quite unsatisfactory as to the nutritional standards that are appropriate considering demographic and other pertinent factors, the numbers falling below standards and the extent of deficiencies. Such information, which would require major research, would be needed in order to measure the additional food supply required to assure all of a minimum adequate diet.

It should be noted that the incidence of malnutrition is heavy among the large populations of India and Bangladesh. To eliminate this problem would greatly enlarge the projected cereal deficits for these countries as shown in this report, especially since population will be almost 50 percent higher by 1985 than in 1970 and a significant proportion of the added population will be poor.

Finally, it should be emphasized that the agricultural data base for developing countries from which production and consumption are projected is far from adequate to deal with a matter of such urgency and importance as the food problem. It should be of high priority to improve the basic statistics so that planning to meet this contingency can be more effective.

Sources of Data and Methodology *

The basic data used in IFPRI projections were as follows: Cereal production, consumption, and trade by country for crop-years 1960/61-1974/75, the time period available from U.S.D.A. Human consumption and feed use are shown separately insofar as such data were available. FAO data, the basis for the WFC projections, are on a calendar year, and were available only for production. Hence the choice was made to use the more complete data of the U.S.D.A.

Population projections used are those of the U.N. medium--medium-variant obtained from the World Bank Computer Center. This is the same variant as used in the WFC document but with some subsequent minor revisions.

Income growth rates were derived from World Bank materials. The high income growth assumption for Non-OPEC countries is generally the growth rate of GNP per capita 1965-73. Income growth rates for OPEC countries were adjusted upward to reflect sharply increased oil revenues since 1973. The average increase projected for developing market economies came to 3.0 percent per year per capita compounded to 1985, compared with 3.5 percent assumed in the WFC projection. This assumes that the effect of high oil prices, which has interrupted the growth in per capita income in developing Non-OPEC countries, is gradually overcome and the historical trend is resumed.

The low income growth assumption was derived from analysis of potential continued ill effects of the oil situation on Non-OPEC developing countries, including also the unfavorable effect on their exports resulting from a slower rate of economic expansion in industrial countries. Under this circumstance, the average increase projected in per capita GNP is 1.7 percent a year compounded.

Income elasticities for cereals by countries were largely derived from the FAO study, Agricultural Commodity Projections, 1970-1980,[2/] adjusted for high and low income growth assumptions. In some cases, elasticities were modified, downward for countries anticipated to expand economies rapidly and upward for those with negative elasticities where consumption was clearly outrunning population growth.

Conventional methods of projection were employed. That is, cereal production was projected to 1985/86 from the historical trend of the past 15 years (FAO projected the trend from a 1969-71 base). As is customary in studies of this nature, the demand projections are based on historical price patterns and relationships. Human consumption was projected from the trend value for 1974/75 on the basis of population growth and the alternative assumptions of growth rates of per capita income X income elasticities for cereals. Feed use for countries for which data are available was projected from trend for the full historical period for Non-OPEC countries and for 1971-74 for OPEC countries to give weight to their recent circumstance.

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* See Annex 2 for detailed description of data and methods.
2/ Volume II, FAO, Rome, 1971.

However, the trend rates for growth in feed use were subject to a constraint related to the projected income growth rates. Feed use was not calculated separately for countries with less than $200 GNP per capita since such use is generally negligible and data are usually unavailable.

Reconciliation of Net Deficits 1985, WFC (FAO) and IFPRI

Despite differences noted above in basic source data, base periods and income growth assumptions, the total net cereal deficits projected by both studies are actually very close. This is largely due to the major role of population growth in determining projected levels of consumption.

To reconcile the two projections, the following major adjustments are in order:

1. FAO data on rice are in terms of paddy whereas the IFPRI data are in milled rice equivalents, roughly two-thirds of paddy weight.

2. FAO projected to the calendar year 1985 whereas IFPRI projections are for the crop-year 1985/86, approximately 6 months later in time. IFPRI projections indicate that deficits will be increasing about five million tons a year by 1985.

3. IFPRI includes pulses in food grains in India, as is the practice of the Indian government. Inasmuch as the trend of production of pulses has not kept pace with population and income growth, the India deficit would be larger under the IFPRI projection than in the WFC/FAO projections.

4. The deficit for the Republic of China (Taiwan) is included under IFPRI among Asian developing market economies whereas FAO includes it as part of the People's Republic of China in category Asian Centrally Planned Economies.

WFC/FAO net cereal deficit	85 million tons
Adj. to milled rice	-13 million tons
TOTAL	72 million tons

IFPRI net cereal deficit	82.6 million tons
Adj. to calendar year	- 2.5 million tons
Adj. for India pulses	- 1.0 million tons
Adj. for Taiwan	- 6.5 million tons
TOTAL	72.6 million tons

A margin so small is negligible, considering that the deficit itself is a residual of two large numbers and thus subject to wide variations.

Root Crops in Relation to Cereal Deficits

In a number of countries, root crops make up an important part of the diet and are a competitive source of calories with cereals. In a band of countries across the center of Africa stretching along the west coast from Guinea on the north to Angola on the south, and eastward through Zaire and Tanzania, cassava, yams, and sweet potatoes provide about as much calories as cereals. In Latin America, a band from Brazil to the west coast, cassava, potatoes, and plantain provide half as much calories as cereals. In Indonesia, cassava provodes one-third as much.3/ Thus, future trends related to root crops affect cereal requirements.

Wide discrepancies are apparent between the production estimates of root crops of FAO and those published by U.S.D.A. The latter, expressed in terms of wheat equivalent in calories, have been used in this report partly to be consistent with the data on cereals, but also because otherwise a significant reduction in per capita calorie intake is implied in some countries which would seem to be contrary to other indications.

Under the assumptions that the production trend of the past decade will continue and that per capita consumption of root crops in 1969-71 will, on average, remain the same (i.e., zero income elasticity), rough calculations have been made as to the increase or reduction that would be involved in the cereal deficit in 1985/86. The assumption implies that increases in per capita income will be reflected more in demand for cereals with their higher energy and protein content rather than for root crops. Thus, in countries where production of root crops is not keeping up with population growth, the cereal deficit is increased and where production of root crops is rising faster, the deficit is decreased.

Sub-Sahara Africa	
Nigeria	1.1 million tons decrease in cereal deficit
Other Low Income Countries	0.4 million tons decrease in cereal deficit
High Income Countries	0.5 million tons decrease in cereal deficit
Latin America	
Brazil	2.0 million tons increase in cereal surplus
Ecuador	0.1 million tons decrease in cereal deficit
Other Latin America	0.2 million tons increase in cereal deficit
Asia	
Indonesia	0.9 million tons increase in cereal deficit

In total, this would not effect the total gross deficit. The surplus in Brazil would be reflected in larger exports of cereals. The cereal deficit for Nigeria would be reduced by more than a million tons, whereas that for Indonesia would be increased by almost the same amount.

3/ Based on country data in Food Balance Sheets, 1964-66, FAO, Rome, 1971.

The Production Record, 1960-74

Projections of cereal production are extensions of trend calculated from the historical experience 1960-74. This is the conventional procedure, the same as that followed in the FAO projections. However, there remains some question as to whether the advent of the "green revolution" occasioned an upward shift in trend of cereal production in the more recent period.

A comparison of the trend rates for 1960-74 and for the last half of that period, 1967-74 (table 1), suggests this is not the case. For DME countries combined, the longer-term trend of 2.50 percent per year is reduced to 1.69 percent in the more recent period. Reductions occur in all regions and in 18 of the 23 IFPRI country/country groups. While the production trends for 1967-74 cover too short a period and are subject to too much variation from intermittent bad weather to be considered valid for statistical projection, the pervasiveness of the recent experience suggests that many countries may have considerable difficulty in maintaining long-term production trend growth rates in the future, unless actions are taken to spur production.

The possibility that the cereal production trend is slowing in most of the developing world is a matter which requires close attention and study.

The production performance of the individual grains in major regions is shown in table 2. In Asia, wheat production has shown strong growth, the most visible evidence of the "green revolution." Nevertheless, growth rates for rice and other small grains, which are by far more important in production and consumption, are lagging considerably behind population increases. This is particularly the case in India and Bangladesh. Furthermore, all cereals, except wheat in Asia, show slower growth rates in 1967-74 than in 1960-74. If the 1967-74 production rate were to prevail, cereal production in DME countries would be almost 100 million tons smaller than at the 1960-74 rate, and the projected cereal deficit would be doubled, i.e., about200 million tons.

In the North Africa/Middle East region, performance of wheat and rice during 1960-74 has been creditable but production of coarse grains, which accounts for 40 percent of regional cereal production, lags.

In Sub-Saharan Africa, both millets and coarse grains, which are the dominant cereals, show production rates much below population growth.

In Latin America, production of coarse grains (maize), the major staple, has increasedquite rapidly, as has rice, but wheat production has not.

For all DME countries combined, the 1960-74 production growth rates for rice, millets and coarse grains which together account for some three-fourths of DME cereal production, fail to come up to the population growth rate projected for the next decade.

TABLE 1

GROWTH RATES: POPULATION AND CEREAL PRODUCTION
(Percent Per Annum Compounded)

Country/Region	Population 1975-85	Cereal Production 1967-74	Cereal Production 1960-74*	Cereal Production Required to Meet Deficit by 1985/86**
Asia High Income	2.31	.99	2.20	11.31
Asia Low Income:				
India	2.46	1.96	2.59	3.32
Bangladesh	2.88	.41	1.21	4.47
Pakistan	3.26	4.92	5.47	3.91***
Indonesia	2.56	4.11	2.74	5.78
Philippines	3.17	3.07	3.63	5.38
Thailand	3.20	3.69	3.71	.65***
Other Asia	2.30	.97	1.23	2.60
Total Asia Low Income	2.63	2.01	2.44	3.54
TOTAL ASIA	2.61	1.95	2.42	4.16
N.Africa/Mid.East OPEC	3.28	-.98	2.00	7.91
N.Africa/Mid.East Non-OPEC:				
Egypt	2.31	1.92	2.54	5.68
Turkey	2.63	-.69	1.62	2.70
N.Africa/Mid.East High Inc.	3.10	6.69	4.17	6.37
N.Africa/Mid.East Low Inc.	2.99	.76	1.43	3.89
Total N.Af./Mid.East Non-OPEC	2.77	1.46	2.23	4.36
TOTAL N.AFRICA/MID. EAST	2.93	.90	2.18	5.26
Nigeria	2.99	.58	-0.09	6.82
Sub-Sahara High Income	2.76	1.86	2.76	4.46
Sub-Sahara Low Income	2.82	-.33	1.85	3.56
TOTAL SUB-SAHARA	2.88	.32	1.54	4.55
Mexico	3.41	.53	4.32	5.25
Other Mid.American/Caribbean	2.65	2.32	2.69	9.43
Argentina	1.21	2.67	3.28	.98***
Brazil	2.82	3.15	3.94	3.71***
Venezuela	2.93	-2.85	3.20	16.52
Ecuador	3.17	-4.43	.69	11.31
Other Latin America	2.70	2.03	1.87	6.64
TOTAL LATIN AMERICA	2.79	2.23	3.48	3.57
TOTAL DEVELOPING MKT. ECON.	2.71	1.69	2.50	4.25

* Used for projecting production to 1985/86.
** Rate required from 1974 trend value of production to meet 1985/86 high consumption.
*** Exporting country in 1985/86.

TABLE 2

Production Growth Rates for Cereals,
Developing Market Economies, by Regions
(percent per annum)

Region	1960/74				
	Rice	Wheat	Coarse Grains	Millets	All Cereals
Asia	1.98 (1.70)	6.89 (8.23)	1.47 (-0.19)	1.65 (-1.17)	2.42 (1.95)
North Africa/ Middle East	3.36 (-0.93)	2.82 (1.97)	1.23 (-0.08)	0.28 (-5.38)	2.18 (0.90)
Sub-Sahara Africa	3.49 (1.53)	3.57 (0.99)	1.50 (0.64)	0.78 (-0.73)	1.54 (0.32)
Latin America	3.30 (2.30)	1.28 (0.80)	4.17 (2.60)	- -	3.49 (2.23)
TOTAL DME	2.20 (1.67)	4.12 (4.26)	2.50 (1.11)	1.21 (-0.93)	2.50 (1.69)

*Figures in parenthesis are rates for 1967/74

Distribution of Cereal Production, 1974/75
(Percentage)

Region	Rice	Wheat	Coarse Grains	Millets	All Cereals
Asia	59	18	18	5	100
N. Afr/Mid East	6	53	40	1	100
Sub-Sahara Afr.	10	3	56	31	100
Latin America	12	19	69	-	100
TOTAL DME	36	22	36	6	100

The series of charts in this report shows the considerable variability of production in relation to its trend, usually a result of weather factors.

As can be seen from the regional experience (figures 5-9), cereal production during 1967-71 was generally above trend whereas production in 1972-74 was mostly below.

The relative position of production, which was also reflected in consumption to a considerable extent, in recent years is summarized in table 3.

Table 3

Deviations in Cereal Production in Relation to Trend
1969-71, 1974/75, and Prel. 1975/76
(million tons)

Region	1969-71	1974/75	Prel. 1975/76
Asia	+ 7.6	- 7.5	+ 7.0
North Africa/Middle East	+ 0.4	- 0.8	- 0.1
Sub-Sahara Africa	+ 1.3	- 0.8	+ 0.2
Latin America	+ 1.8	- 6.0	- 2.5
TOTAL	+11.2	-15.1	+ 4.6

The crop-year 1975/76 was a very good year in terms of weather and growing conditions in Asia, notably in India, Bangladesh, and Indonesia. Production in Asia was almost 4 percent above trend. On the other hand, Latin America was almost 3½ percent below trend. Total production in all DME countries, which was 3.7 percent above trend in 1969-71 and 4.5 percent below trend in 1974/75, appears to be only 1.3 percent above trend based on preliminary figures for 1975/76. Some magnitudes of possible deviations from trend in relation to the 1985 projection are indicated in the following section.

Potential Cereal Deficits of DME Countries 1985/86

The Global View

Taking all IFPRI Countries/Country Groups together, the projections yield the following deficits:

Table 4

DME Countries: Gross and Net Cereal Deficits
(million tons)

	Actual Average 1969-71	Actual 1974/75	Projected 1985/86	
			High Income	Low Income
Gross deficit * (food deficit countries only)	28.2	44.8	108.3	94.5
Net deficit (deficits-surpluses)	16.7	33.4	82.6	65.5

In 1970, the DME group contained 1.7 billion persons, of whom 1.5 billion were in food-deficit countries. By 1985, projected population would be 2.5 billion, of whom 2.2 billion would be in food deficit countries.

As shown in figure 1, these figures point in the direction of a persistent widening gap between prospective food demand and food production, if the past production trend is repeated.

On a gross basis, the combined deficit of food-short countries by 1985/86 would run 2-2½ times larger than in 1974/75, which was characterized by poor crops, and 3½-4 times larger than the average of 1969-71, when grain harvests and grain consumption were generally quite favorable and above trend.

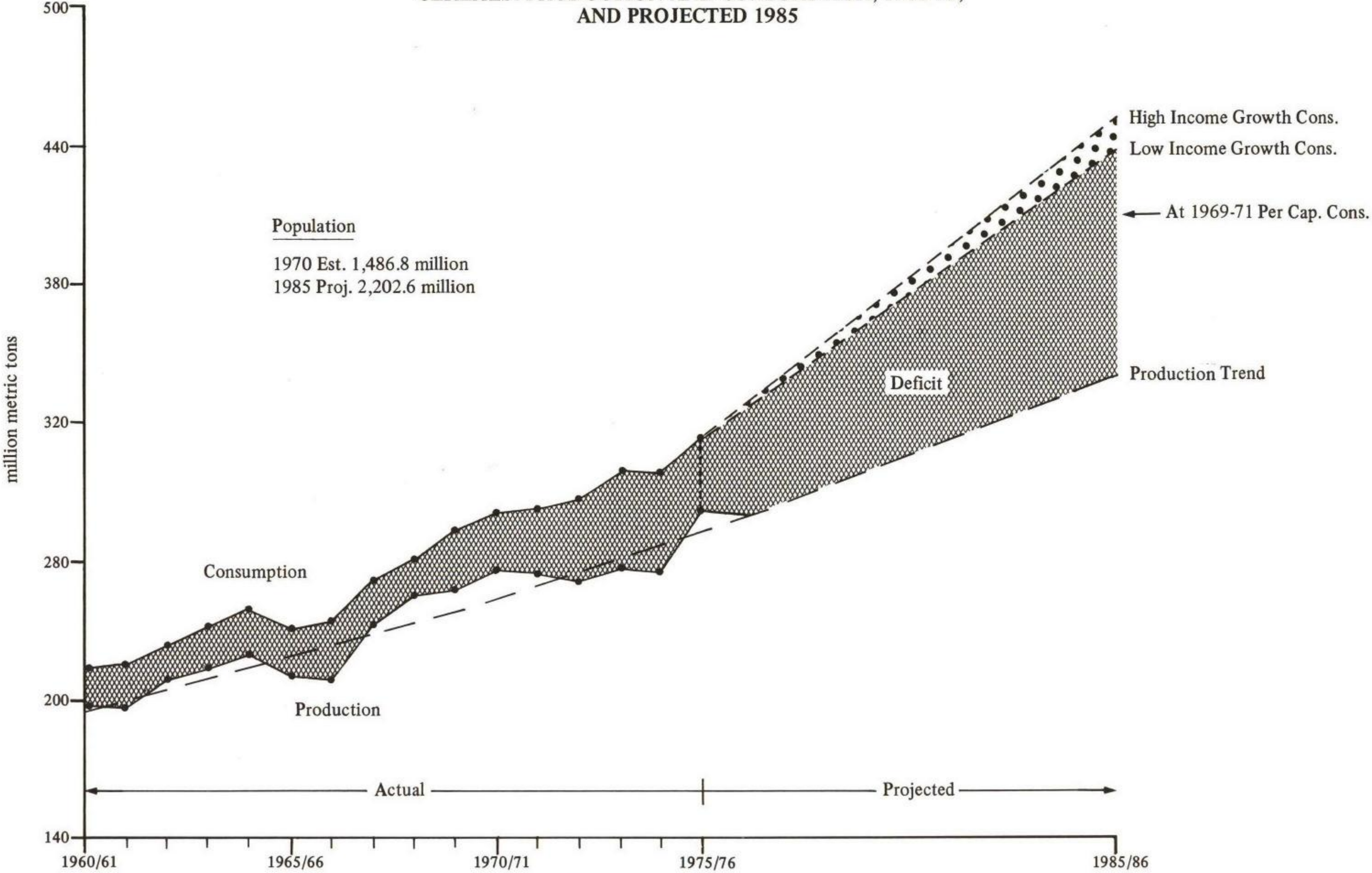
For food-deficit countries, the projections for 1985/86 yield an increase in production from 1969-71 of only about half of the increase in consumption. Of the projected increase in high income consumption, 80 percent comes from population growth, 12 percent reflected the additional demand from the low income growth assumption, and 8 percent from the added impetus to demand from high income growth assumptions. It should also be noted that projected production by 1985 would fall some 70 million tons short of providing the 1969-71 average level of per capita consumption for the larger population by 1985. In that earlier period, a majority of DME countries had average consumption levels deficient in calories.

* Some IFPRI country groups which are treated en bloc include some grain exporters. Thus, the figures of gross deficit are somewhat understated. The adjustment to exclude all exporting countries would increase the deficit by about 1.3 million tons in 1969-71, 1.4 million tons in 1974/75, and 1.4 million tons under the high income assumption and 1.5 million tons under the low income assumption in 1985/86.

FIGURE 1

ALL FOOD DEFICIT DEVELOPING MARKET ECONOMIES*

CEREALS: PRODUCTION AND CONSUMPTION, 1960-75, AND PROJECTED 1985



** See Annex 1 for countries included*

Deficits Associated with Income Group Categories

Classifying the countries projected to be food-deficit in 1985 according to income groups provides some insight as to the burden of potential food deficits and the capacity of those countries to cope with them.

Table 5

Gross Cereal Deficits by Income Groups (million tons)

Country Categories	1969-71 Ave.	1974/75 Ave.	Projected 1985/86 High Income Growth	Projected 1985/86 Low Income Growth	Increase from 1969-71 High Income Growth	Increase from 1969-71 Low Income Growth
Low Income	5.4 *	12.6 *	48.0	41.9	42.6	36.5
Middle Income	10.9	17.1	25.2	22.9	14.6	12.0
High Income	9.3	13.0	34.8	29.7	25.5	20.4
TOTAL	25.6 *	42.7 *	108.3	94.5	82.7	68.9

* Does not include deficits for Pakistan and Brazil which are projected to become exporters by 1985.

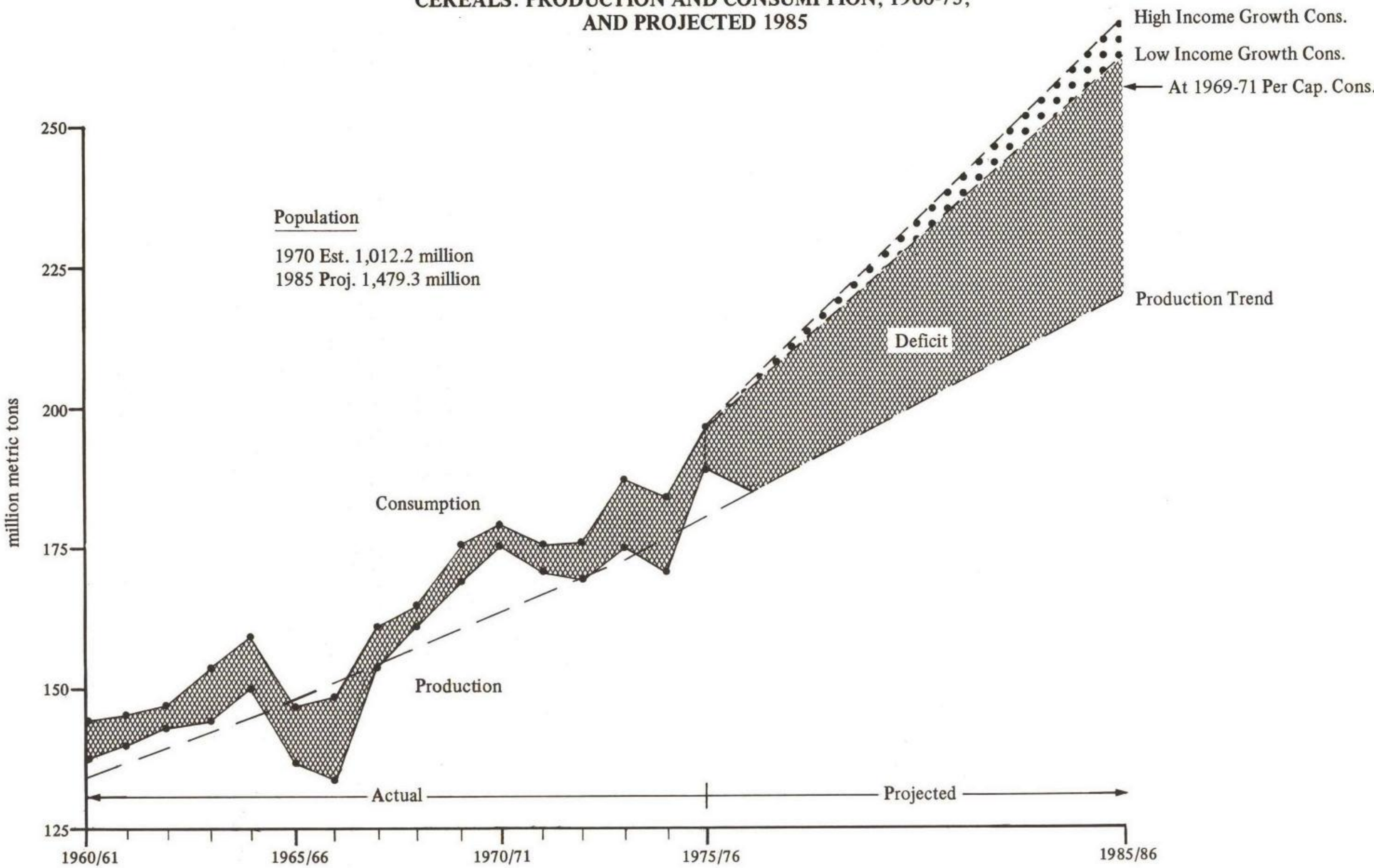
Low income countries are those with per capita incomes of less than $200 in 1972.1/ As shown in Annex 1, Table 1, these include the South Asian countries, Indonesia, a few in North Africa/Middle East, Nigeria, and a large number of Sub-Saharan countries. They encompass close to 60 percent of the total population in DME countries. In most, agriculture is the dominant sector of the economy, but food production is particularly subject to weather and other uncertainties and does not keep pace with food needs. Being poor and underfed, the income elasticity for cereals is high but income growth is relatively slow, Inasmuch as the oil price situation has affected the oil importing countries most severely, economic growth may well lag further in the decade ahead dampening demand for food, with the consequence that any improvement in diets is likely to be little, if at all. More than half of the total increase in deficit from 1969-71 to 1985/86 accrues to this group of countries. In the event of their failure to compensate with increased production, this group would have difficulty in importing supplies commercially and would need to look to a large measure of food aid. Further, as shown in figure 2, large variations in production do occur in these countries.2/ Taking the largest percentage deviations from trend that occurred during 1960-74, production in 1985 could range from plus 16 million tons to minus 24 million tons relative to trend, affecting consumption and/or deficit accordingly.

1/ Based on data in World Bank Atlas, Washington, 1974.
2/ Note the differences in scale charted for the various income categories and regions in making visual comparisons among them.

FIGURE 2

LOW INCOME FOOD DEFICIT DEVELOPING MARKET ECONOMIES*

CEREALS: PRODUCTION AND CONSUMPTION, 1960-75, AND PROJECTED 1985



** See Annex 1 for countries included*

Most countries in this group had average diets in 1970 significantly deficient in energy (calories) and quite likely they contained the large part of the underfed population in the developing world. Even if consumption of cereals attained projected levels in 1985, per capita consumption of cereals would be improved only by two percent under the low income assumption and by 4 percent under the high assumption.

At the other extreme is the high income group (high capacity to earn foreign exchange) which includes the North Africa/Middle East OPEC nations, Venezuela, and the high economic growth countries of Asia, such as Taiwan, South Korea, Malaysia, Singapore, and Hong Kong. Together, they contain some 8 percent of the population in DME countries. Most have limited agricultural resources domestically to meet rapidly rising demand for cereals, including feed grains. The impetus to economic growth comes largely from the non-agricultural sector. About 30 percent of the total increase in deficit projected occurs in this group. Their needs would likely be reflected in commercial imports since they have ability to generate foreign exchange. Considering the largest deviations in production from trend since 1960, production in 1985 could range from trend by plus 3 million tons to minus 2½ million tons, most likely reflected in compensating adjustments in imports.

At projected consumption levels for 1985, per capita consumption of cereals would be increased by 29 percent under the low income assumption and 41 percent under the high. Most of it would reflect increased use for feed. (See figure 3.)

In between in characteristics is the middle income group which encompasses the rest of the food deficit countries, the Philippines, Egypt, Turkey, most non-OPEC countries of North Africa/Middle East, the better-off Sub-Saharan countries and the Latin American deficit countries. Some 20 percent of DME population fall in this group which would account for about 18 percent of the increase in cereal deficit. Some may well represent commercial import markets; others may need some measure of food aid to overcome potential deficits. Again, variations in production could bring a range in 1985 production from plus 6 million tons to minus 9 million tons.

At projected consumption levels for the middle income group, average per capita consumption would rise 5 percent under the low income situation and 8 percent under the high assumption. (See figure 4.)

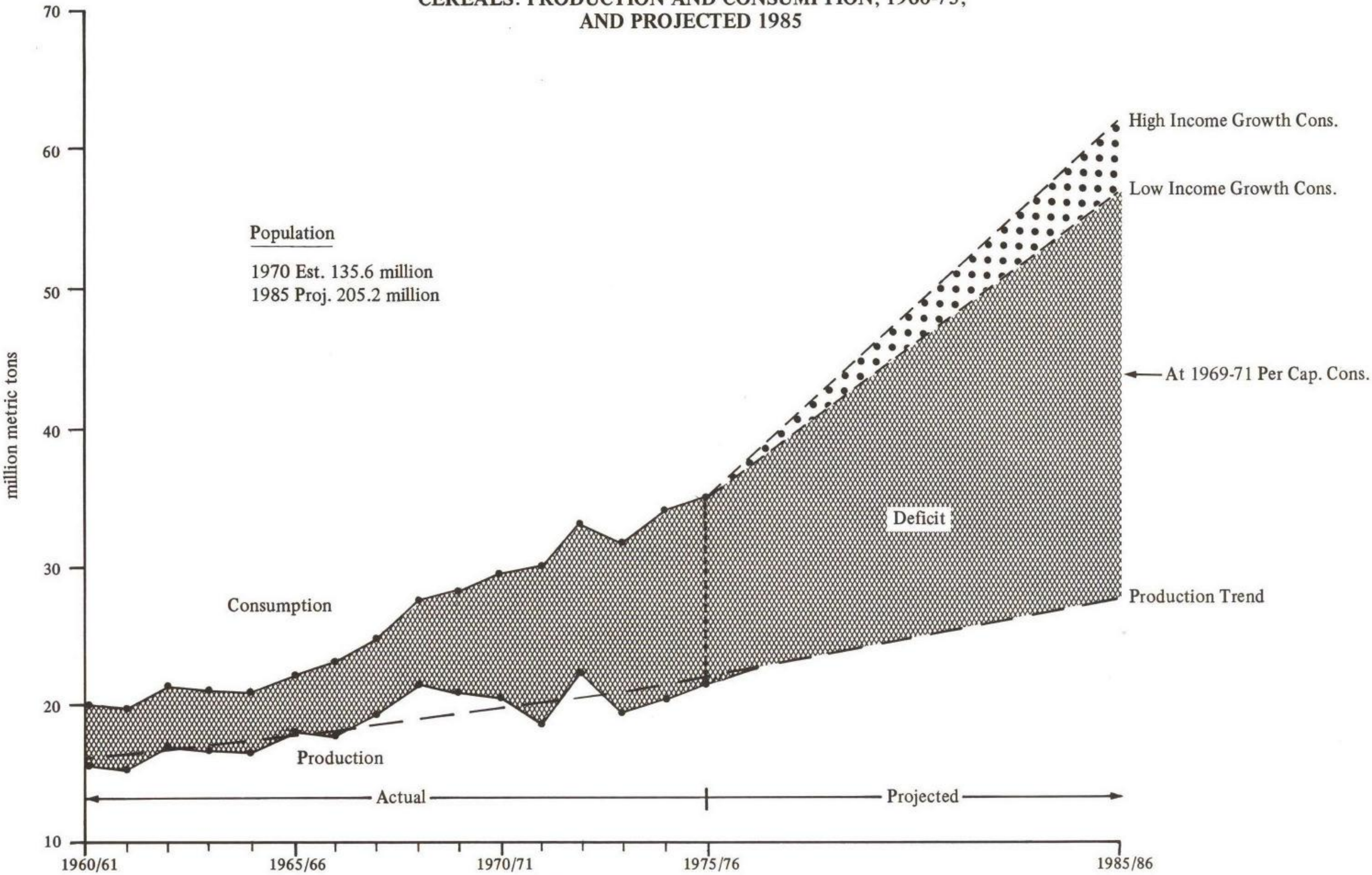
A significant point is that a substantial part of the total deficit, perhaps 40 - 50 percent, can be, and likely should be, met through regular commercial dealings which draw on supplies from exporting countries.

In this connection, the surpluses of developing export countries--Argentina, Thailand, and probably Pakistan and Brazil, which are expected to become exporters within the next 10 years--are projected to increase to about 26 - 29 million tons, roughly one-fourth

FIGURE 3

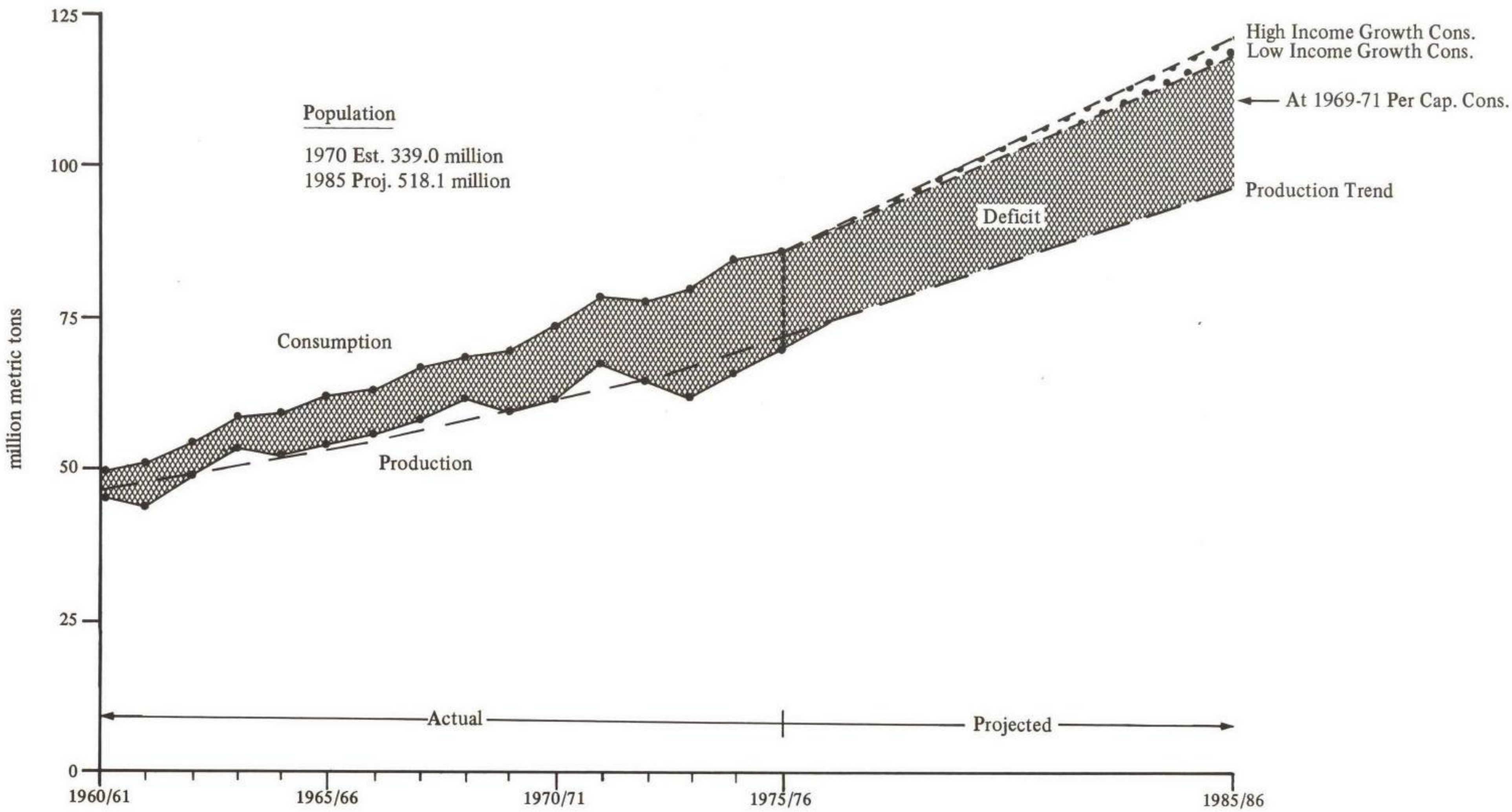
HIGH INCOME FOOD DEFICIT DEVELOPING MARKET ECONOMIES*

CEREALS: PRODUCTION AND CONSUMPTION, 1960-75, AND PROJECTED 1985



** See Annex 1 for countries included*

FIGURE 4
MIDDLE INCOME FOOD DEFICIT DEVELOPING MARKET ECONOMIES*
CEREALS: PRODUCTION AND CONSUMPTION, 1960-75, AND PROJECTED 1985

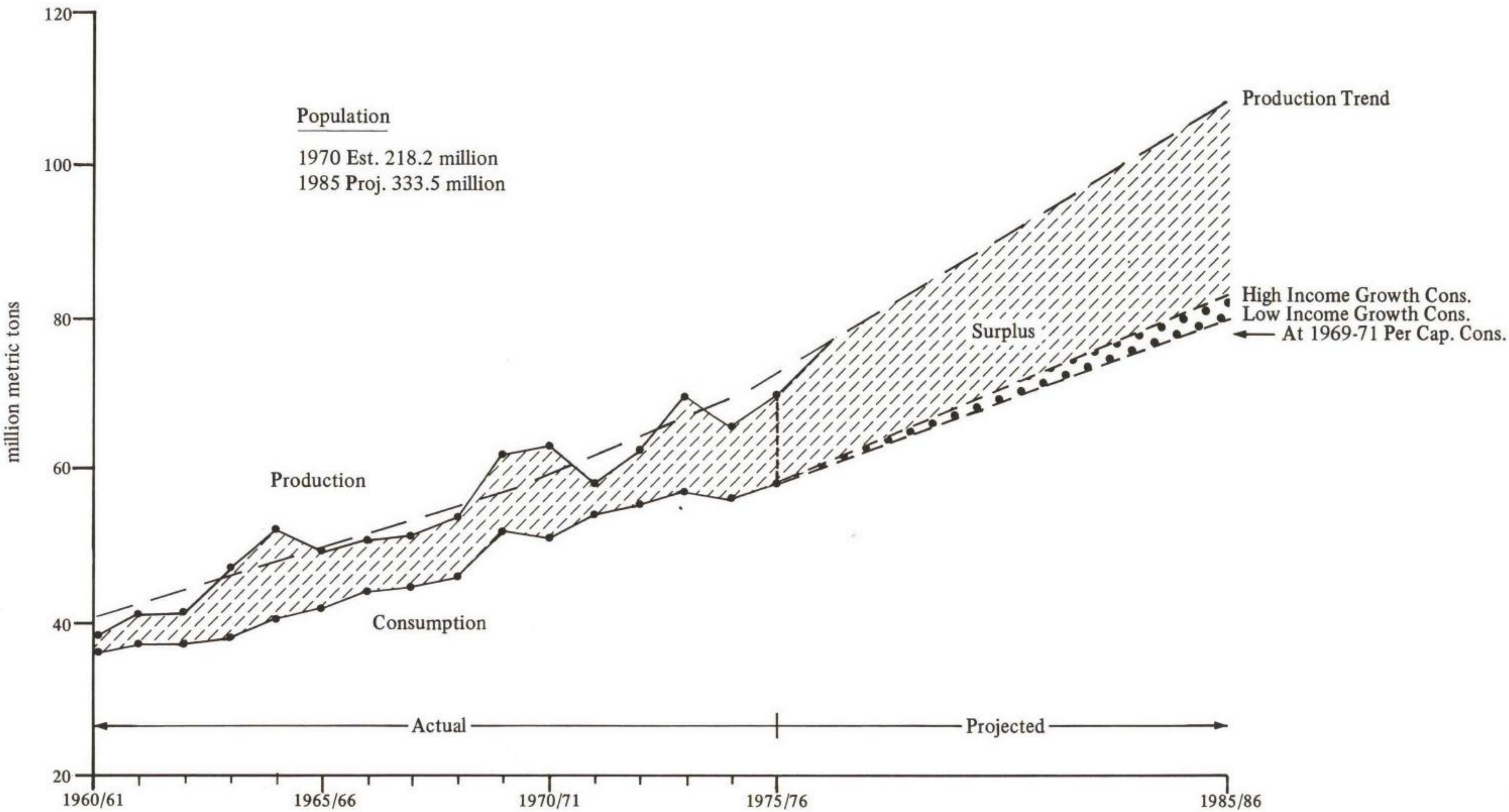


** See Annex 1 for countries included*

FIGURE 5

CEREAL EXPORTING DEVELOPING MARKET ECONOMIES*

CEREALS: PRODUCTION AND CONSUMPTION, 1960-75, AND PROJECTED 1985



** See Annex 2 for countries included*

of the combined deficit. Variations in production for 1985 could bring a range of plus 10 million tons to minus 6½ million tons, probably reflected in changes in export volume. It is likely that the bulk of export supplies in these countries would be available only on commercial terms. Some 13 percent of DME population lives in these countries. (See figure 5.)

The real core of the food deficit problem is in the projected deficits of the low income deficit group, where needs, which more than doubled between 1969-71 and 1974/75, may increase further by three or four fold in the next decade.

The cost of filling deficits by imports in 1985 by the low income group would appear to be beyond their prospective foreign exchange earnings. In this circumstance, a massive increase in food aid would be required just to maintain per capita consumption at recent unsatisfactory levels. The better alternative, and probably much less costly, would be to help these countries improve their own production to meet their food needs. But this, too, would be a large order. It would require raising their cereal production performance from the long-term average of 2.0 percent a year to almost 4 percent during the next decade. Realistically food production in these countries is not likely to increase rapidly enough in the next decade to meet their growing demands, much less overcome the serious nutritional deficiencies of large portions of their populations. Even with production increasing more rapidly than in the past, there would likely be a continuing need for food transfers, though possibly on a diminishing scale.

The Regional View

Table 6 summarizes the regional impact of cereal deficits. While gross deficits increase in all regions, there is a significant shift in relative positions. Asia accounts for about 50 percent of the total projected for 1985/86 compared with 40 percent in recent times. Sub-Sahara Africa's share increases from 5 to 15 percent. Latin America's share declines by half, from 28 to 14 percent, while that of North Africa/Middle East goes from 27 to 23 percent.

Considering the availability of supplies from exporting countries in the region, Latin America alone is projected to be self-sufficient and possibly in a net export position, largely as a result of Argentina's traditional surplus.

For Asia, as a region, to meet its food needs from regional production by 1985, the production growth rate, which has lagged behind population growth, would need to rise from 2.4 percent annually to 4.2 percent. The increase required may be even greater if the 2.0 percent average increase recorded in 1967-74 continues.

For North Africa/Middle East, production also has lagged behind population, and would require an increase from 2.2 percent a year to

TABLE 6

REGIONAL CEREAL DEFICITS
(million tons)

Region	Gross Deficit 1/			
	Actual Ave. 1969-71	Actual 1974/75	Projected 1985/86	
			High Income	Low Income
Asia	11.5	18.3	54.8	46.3
North Africa/Middle East	7.9	12.0	22.5	21.4
Sub-Sahara Africa	1.5	2.1	14.9	13.7
Latin America	7.3	12.4	16.1	13.2
TOTAL	28.2	44.8	108.3	94.5

Region	Net Deficit 2/			
	Actual Ave. 1969-71	Actual 1974/75	Projected 1985/86	
			High Income	Low Income
Asia	8.3	15.1	45.9	36.8
North Africa/Middle East	7.9	12.0	22.5	21.4
Sub-Sahara Africa	1.5	2.1	14.9	13.7
Latin America	(1.0)	4.2	(0.7)	(6.4)
TOTAL	16.7	33.4	82.6	65.5

Note: Parenthesis indicates surplus.
1/ Sum of food deficit countries.
2/ Gross deficits minus surpluses of exporting countries in the region.

5.3 percent. Again, the more recent growth rate shows a drastic drop to 0.9 percent.

Sub-Sahara Africa's production record of 1.5 percent per year would need to rise to 4.5 percent. The more recent performance has shown only 0.3 percent rise per year.

Latin America, considering the region as a whole, with a high growth rate of 3.5 percent, significantly above population growth, would not need to accelerate production, unless the drop to 2.2 percent recorded for 1967-74 continues.

Asia
(See figure 6 and table 7A)

High Income Group: These countries are consistently high foreign exchange earners and increasingly urban in character. They presently import about 40 percent of their cereal consumption, which rises rapidly especially for feed. By 1985 commercial imports may well account for 55 - 60 percent of consumption, rising from less than six million tons average in 1969-71 to the range of 17 - 20 million tons according to low and high income growth assumptions. Taiwan and South Korea would account for 75 - 80 percent of the total cereal deficit.

India: With over half of the people in Asia DME countries, India could incur a deficit of 14 - 17 million tons by 1985 if historical production trends prevail in the future. Even if India should be able to bring in 17 million tons, it would barely suffice to make cereal availability per capita equal to that of 1969-71 which was a relatively favorable production period. At that time, moreover, average per capita calorie intake was significantly below minimum adequate standards, with India accounting for perhaps half of the underfed in all DME countries. Their numbers of underfed would likely increase substantially by 1985 even if the deficit is met.

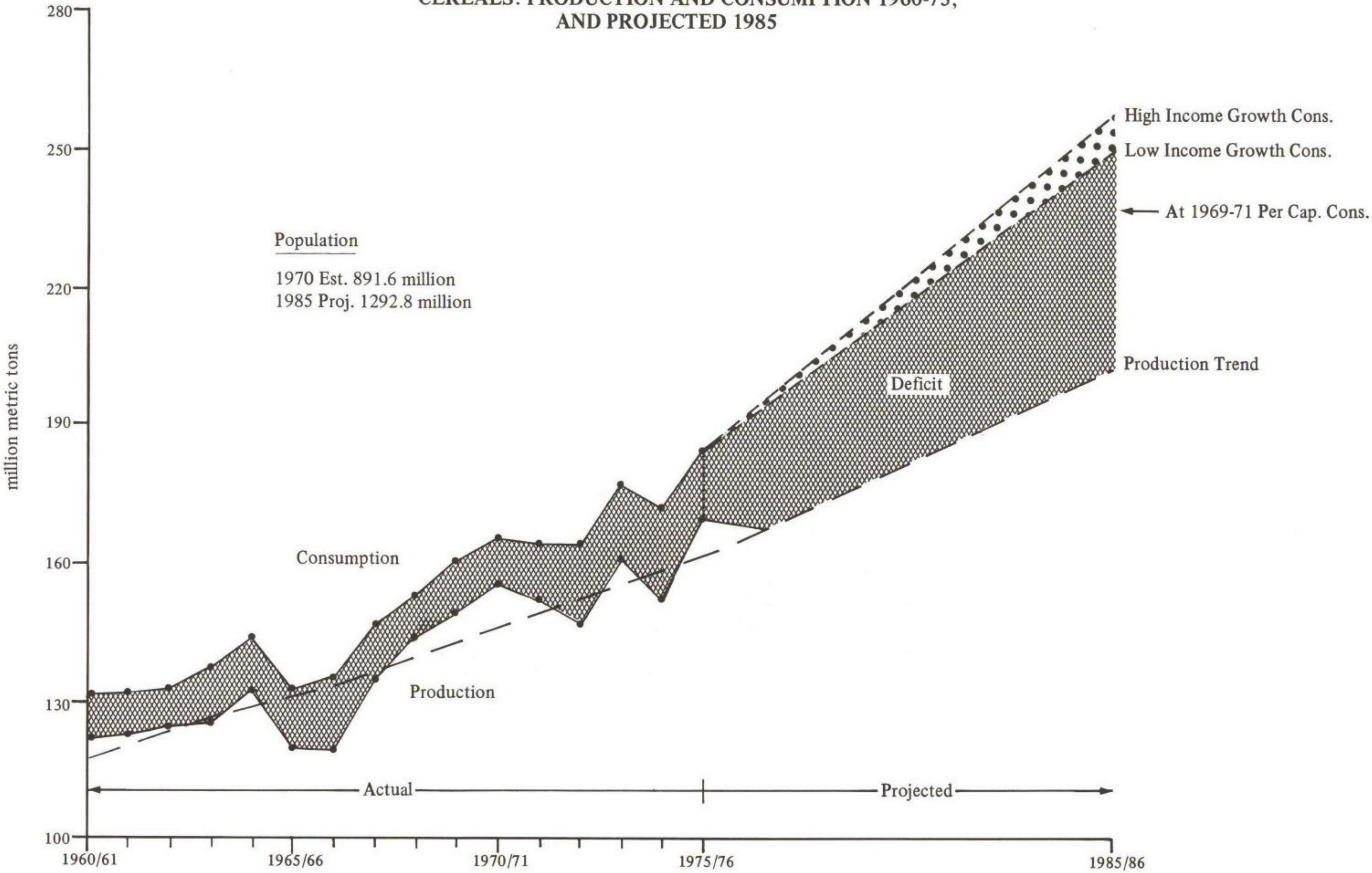
For India to meet the deficit by its own production would require accelerating its rate from 2.6 percent (1960-74 average) to 3.3 percent (see table 1). This may be even more difficult since the more recent rate (1967-74) indicates some slackening.

Bangladesh: The position of Bangladesh is even more difficult than India's, with again a large part of the population ill-fed. The trend of production (1960-74) increases at 1.2 percent per year, whereas the rate of population growth to 1985 increases 2.9 percent. Production increases have been negligible (0.4 percent) in the 1967-74 period. For Bangladesh to meet its deficit from internal production would require a rate of 4.5 percent a year which hardly seems a likely achievement on a sustained basis even under the best of circumstances. The potential deficit by 1985 of 5-5½ million tons, even if met, would still leave an increasing number with inadequate calorie intake.

Pakistan: While this country has been an importer for some years, it is projected to become an exporter of 3½-4 million tons by 1985. Its historical production rate (5.5 percent annually) substantially exceeds its relatively high population growth. Even though production increases have slowed in the recent periods, they are still close to 5 percent.

Indonesia: As a recipient of oil revenues, Indonesia's economy might well be expected to grow more rapidly. With a high income elasticity for cereals, demand for cereals is expected to increase very substantially. Compared with its historical production rate, the deficit would increase from 1.3 million tons in 1969-71 to 6½-8½ million tons by 1985. To meet this from internal production

FIGURE 6
ASIA: FOOD DEFICIT DEVELOPING MARKET ECONOMIES*
CEREALS: PRODUCTION AND CONSUMPTION 1960-75, AND PROJECTED 1985



** See Annex 1 for countries included*

TABLE 7-A

ASIA DEVELOPING MARKET ECONOMIES:
CEREAL PRODUCTION, CONSUMPTION, AND SURPLUS/DEFICIT
(million tons)

Country/Group	Actual 1969-71 Ave.			Actual 1974/75		
	Prod.	Cons.	S/D	Prod.	Cons.	S/D
Asia High Income Group	9.6	15.4	-5.8	9.9	16.7	-6.7
Asia Low Income Group:						
India*	101.7	104.0	-2.2	97.8	104.5	-6.7
Bangladesh	11.1	11.8	-0.7	11.5	13.8	-2.3
Pakistan	10.5	11.3	-0.8	11.6	11.9	-0.3
Indonesia	15.6	16.9	-1.3	18.6	19.7	-1.2
Philippines	5.4	6.1	-0.7	5.9	6.7	-0.8
Thailand	11.0	7.9	+3.2	12.3	9.1	+3.2
Other Asia	9.3	9.3	0.0	9.5	9.9	-0.3
Total Asia Low Income Group	164.8	167.3	(-5.7) (+3.2) -2.5	167.3	175.6	(-11.6) (+3.2) -8.3
TOTAL ASIA	174.4	182.7	(-11.5) (+3.2) -8.3	177.2	192.3	(-18.3) (+3.2) -15.1

Country/Group	Projected 1985/86						
	Prod.	Cons.			S/D		
		High Growth	Low Growth	At 1969-71 per cap	High Growth	Low Growth	At 1969-71 per cap
Asia High Income Group	13.1	33.5	29.9	21.8	-20.4	-16.8	-8.7
Asia Low Income Group:							
India*	133.5	150.3	147.8	149.8	-16.8	-14.2	-16.3
Bangladesh	13.1	18.6	18.4	17.2	-5.5	-5.3	-4.1
Pakistan	22.3	18.6	18.4	18.2	+3.7	+3.9	+4.1
Indonesia	23.3	31.9	30.0	24.8	-8.6	-6.7	-1.5
Philippines	8.7	10.5	10.3	9.9	-1.8	-1.5	-1.1
Thailand	18.4	13.1	12.8	12.7	+5.3	+5.6	+5.7
Other Asia	10.9	12.6	12.5	13.2	-1.7	-1.7	-2.3
Total Asia Low Income Grp.	230.2	255.7	250.2	245.8	(-34.4) (+9.0) -25.5	(-29.4) (+9.4) -20.0	(-25.4) (+9.8) -15.6
TOTAL ASIA	243.3	289.1	280.1	267.6	(-54.8) (+9.0) -45.9	(-46.2) (+9.4) -36.8	(-34.1) (+9.8) -24.3

Note: Parentheses sum deficits and surpluses separately. Net deficit or surplus shown without parentheses. Totals may not add due to rounding.

* India includes pulses.

would require an increased rate of production to 5.8 percent per year compared with the historical rate of 2.7 percent. It might be almost a million tons larger reflecting some lag in cassava production which provides one-third as much calories as cereals in the diet. On the other hand, the recent production trend of cereals has risen to 4.1 percent which, if carried forward, would largely eliminate the deficit.

Philippines: Domestic production of cereals has been about 12 percent short of consumption in recent periods. As a percentage, this is expected to narrow to about 8 percent by 1985, but the deficit will increase in amount from 1.2 - 1.3 million tons to 1.5 - 1.8 million, largely a reflection of demand for feed. In order to meet cereal demand from domestic production, the historical increase of 3.6 percent per year would need to be raised to 5.4 percent. Again, the recent rate (1967-74) has been somewhat reduced.

Thailand: A traditional exporter of rice and maize, with a fairly high production growth rate of 3.7 percent a year, which has also been well-maintained in recent years, Thai exports are projected to increase from some 3.2 million tons to 5.3 - 5.6 million tons annually by 1985.

Other Asia: This group was roughly in balance in 1969-71 as a result of surpluses in Burma and Nepal compensating for a deficit in Sri Lanka. By 1985, all three countries are projected to be in deficit by about 1.7 million tons. To meet this internally would require an increase in rate of production from 1.2 to 2.6 percent a year.

North Africa/Middle East

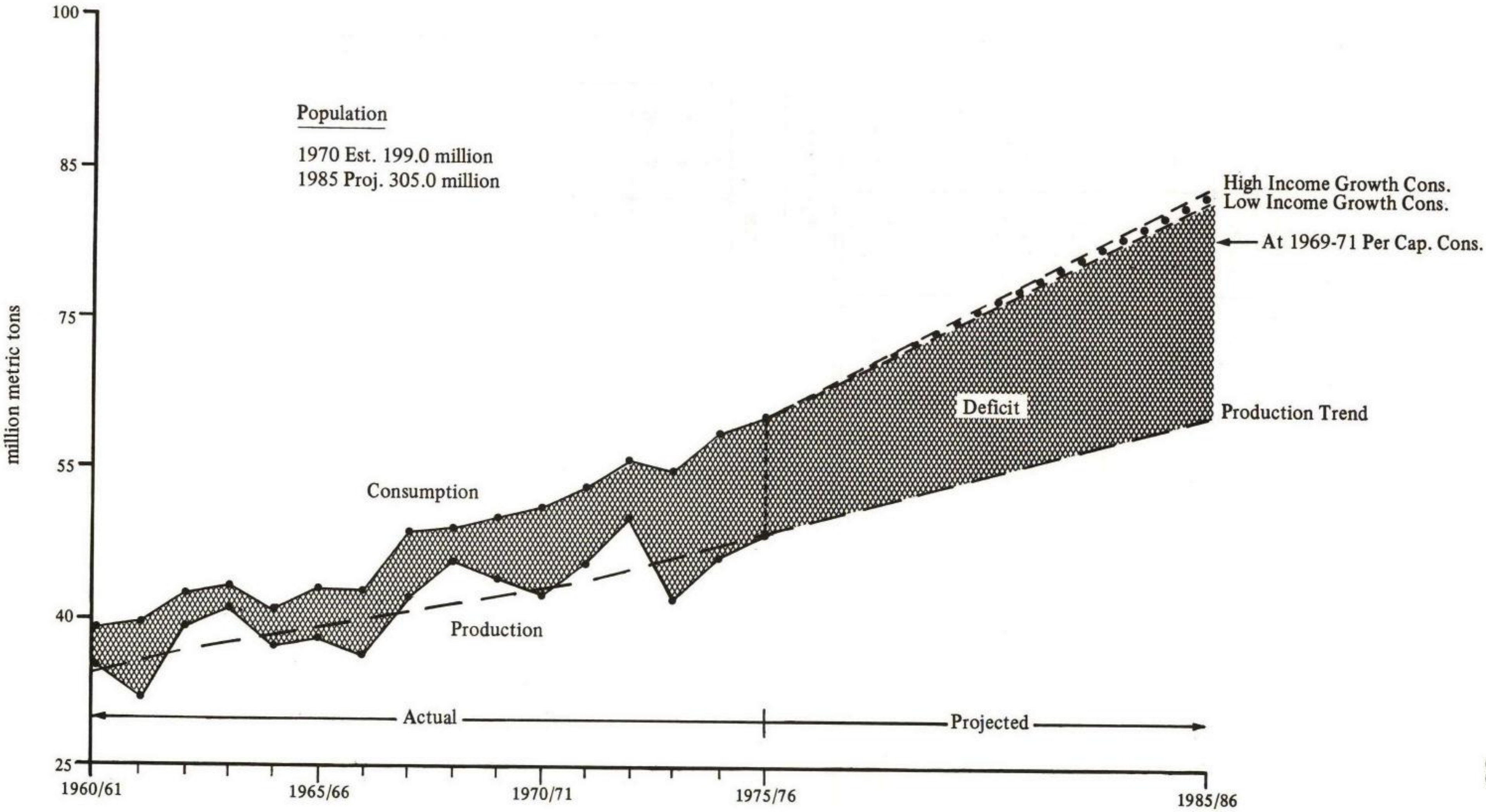
(see figure 7 and table 7-B)

OPEC: This regional group consists of commercial importers who presently produce about two-thirds of their cereal consumption. Production during 1960-74 grew at the annual rate of 2.0 percent; during the 1967-74 period, it declined on average by 1.0 percent a year. With high food demand, the food deficit (imports) is projected to increase from 2.6 million tons in 1969-71, 4.8 million tons in 1974/75 to about 11 million tons in 1985. This would bring an appreciable increase in per capita consumption.

Egypt: This country is a consistent importer. In 1969-71 imports accounted for one-fourth of cereal consumption and in 1974/75 about one-third. The historical production growth rate of 2.5 percent would hold the deficit within this range, about 3½ million tons. Egypt also has shown some slowing in production in recent years. To meet food demand internally would require an annual increase of 5.7 percent.

Turkey: A slow rate of production growth (1.6 percent), which in recent years has turned negative, is bringing increasing import requirements. The cereal deficit by 1985 would rise to about 2 million

FIGURE 7
NO. AFRICA/MIDEAST: FOOD DEFICIT DEVELOPING MARKET ECONOMIES*
CEREALS: PRODUCTION AND CONSUMPTION 1960-75,
AND PROJECTED 1985



* *See Annex 1 for countries included*

TABLE 7-B

NORTH AFRICA/MIDDLE EAST: GRAIN PRODUCTION, CONSUMPTION, SURPLUS/DEFICIT
(million tons)

Country/Group	Actual 1969-71 Ave.			Actual 1974/75		
	Prod.	Cons.	S/D	Prod.	Cons.	S/D
N.Afr./Mid. East OPEC	9.7	12.2	-2.6	10.0	14.8	-4.8
N.Afr./Mid. East Non-OPEC:						
Egypt	6.5	8.5	-2.0	7.1	10.6	-3.5
Turkey	15.2	15.6	-0.4	13.9	15.0	-1.1
Other High Income Grp.	5.9	8.3	-2.4	8.9	10.8	-2.0
Other Low Income Grp.	6.3	6.7	-0.4	6.6	7.2	-0.6
Total N.Afr./Mid. East Non-OPEC	33.9	39.2	-5.3	36.5	43.7	-7.2
TOTAL N.AFR./MID. EAST	43.6	51.4	-7.9	46.5	58.5	-12.0

Country/Group	Projected 1985/86						
	Prod.	Cons.			S/D		
		High Growth	Low Growth	At 1969-71 per cap	High Growth	Low Growth	At 1969-71 per cap
N.Afr./Mid.East OPEC	13.2	24.5	23.9	19.7	-11.4	-10.7	-6.5
N.Afr./Mid.East-Non-OPEC:							
Egypt	9.7	13.4	13.3	12.1	-3.6	-3.6	-2.4
Turkey	18.3	20.5	20.3	22.9	-2.2	-2.0	-4.6
Other High Inc.Grp.	11.7	14.6	14.4	13.0	-2.9	-2.7	-1.3
Other Low Inc.Grp.	7.8	10.2	10.1	10.4	-2.4	-2.3	-2.6
Total N.Afr./Mid.-East Non-OPEC	47.5	58.7	58.1	58.4	-11.2	-10.6	-10.9
TOTAL N.AFR./MID.EAST	60.7	83.2	82.0	78.0	-22.5	-21.4	-17.4

Note: Totals may not add due to rounding.

tons compared with one million in 1974/75 and an average of less than ½ million tons in 1969-71.

Non-OPEC High Income: Excluding OPEC countries, these include the band of North Africa along the Mediterranean from Lebanon to Morocco. Most are consistent cereal importers, but occasionally some export. They have a high production growth rate (4.2 percent) which would yield a deficit of somewhat less than 3 million tons by 1985 compared with 2½ million tons in 1969-71. However, the more recent production of 6.7 percent (1969-74), if maintained, could well make them self-sufficient as a group. The major deficit countries projected for 1985 are Lebanon and Syria.

Non-OPEC Low Income: The production growth rate of 1.4 percent is substantially below population growth. In recent years (1967-74) it has fallen by a half. The deficit is projected from about ½ million tons in recent years to approach 2½ million tons by 1985. It would require production increases of almost 4 percent annually to meet the deficit. Afghanistan and Sudan are the major countries involved.

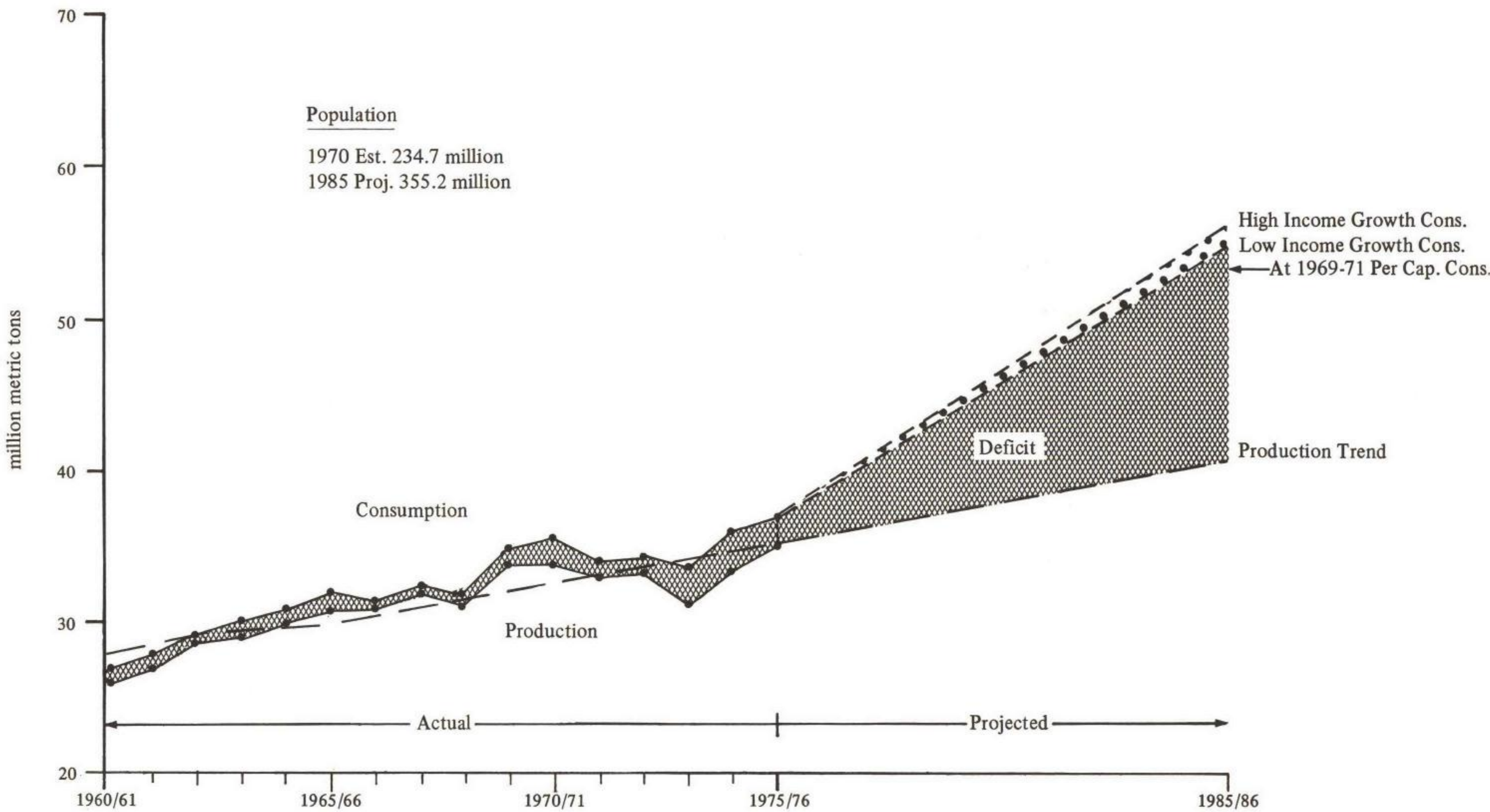
Sub-Sahara Africa
(see figure 8 and table 7-C)

Nigeria: The production record for cereals is slightly negative for 1960-74 (slightly positive for 1967-74). With relatively high income growth from oil revenues, a high income elasticity, and population growing at 3 percent a year, a large deficit of 7½ - 8 million tons of cereals is projected for 1985 compared with less than ½ million in recent years.

However, production of cassava and yams, which is a preferred food (and calorie substitute) in much of Nigeria increases somewhat faster than population and thus reduces the cereal deficit in 1985 by the equivalent of about one million tons. It may well be easier, particularly over the short-run, to increase production of root crops faster than cereals in order to meet food demand. However, since these root crops require much larger bulk to provide calories than do cereals, and are low in protein, demand may shift toward cereals, as has occurred in other countries. A cereal production growth rate of almost 7 percent annually would be required to meet food needs projected for 1985.

Sub-Sahara High Income: These countries, with per capita incomes over $200, are mostly in West Africa and, in many cases, are oriented toward plantation export crops. Cereal production increases about 2.8 percent a year (1.9 percent in 1967-74), a rate which will increase the deficit of less than one million tons in 1969-71 to about 2 million tons by 1985. A rate of 4.5 percent annually would be required to meet the cereal deficit. Taking root crops into account would reduce the deficit by ½ million tons. Senegal, Ivory Coast and Cameroon would likely account for a major part of the deficit. Depending on the terms

FIGURE 8
SUB-SAHARA AFRICA: FOOD DEFICIT DEVELOPING MARKET ECONOMIES*
CEREALS: PRODUCTION AND CONSUMPTION 1960-75
AND PROJECTED 1985



** See Annex 1 for countries included*

TABLE 7-C

SUB-SAHARA AFRICA: GRAIN PRODUCTION, CONSUMPTION, SURPLUS/DEFICIT
(million tons)

COUNTRY/GROUP	Actual 1969/71 Ave.			Actual 1974/75		
	Prod.	Cons.	S/D	Prod.	Cons.	S/D
Sub-Sahara Africa:						
Nigeria	8.4	8.7	-0.4	8.0	8.4	-0.3
Other High Income	6.6	7.4	-0.8	7.5	8.1	-0.6
Other Low Income	18.6	18.9	-0.3	18.2	19.4	-1.2
Total Sub-Sahara	33.5	35.0	-1.5	33.7	35.8	-2.1

COUNTRY/GROUP	Projected 1985/86						
	Prod.	Cons.			S/D		
		High Growth	Low Growth	At 1969/71 per cap	High Growth	Low Growth	At 1969/71 per cap
Sub-Sahara Africa:							
Nigeria	7.5	15.5	15.1	13.4	-8.1	-7.6	-6.0
Other High Income	10.0	12.0	11.9	11.1	-2.0	-2.0	-1.1
Other Low Income	24.0	28.8	28.1	28.5	-4.8	-4.1	-4.5
Total Sub-Sahara	41.4	56.3	55.1	53.0	-14.9	-13.7	-11.6

Note: Totals may not add due to rounding.

of trade for their exports, these countries could well be commercial importers.

Sub-Sahara Low Income: This large group of countries with less than $200 income per capita is mostly located in Central and East Africa. The production growth rate of 1.9 percent runs substantially below population growth. During 1967-74 it was slightly negative. The cereal deficit is projected to rise from less than half a million tons in 1969-71 and over one million in 1974/75 to 4 - 5 million tons by 1985. Even if the deficit is met, per capita consumption will hardly be improved over 1969-71 levels. To meet the deficit internally, a production growth rate of 3.6 percent a year would be required. Again, increasing production of root crops would reduce the cereal deficit by about ½ million tons. Tanzania and Ethiopia would likely incur the largest deficits in this group.

Latin America

(see figure 9 and table 7-D)

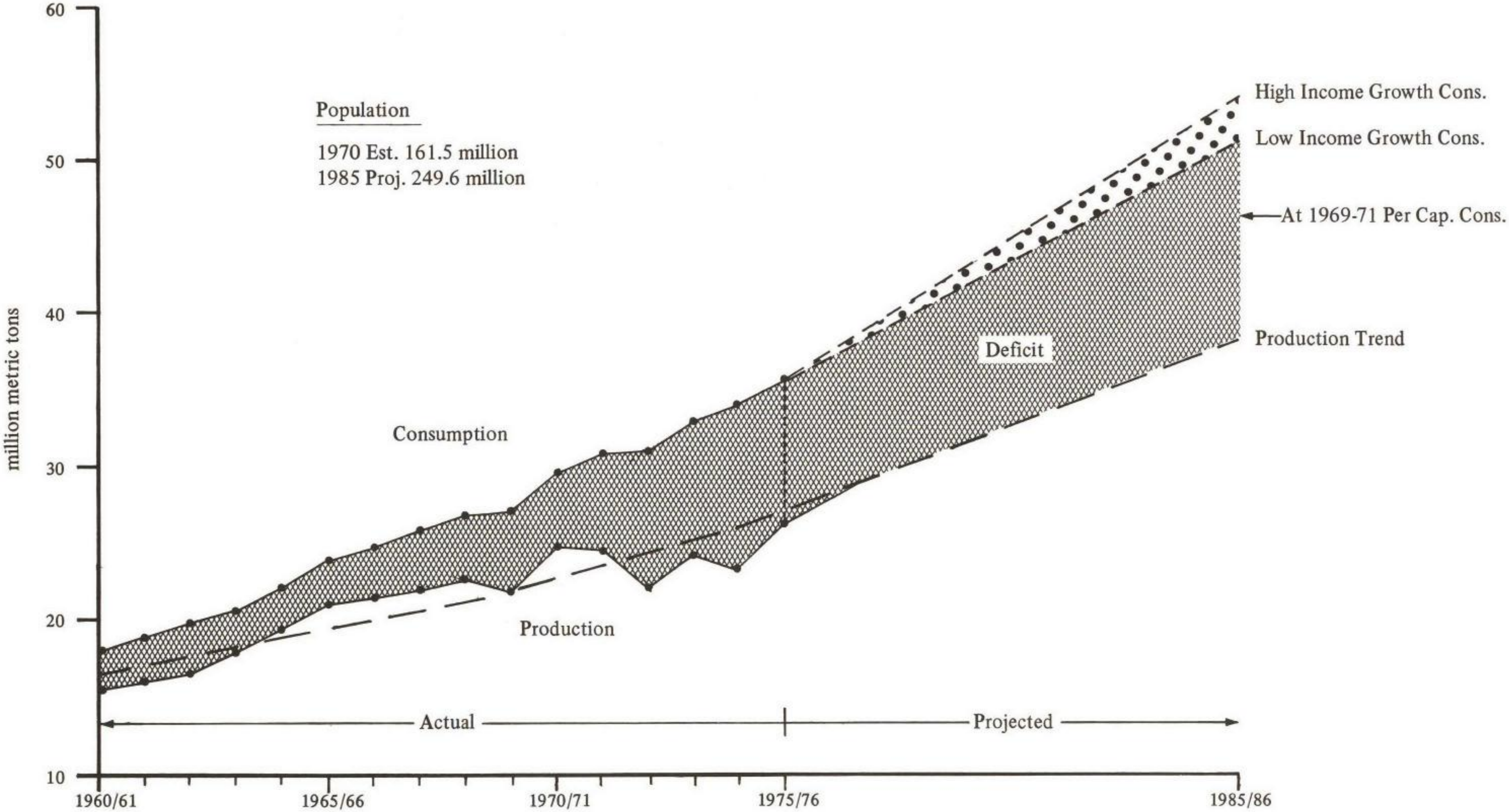
Mexico: The historical production growth rate has been among the highest in developing countries, 4.3 percent a year. Yet, with one of the highest population rates, 3.4 percent, and increasing demand, particularly for livestock feed, generated by income growth, Mexico is projected to continue to run a deficit of 1 - 2 million tons in 1985. To come to a cereal balance, the production rate would need to be raised to 5.2 percent. Again, this may be difficult to reach considering that more recently production has barely increased.

Other Mid-America/Caribbean: All the major countries in this group are cereal importers. In total, in recent years they have brought in about 45 percent of their consumption. With a production growth rate of 2.7 percent (roughly the same as population), the cereal deficit is projected to rise from 2½ - 3 million tons to 4 - 4½ million tons. This would be equivalent to almost half of their food needs in 1985. To make up the deficit internally would require a production rate of almost 9½ percent a year. The largest deficit would likely be incurred by Cuba.

Argentina: A large exporter of cereals, with production growth of 3.3 percent and population growth of only 1.2 percent, the exportable surplus is projected to double from about 8 million tons to 16 million tons by 1985.

Brazil: While Brazil has imported about 1.5 million tons of cereals in recent times, it is projected to export 1 - 3 million tons by 1985. It could export perhaps 2 million tons more if its increasing supply of root crops, which provide half as much calories in the diet as cereals, should substitute for cereal consumption internally. The historical production growth rate of 3.9 percent shows some reduction in the more recent period.

FIGURE 9
LATIN AMERICA: FOOD DEFICIT DEVELOPING MARKET ECONOMIES*
CEREALS: PRODUCTION AND CONSUMPTION 1960-75,
AND PROJECTED 1985



** See Annex 1 for countries included*

TABLE 7-D

LATIN AMERICA: GRAIN PRODUCTION,
CONSUMPTION, SURPLUS/DEFICIT
(million tons)

COUNTRY/GROUP	Actual 1969/71 Ave.			Actual 1974/75		
	Prod.	Cons.	S/D	Prod.	Cons.	S/D
Latin America:						
Mexico	13.0	13.1	-0.1	12.3	15.9	-3.6
Other Middle Amer./Carib.	3.1	5.5	-2.4	3.2	6.1	-2.9
Argentina	19.3	11.1	+8.2	19.4	11.5	+7.8
Brazil	21.0	22.7	-1.7	22.6	24.1	-1.5
Venezuela	0.8	1.8	-0.9	0.8	2.3	-1.5
Ecuador	0.5	0.6	-0.1	0.3	0.6	-0.3
Other Lat.Amer.	6.5	8.5	-2.0	7.1	9.4	-2.3
Total Lat. Amer.	64.1	63.2	(-7.3) (+8.3) +1.0	65.7	69.9	(-12.4) (+8.1) -4.2

COUNTRY/GROUP	Projected 1985/86						
	Prod.	Cons.			S/D		
		High Growth	Low Growth	At 1969/71 per cap	High Growth	Low Growth	At 1969/71 per cap
Latin America:							
Mexico	23.7	25.8	24.4	21.5	-2.2	-0.8	+2.1
Other Middle Amer./Carib.	4.5	8.9	8.7	8.2	-4.4	-4.2	-3.7
Argentina	31.7	16.1	15.6	13.4	+15.7	+16.1	+18.3
Brazil	36.3	35.1	32.9	34.6	+1.1	+3.4	+1.7
Venezuela	1.2	4.3	3.3	2.7	-3.1	-2.1	-1.5
Ecuador	0.5	1.3	1.1	0.9	-0.8	-0.7	-0.4
Other Lat.Amer.	8.4	14.1	13.8	12.5	-5.6	-5.4	-4.0
Total Lat. Amer.	106.2	105.5	99.9	93.8	(-16.1) (+16.8) +0.7	(-13.2) (+19.5) +6.4	(-9.7) (+22.1) +12.4

Note: Parentheses sum deficits and surpluses separately. Net deficit or surplus shown without parenthesis. Totals may not add due to rounding.

Venezuela: This country depends on commercial imports for its major source of cereals. By 1985, imports could well account for three-fourths of its consumption. An oil-exporting high-income country, Venezuela's demand for livestock feed is rising rapidly. Production growth rates of its relatively small cereal base are 3.2 percent for the 1960-74 period and -2.8 percent for 1967-74.

Ecuador: Also an oil-exporting country, but with relatively lower income levels, Ecuador is likely to depend more on imports than domestic production for its cereal supply. A very low historical production growth rate (0.7 percent) leads to a deficit of about 3/4 million tons by 1985. The trend of production during 1967-74 was sharply negative.

Other Latin America: With a production growth rate of 1.9 percent a year, (slightly higher in 1967-74), which is considerably lower than population growth, the deficit for this group is projected to rise from 2 - 2½ million tons to about 5½ million tons. Most of it will likely be incurred in Chile, Peru and Colombia. The overall effect of taking root crop into account would make for only a minor reduction in the cereal deficit.

Asian Centrally Planned Economies
(see table 7-E)

Projections for the Peoples Republic of China and other countries in this group have not been made. China's historical production rate of 3.4 percent per year (2.4 percent in 1967-74) and population growth of 1.5 percent suggest a shift from recent deficits to a substantial surplus. However, essentially it is assumed that the direction of policy will be toward self-sufficiency within the group. This may have some validity, since China, according to FAO data, would need to increase per capita consumption of food by 10 percent over 1969-71 levels in order to attain an average adequate energy intake level. Further it would be logical to go considerably beyond that in improving diets. Additionally, the deficit position of other centrally planned countries is projected to widen as a reflection of a production trend of 1.5 percent a year compared with population growth of 2.4 percent a year.

Nevertheless, if the historical growth rate should prevail, it would not be out of the question for China to assume a major grain exporter role if that should be their policy decision. If the more recent growth rate continues, China's flexibility to adopt such a course would be quite limited.

TABLE 7-E

TOTAL DEVELOPING COUNTRIES: GRAIN PRODUCTION, CONSUMPTION, AND SURPLUS/DEFICIT
(million tons)

COUNTRY/GROUP	Actual 1969-71 Ave.			Actual 1974/75		
	Prod.	Cons.	S/D	Prod.	Cons.	S/D
Developing Market Economies	315.6	332.4	(-28.2) (+11.5) -16.7	323.0	356.5	(-44.8) (+11.4) -33.4
Asian Centrally Planned Econ's.						
China, Peoples Republic of	135.1	138.2	-3.1	150.2	154.6	-4.4
Other Centr'ly Planned Asia	11.1	12.7	-1.6	11.5	12.7	-1.2

COUNTRY/GROUP	Projected 1985/86						
		Cons.			S/D		
	Prod.	High Growth	Low Growth	At 1969-71 per cap	High Growth	Low Growth	At 1969-71 per cap
Developing Market Economies	451.6	534.2	517.1	492.5	(-108.3) (+25.7) -82.6	(-94.5) (+29.0) -65.5	(-72.9) (+31.9) -40.9
Asian Centrally Planned Econ's.							
China, Peoples Republic of	220.4			173.8			+46.6
Other Centr'ly Planned Asia	13.0			18.1			-5.1

Note: Parentheses sum deficits and surpluses separately. The net deficit or surplus shown without parenthesis. Totals may not add due to rounding.

* * * * *

This report is the first step toward bringing deeper understanding of the food problem in the developing world. Some serious questions emerge from the analyses, questions that have no answers now but need to be pursued.

First, there is need to determine whether the slowdown in production of cereals noted for the 1967-74 period represents in fact a significant change in trend or is largely a temporary aberration due to weather. If the former, the task ahead is even more difficult than the figures portray.

Second, there is the question of how to come to grips with the problem of the large mass of malnourished people. It is clear that meeting food demand which arises from economic growth will do little in most low income countries to alleviate their condition.

Finally is the question of the appropriate strategies, policies and programs by which food and nutrition needs can be met most effectively. The historical trend of production is an insecure base to project the future. What is needed is an inventory of resources and policies and some measure of their effectiveness. From this, it is possible to come to some judgement as to the additional resources, changes in policies and in performance, which would be required to meet production goals.

Annex 1

IFPRI COUNTRY CATEGORIES

A. DEVELOPED EXPORTERS

1. United States
2. Canada
3. South Africa
4. Australia

B. DEVELOPED IMPORTERS

1. Japan
2. U. S. S. R.
3. Other Importers:

Austria	Norway
Finland	Portugal
Greece	Spain
Iceland	Sweden
Israel	Switzerland
Malta	(New Zealand)

4. East Europe:

Albania	Hungary
Bulgaria	Poland
Czechoslovakia	Romania
East Germany	Yugoslavia

5. EEC: Euro-Six:

Belgium	Italy
France	Luxembourg
Germany	Netherlands

EEC: Euro-Three:

Denmark
Ireland
United Kingdom

C. DEVELOPING COUNTRIES WITH FOREIGN EXCHANGE

1. Asia Group:

Brunei	Singapore	Macao
Hong Kong	South Korea	
Malaysia	Taiwan	

2. North Africa - Middle East OPEC:

Iran	Algeria	Saudi Arabia
Iraq	Libya	Kuwait
Bahrain	Oman	Qatar
United Arab Emirates		

Annex 1

(IFPRI Country Categories cont'd.)

D. DEVELOPING COUNTRIES WITH FOREIGN EXCHANGE CONSTRAINTS
(Countries asterisked are oil exporters which are likely to improve reserve positions.)

1. Asia Market Economies:
   - a. India
   - b. Bangladesh
   - c. Pakistan
   - *d. Indonesia
   - e. Philippines
   - f. Thailand
   - g. Other Asia: Bhutan, Nepal, Sri Lanka, Burma, Pacific Islands, Papua-New Guinea, Sikkim, Maldive Islands

2. Centrally Planned Asia:
   - a. People's Republic of China
   - b. Other Centrally Planned Asia: Mongolia, Khmer, Laos, S. Vietnam, N. Vietnam, N. Korea

3. North Africa-Middle East (Non-OPEC):
   - a. Egypt
   - b. Turkey
   - c. Remaining Countries (from Afghanistan to Morocco):
     - (1) High Income ($200 +):
       - Jordan
       - Lebanon
       - Morocco
       - Syria
       - Tunisia
       - Cyprus
     - (2) Low Income (less than $200):
       - Sudan
       - Yemen (Sana)
       - Yemen (Aden)
       - Afghanistan

4. Sub-Sahara Africa
   - *a. Nigeria
   - b. Remaining Sub-Sahara:
     - (1) High Income ($200 +):
       - Mozambique
       - Rhodesia
       - Zambia
       - *Angola
       - Cameroon
       - Congo
       - *Gabon
       - Ghana
       - Equatorial Guinea
       - Ivory Coast
       - Liberia
       - Mauritius
       - Reunion
       - Senegal
       - Spanish Sahara
       - French Terr. Afaro & Issas
       - Guinea-Bissau
       - Cape Verde Isles
       - Ceuta & Melilla
       - Sao Toma & Principe
       - Seychelles Isl.

Annex 1

(IFPRI Country Categories cont'd.)

(2) Low Income (less than $200):

Kenya	Mali
Malagasy Republic	Mauritania
Malawi	Niger
Tanzania	Rwanda
Uganda	Sierra Leone
Burundi	Somalia
Central Africa Rep.	Togo
Chad	Upper Volta
Dahomey	Zaire
Ethiopia	Lesotho
Gambia	Comoro Islands
Guinea	

5. Latin America:
   a. Argentina
   b. Mexico
   c. Brazil
   *d. Venezuela
   *e. Ecuador
   f. Other Middle America and Caribbean:

Bahamas	Guatemala	Panama
Bermuda	Haiti	*Trinidad & Tobago
Costa Rica	Honduras	Other Caribbean Isles (Martinique, etc.)
Cuba	Br. Honduras	
Dominican Rep.	Jamaica	
El Salvador	Nicaragua	

6. Remaining Latin America:

Bolivia	French Guiana	Peru
Chile	Guyana	Surinam
Colombia	Paraguay	Uruguay

ANNEX 1

TABLE 1

POPULATION IN IFPRI CATEGORIES
BY INCOME GROUPS, 1970 EST. AND 1985 PROJECTED

Income Group	1970 Est. (millions)	1985 Proj. (millions)
Low Income-Food Deficit (under $200 per capita):		
India	549.8	792.4
Bangladesh	68.3	99.4
Indonesia	121.0	177.7
Other Asia	52.1	73.7
NA/ME Non-OPEC Low Income	34.6	53.4
Nigeria	55.8	85.7
Sub-Sahara Low Income	130.6	197.0
Total Low Income	1,012.2	1,479.3
Middle Income-Food Deficit ($200+ per capita):		
Philippines	38.2	61.8
Egypt	33.7	47.7
Turkey	35.7	52.4
NA/ME Non-OPEC High Income	32.3	50.7
Sub-Sahara High Income	48.3	72.5
Mexico	51.1	84.2
Other MA/Carib.	37.0	54.6
Ecuador	6.1	9.8
Other Latin America	56.6	84.4
Total Middle Income	339.0	518.1
High Income-Food Deficit (high foreign exchange capacity):		
Asia Group High Income	62.2	87.8
NA/ME OPEC	62.7	100.8
Venezuela	10.7	16.6
Total High Income	135.6	205.2
Total DME-Food Deficit	1,486.8	2,202.6
Grain Exporters:		
Pakistan	61.4	98.9
Thailand	36.3	58.7
Argentina	23.9	28.8
Brazil	96.6	147.1
Total Exporters	218.2	333.5
TOTAL DME	1,705.0	2,536.1

Source: United Nations Projection for 1985 is U.N. medium-medium variant 1974.

ANNEX 2

PROJECTION METHODS

1. Projections of the demand for cereals during the 1975-85 period were based upon assumptions with respect to growth rates in population, growth rates in real per capita GDP, estimates of income elasticities in cereal consumption, and trends in the use of cereals for feed. They also assume historical patterns of price relationships are not altered significantly. Centrally planned Asian countries were excluded from the analysis. It was assumed that these countries would follow a policy of self-sufficiency more or less. The principal assumptions and the related methodology used in estimating demand growth rates in the developing market economies are briefly summarized below.

2. The 1974 UN medium--medium-variant population projection was selected for use in the study. The projected mid-year population for study countries and country groupings at 5-year intervals from 1970 to 1990 were made available from the IBRD computer program. Compound rates of growth for each of the 5-year periods were used to derive year-end estimates for 1970, -75, -80, and -85. These rates of growth were also used to estimate population for the intervening years in the 1975-85 period. Population estimates for 1970 and projections for 1985 are shown by IFPRI categories in Annex 1, Table 1.

3. The basic sources for projecting growth rates of real GDP per capita for developing countries and country groupings were (1) the 1965-73 rates as derived from IBRD estimates of total real GDP and population, and (2) IBRD estimates of projected oil revenues in 1980 to OPEC countries and the net effect of continued high oil prices on economic growth, 1976-80, in Non-OPEC developing countries, treating low-income countries as a group (less than $200 GDP per capita in 1972) and middle/higher-income countries as a group ($200 per capita and above).

High- and low-income growths were assumed. These are shown in Table 1.

For Non-OPEC countries, the high-income assumption was generally the growth rate of GDP per capita as derived from the IBRD estimates noted in (1) above. The low-income assumption for NON-OPEC countries was that taken from the IBRD analysis (2) above which, under conditions of low import demand by OECD countries, would yield 0.5 percent annual growth rate in GDP per capita for the low-income country group and 1.8 percent annual rate for the middle/high-income country group. However, in those instances where the 1965-73 growth rate fell below the projected low-income growth rate, the rate for the high-income assumption was adjusted upward to exceed the low rate by 0.5%.

For most OPEC countries, the high-income growth rate was assumed to be 10 percent. For Indonesia, Nigeria, Venezuela, and Ecuador 7 percent was assumed because at their level of development, progress is likely to be slower. Oil revenues for OPEC countries as a whole are estimated to increase by 25 percent annually from 1973-80. The low-growth for OPEC countries was assumed to be the historical rate 1965-73.

A special adjustment was made for the low-growth situation for the Asia high-income group -- Hong Kong, Singapore, Taiwan, South Korea, Malaysia -- to a rate approximately one-fourth below the high-growth situation. This is the percentage reduction involved in the Bank report for middle/higher-income countries under the alternatives of high and low economic growth for OECD countries to which the economic activities for the Asia group are linked.

In some countries, agriculture is the dominant sector of the economy, accounting for about half of the GNP. The question may be raised as to whether the historical production trend which is projected for cereals is consistent with the assumptions as to economic growth which enter into the demand projections. For the high-income growth assumption this is not a matter of concern since that assumption is generally based also on the historical trend of GNP. But it has some bearing in relation to the low-income growth assumption as to whether such assumption could be fulfilled without a reduction in the growth rate of cereal production and thus bring a somewhat wider food deficit than projected.

Since the low-income growth assumption is linked to disruptions stemming from the oil situation, it would appear reasonable to assume that the effect would be borne more in the non-agricultural sector than in the agricultural sector. Even in the case of India where cereal production accounts for most of agricultural production, and agriculture in turn accounts for about 45 percent of total GNP, the reduction required in the non-agricultural sector rate to accommodate the low income growth assumption would be at most from 4.6 percent a year to 3.4 percent. Such a slowing of the non-agricultural sector would reduce opportunities for employment outside of agriculture, but conversely would increase manpower in agriculture. Thus, a lower economic growth rate need not significantly affect production in the agricultural sector.

4. The income elasticities (Table 2) used in the study were based on FAO estimates contained in the publication Agricultural Commodity Projections 1970-80, Volume 2, Food and Agriculture Organization, Rome, 1971. For the low growth Non-OPEC countries FAO projection of elasticities in reference period 1970-75 was generally used, for higher growth Non-OPEC countries the reference period was 1970-80, and for the OPEC countries the FAO projection reference period for 1975-80 was used in view of the accelerated rates of economic growth projected for these countries. Adjustments for high and low income assumptions were introduced. The

derived estimates of elasticities, however, were subject to the general assumption that for the study countries and regions the cereal income elasticities for human consumption would not be negative during the projection period. Thus, whereas FAO projected slight negative elasticities for Argentina and Turkey, zero elasticities were used in this study. Mexico and Thailand were adjusted from slight negative to slight positive elasticities. In both countries grain consumption has been increasing faster than population. Unpublished analyses made by the USDA of cereal income elasticities were also consulted in finalizing the income elasticities. The elasticities are assumed to prevail throughout the projected period.

The U.S. Department of Agriculture consumption data used in this study does not attempt to estimate post-harvest cereal losses and amounts of cereals used for seed. Instead, these data are included in the consumption estimates, and it is, therefore, implicitly assumed that rate of growth in these uses would be the same as the projected rate of growth in human consumption.

5. The cereal supply/utilization data provided by the Department of Agriculture include estimates of grain used for feed for a limited number of major developing countries. These data were used in making projections of grain used for feed for countries and regions where data were available and trends in the use of grain for feed were presumed to differ significantly from trends in human or total consumption. In particular it was assumed that the total consumption and feed consumption trends would not differ significantly in all Non-OPEC countries with less than $200 GDP per capita in 1972 and feed consumption was not calculated separately for these countries. For the remaining countries and groups of countries projections were made of the grain used for feed on the basis of historical trends in the rate of growth in grain used for feed subject to a maximum constraint that the rate of growth would not exceed the rate of growth in population plus the rate of growth in GDP per capita X 2. Inasmuch as the historical trend in GDP was adopted for most countries as the high income growth assumption and the historical trend in feed use was related thereto, the latter was used to determine feed use under the high income growth assumption. For the low income growth assumption, the rate of growth in feed use was adjusted downward according to the reduced growth in GDP per capita. For Non-OPEC countries the 1960/61-1974/75 period was used for calculating the compound rate of growth trend. For OPEC countries the 1971/72-1974/75 period was used.

In countries where projections were not made of the grain used for feed, total consumption was projected on the basis of the growth rates in population, and growth rates in GDP per capita X the estimated cereal income elasticities. Also, in all countries no separate projections of feed use of rice and minor grains were made since no estimates were available of the amount of these commodities that were used for feed. They were included in the projections of total consumption.

6. Projections of cereal production for the 1975-85 period were made on the assumption that historical rates of growth would continue. The 1960/61-1974/75 compound rates of growth in production for these study countries and regions were computed from USDA annual crop-year cereal production estimates. These rates of growth were then extrapolated for the 1975-85 period from the 1974 trend estimate of production. Production growth rates were also computed for 1967/68-1974/75.

(See following Note for mathematical formulation of projection methodology.)

ANNEX 2

NOTE ON METHODOLOGY

Production:

Production of foodgrains was projected to 1985/86 according to a logarithmic time trend fitted by ordinary least squares, i.e.,

Fitted $y = a_0 + a_1 t + e$

Predicted $\hat{y}_t = a_0 + a_1 t$

where y = logarithm of production

$\hat{y}_t$ = estimated value of the logarithm of production in year t.

a_1 = estimated growth rate of production

e = random error component.

The growth rate of production a_1 , was estimated for two different base periods, 1960-74 and 1967-74.

Consumption:

Per capita human consumption was projected as:

$$\hat{c}_t = \hat{c}_{74} + gzt$$

where $\hat{c}_t$ = predicted value of the logarithm of per capita consumption in year t

$\hat{c}_{74}$ = logarithm of the estimated value of consumption per capita in the year 1974.

g = assumed rate of growth of per capita income

z = assumed income elasticity

t = year (i.e. current year - 1974)

Per capita consumption in 1974 was taken as the fitted trend value from the logarithmic time trend of total human consumption estimated for the period 1960-1974, i.e.

Fitted $C = b_0 + b_1 t + e$

Estimated $\hat{C}_{74} = b_0 + b_1(t=74)$

$$\hat{c}_{74} = C_{74} - P_{74}$$

where C = logarithm of total consumption

$\hat{c}$ = logarithm of per capita consumption

b_1 = estimated growth rate of consumption

P_{74} = logarithm of population in 1974

ANNEX 2

TABLE 1

ASSUMPTIONS OF GDP PER CAPITA GROWTH RATES FOR PROJECTING DEMAND FOR CEREALS IN DEVELOPING COUNTRIES

	High	Low
Asia Group with Foreign Exchange		
Taiwan, South Korea, etc.	7.3%	5.5%
North Africa-Middle East (OPEC)		
Algeria, Iran, Saudi, etc.	10.0%	6.5%
Developing Exporters		
Thailand	5.0%	1.8%
Argentina	2.4%	1.8%
Developing Food Deficit (low income)		
India	1.2%	0.5%
Bangladesh	1.0% 1/	0.5%
Pakistan	1.2%	0.5%
Philippines	2.9%	1.8%
Indonesia	7.0%	4.3%
Other Asia	1.0%	0.5%
North Africa-Middle East (Non-OPEC)		
Egypt	1.0% 1/	0.5%
Turkey	4.8%	1.8%
Other Non-OPEC High Income	2.6%	1.8%
Other Non-OPEC Low Income	1.0% 1/	0.5%
Sub-Sahara Africa		
Nigeria	7.0%	5.9%
Other Sub-Sahara High Income	2.04%	1.8%
Other Sub-Sahara Low Income	1.6%	0.5%
Latin America		
Mexico	2.9%	1.8%
Other Middle America/Caribbean	3.4%	1.8%
Brazil	6.0%	1.8%
Venezuela	7.0%	1.3% 1/
Ecuador	7.0%	3.4%
Rest of Latin America	2.3% 1/	1.8%

1/ Adjusted upward as noted in Paragraph 3 of text.

ANNEX 2

TABLE 2

ESTIMATED CEREAL INCOME ELASTICITIES

1970-1985 STUDY COUNTRY/REGIONAL CATEGORIES

COUNTRY/REGIONAL CATEGORIES	ESTIMATED CEREAL INCOME ELASTICITY	
	Low-Growth Assumption	High-Growth Assumption
A. Developing Countries with Foreign Exchange:		
Asia Group	.050	.045
NA/ME OPEC	.080	.078
Venezuela	.190	.154
B. Developing Exporters:		
Argentina	.000	.000
Thailand	.050	.049
C. Developing Countries with Foreign Exchange Constraints:		
India	.450	.442
Pakistan	.230	.228
Bangladesh	.450	.444
Indonesia	.420	.396
Philippines	.180	.176
Other Asia	.120	.119
Turkey	.000	.000
Egypt	.160	.159
NA/ME Non-OPEC - Low Income	.430	.425
NA/ME Non-OPEC - High Income	.170	.169
Nigeria	.500	.486
Sub-Sahara - Low Income	.410	.399
Sub-Sahara - High Income	.280	.279
Mexico	.100	.094
Other Middle America	.210	.205
Brazil	.100	.094
Ecuador	.420	.379
Other Latin America	.230	.227

STATISTICAL SERIES:

DATA FOR FIGURES 1 - 9

DATA FOR FIGURE 1

ALL FOOD DEFICIT DME COUNTRIES:
CEREAL PRODUCTION, TREND, AND CONSUMPTION
1960-75 AND PROJECTED 1985

(million tons)

Year	Cereal Prod. Actual	Cereal Prod. Trend Est.	Cereal Cons. Actual
1960-61	197.8	196.6	214.0
61-62	197.7	200.8	216.9
62-63	208.8	205.2	223.4
63-64	213.7	209.6	232.0
64-65	218.8	214.2	238.8
65-66	209.0	218.8	231.6
66-67	207.4	223.3	234.3
67-68	231.0	228.5	253.8
68-69	243.7	233.5	260.8
69-70	248.2	238.7	272.7
70-71	257.5	244.0	281.6
71-72	255.8	249.4	284.0
72-73	251.9	255.0	286.9
73-74	257.8	260.7	298.2
74-75	257.1	266.5	300.2
75-76	280.7	273.0	314.2
1985-86 projected		342.9	High 451.3; Low 437.4; At 69-71 per cap cons. 413.7

DATA FOR FIGURE 2

LOW INCOME-FOOD DEFICIT DME COUNTRIES:
CEREAL PRODUCTION, TREND, AND CONSUMPTION
1960-75 AND PROJECTED 1985

(million tons)

Year	Cereal Prod. Actual	Cereal Prod. Trend Est.	Cereal Cons. Actual		
1960-61	137.1	134.6	144.3		
61-62	139.0	137.2	145.4		
62-63	142.9	139.9	147.1		
63-64	144.1	142.6	153.0		
64-65	149.8	145.3	159.3		
65-66	136.7	148.2	147.4		
66-67	134.2	151.0	148.4		
67-68	153.5	154.0	161.4		
68-69	161.0	157.0	165.1		
69-70	168.0	160.0	175.0		
70-71	175.0	163.2	178.6		
71-72	170.0	166.4	175.6		
72-73	166.4	169.6	175.8		
73-74	175.9	173.0	187.4		
74-75	170.2	176.4	182.9		
75-76	189.0	179.9	196.1		
			High	Low	At 69-71 per cap cons.
1985-86 projected		220.1	268.1	262.0	257.4

DATA FOR FIGURE 3

HIGH INCOME-FOOD DEFICIT DME COUNTRIES
CEREAL PRODUCTION, TREND, AND CONSUMPTION
1960-75 AND PROJECTED 1985

(million tons)

Year	Cereal Prod. Actual	Cereal Prod. Trend Est.	Cereal Cons. Actual		
1960-61	15.9	16.1	20.0		
61-62	15.6	16.4	19.9		
62-63	17.3	16.8	21.6		
63-64	16.8	17.1	21.2		
64-65	16.8	17.5	21.1		
65-66	18.0	17.9	22.1		
66-67	18.0	18.3	23.3		
67-68	19.5	18.7	25.1		
68-69	21.7	19.1	27.7		
69-70	21.1	19.5	28.3		
70-71	20.7	19.9	29.7		
71-72	18.6	20.3	30.3		
72-73	22.3	20.8	33.3		
73-74	19.4	21.2	31.9		
74-75	20.7	21.7	34.0		
75-76	21.7	22.1	34.9		
			High	Low	At 69-71 per cap cons.
1980-85 projected		27.4	62.3	57.1	44.2

DATA FOR FIGURE 4

MIDDLE INCOME-FOOD DEFICIT DME COUNTRIES
CEREAL PRODUCTION, TREND, AND CONSUMPTION
1960-75 AND PROJECTED 1985

(million tons)

Year	Cereal Prod. Actual	Cereal Prod. Trend Est.	Cereal Cons. Actual
1960-61	44.8	45.9	49.7
61-62	43.2	47.2	51.6
62-63	48.7	48.5	54.6
63-64	52.8	49.9	57.8
64-65	52.2	51.3	58.4
65-66	54.3	52.8	62.2
66-67	55.2	54.0	62.6
67-68	57.9	55.9	67.3
68-69	61.0	57.5	68.1
69-70	59.0	59.2	69.4
70-71	61.8	60.9	73.3
71-72	67.1	62.7	78.0
72-73	63.3	64.6	77.8
73-74	62.4	66.5	78.9
74-75	66.2	68.4	83.3
75-76	70.0	70.6	85.2

	Cereal Prod. Trend Est.	High	Low	At 69-71 per cap cons.
1985-86 projected	95.4	120.9	118.3	112.1

DATA FOR FIGURE 5

DME CEREAL EXPORTING COUNTRIES
CEREAL PRODUCTION, TREND, AND CONSUMPTION
1960-75 AND PROJECTED 1985

(million tons)

Year	Cereal Prod. Actual	Cereal Prod. Trend Est.	Cereal Cons. Actual		
1960-61	38.5	40.5	36.3		
61-62	41.4	42.1	36.9		
62-63	41.6	43.7	37.0		
63-64	47.4	45.5	38.4		
64-65	52.4	47.3	40.6		
65-66	49.3	49.2	42.1		
66-67	51.2	51.1	44.2		
67-68	51.9	53.2	44.5		
68-69	54.4	55.3	46.5		
69-70	62.8	57.5	52.2		
70-71	63.9	59.8	51.8		
71-72	58.7	62.2	54.8		
72-73	63.3	64.7	55.9		
73-74	70.0	67.3	57.9		
74-75	66.0	70.1	56.6		
75-76	70.1	72.9	58.4		
			High	Low	At 69-71 per cap cons.
1985-86 projected		108.7	82.9	79.7	78.9

DATA FOR FIGURE 6

ASIA FOOD DEFICIT COUNTRIES
CEREAL PRODUCTION, TREND, AND CONSUMPTION
1960-75 AND PROJECTED 1985

(million tons)

Year	Cereal Prod. Actual	Cereal Prod. Trend Est.	Cereal Cons. Actual	
1960-61	121.2	117.5	130.3	
61-62	122.4	120.0	131.1	
62-63	124.7	122.6	132.2	
63-64	125.8	125.3	137.9	
64-65	132.1	128.0	143.9	
65-66	118.8	130.8	132.0	
66-67	118.6	133.6	135.2	
67-68	134.9	136.5	146.5	
68-69	143.9	139.5	152.8	
69-70	148.7	142.5	160.5	
70-71	156.4	145.6	165.3	
71-72	153.4	148.8	164.9	
72-73	146.9	152.0	165.0	
73-74	160.1	155.3	177.2	
74-75	153.3	158.7	171.6	
75-76	170.6	162.2	183.9	
			High / Low	At 69-71 per cap cons.
1985-86 projected		202.6	257.4 / 248.9	236.7

DATA FOR FIGURE 7

NA/ME-FOOD DEFICIT COUNTRIES
CEREAL PRODUCTION, TREND, AND CONSUMPTION
1960-75 AND PROJECTED 1985

(million tons)

Year	Cereal Prod. Actual	Cereal Prod. Trend Est.	Cereal Cons. Actual
1960-61	34.9	34.8	38.6
61-62	32.3	35.6	39.1
62-63	38.8	36.3	42.2
63-64	40.6	37.1	43.1
64-65	36.8	37.9	41.3
65-66	37.9	38.7	43.3
66-67	36.4	39.6	42.9
67-68	41.9	40.4	48.7
68-69	45.5	41.3	49.2
69-70	43.6	42.2	49.7
70-71	42.2	43.2	51.1
71-72	44.9	44.1	53.4
72-73	49.7	45.1	56.0
73-74	41.9	46.1	54.4
74-75	46.5	47.1	58.5
75-76	48.3	48.2	59.7
1980-86 projected		60.7	High 83.2; Low 82.1; At 69-71 per cap cons. 78.1

DATA FOR FIGURE 8

SUB SAHARA AFRICA: FOOD DEFICIT COUNTRIES:
CEREAL PRODUCTION, TREND, AND CONSUMPTION
1960-75 AND PROJECTED 1985

(million tons)

Year	Cereal Prod. Actual	Cereal Prod. Trend Est.	Cereal Cons. Actual		
1960-61	26.2	27.7	27.0		
61-62	27.1	28.2	27.8		
62-63	28.6	28.6	29.2		
63-64	29.4	29.0	30.4		
64-65	30.3	29.5	31.1		
65-66	30.9	29.9	32.2		
66-67	30.8	30.4	31.4		
67-68	32.1	30.8	32.4		
68-69	31.2	31.3	31.8		
69-70	34.1	31.8	35.2		
70-71	33.7	32.3	35.6		
71-72	32.8	32.8	34.3		
72-73	33.2	33.4	34.6		
73-74	31.4	33.9	33.6		
74-75	33.7	34.5	35.8		
75-76	35.3	35.0	36.7		
			High	Low	At 69-71 per cap cons.
1985-86 projected		41.4	56.3	55.1	53.0

DATA FOR FIGURE 9

LATIN AMERICA FOOD DEFICIT COUNTRIES
CEREAL PRODUCTION, TREND, AND CONSUMPTION
1960-75 AND PROJECTED 1985

(million tons)

Year	Cereal Prod. Actual	Cereal Prod. Trend Est.	Cereal Cons. Actual	
1960-61	15.6	16.5	18.1	
61-62	15.9	17.1	18.9	
62-63	16.6	17.6	19.8	
63-64	17.8	18.2	20.7	
64-65	19.7	18.8	22.5	
65-66	21.3	19.4	24.2	
66-67	21.6	19.8	24.8	
67-68	22.0	20.7	26.0	
68-69	23.1	21.4	27.0	
69-70	21.8	22.1	27.2	
70-71	25.2	22.9	29.6	
71-72	24.7	23.7	31.4	
72-73	22.1	24.5	31.4	
73-74	24.4	25.3	33.0	
74-75	23.7	26.2	34.3	
75-76	26.5	27.1	35.9	
			High / Low	At 69-71 per cap cons.
1985-86 projected		38.2	54.3 / 51.4	45.8

RESEARCH REPORT 3

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M-14

Food Needs of Developing Countries:

Projections of Production and Consumption to 1990

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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FOREWORD

This report updates and widens the scope of Research Report No. 1, Meeting Food Needs in the Developing World: The Location and Magnitude of the Task in the Next Decade, published in February, 1976. The earlier report emphasized a large and widening gap between food needs and food production in developing market economies (DME), if past production trends continue, particularly among the low income, food deficit countries. The DME countries, which exclude the Asian centrally planned economies, contain more than half of the people on earth. Most of these people reside in low income, food deficit countries where the incidence of hunger and malnutrition is high.

Several important changes have been introduced in this report:

1. The new projections cover the major staple food crops including cereals for all countries and root crops, pulses and groundnuts for those countries where they are important food sources. These food crops represent two-thirds or more of average calorie intake in most DME countries.

2. The past production record of countries and regions is analyzed in more detail. In particular, the difference between recent and longer run trends in production and the relative contribution of area and yield to the growth of production are examined.

3. Estimates of the additional amount of cereals that would be needed to feed the poor and underfed in each country are presented for the first time.

4. The projections have been extended to 1990 from a 1975 base year. This establishes the time period and overall dimensions of the food problem for the first phase of an IFPRI study on investment requirements to increase production in low income, food deficit countries. The investment study is sponsored by the Consultative Group on Food Production and Investment and the United Nations Economic and Social Council.

5. A sensitivity analysis is presented to illustrate the effects of changes in assumptions with respect to population and production growth rates.

6. Country details on production trends and projected food needs for the 82 DME countries have been included so that the recipients of this report can use their judgment about the future trend of events. In this way, it is hoped that the report can constitute a do-it-yourself kit.

Further work is underway to define more accurately the underlying historical growth rate which forms the base for future acceleration in growth. Additional definitions and assumptions are being developed. Analysis is proceeding to define: (1) the resource requirements and policies needed to achieve the requisite growth rates, (2) the short run approaches to close the national food gaps, and (3) the distribution policies needed to improve food consumption of the poor, once basic supplies become available.

The report is a joint effort based on work started in 1976. Nathan Koffsky, then Consultant to the Institute, carried much of the burden for the planning and initial analyses of these projections, as well as, a continuing role as the effort developed.

This report is principally authored by Leonardo Paulino, Research Fellow, in close collaboration with Kenneth Bachman, Consultant to the Institute. They were assisted by Diane Skellie, Vishva Bindlish and Katherine Michael who performed the statistical computations. Valuable editorial assistance was provided by Kathleen Hathaway and Wayne Dexter.

Special thanks are due to other organizations that contributed in various ways. These include the World Bank, the United States Department of Agriculture, the Food and Agriculture Organization, all of which made data available. Thanks are also due to the Brookings Institution whose computer facilities greatly assisted in the analysis.

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John W. Mellor
Director

FOOD NEEDS OF DEVELOPING COUNTRIES:
PROJECTIONS OF PRODUCTION AND CONSUMPTION TO 1990

1. SUMMARY

Longer term food prospects in food deficit countries with developing market economies remain unfavorable, despite good crops the last two years. Under the conditions assumed in this study, production of staple food crops in these countries would fall short of meeting demand in 1990 by 120-145 million metric tons. This is over three times the shortfall of 37 million metric tons in the relatively good production year 1975.

The core of the food problem is the low income, food deficit countries in which the per capita GNP in 1973 was less than US $300. These countries have almost two-thirds of the total population of the developing market economies (DMEs). Their food deficit is projected to rise from 12 million metric tons in 1975 to 70-85 million by 1990. Just to maintain consumption at the 1975 per capita level would require 35 million metric tons more than projected production.

The study indicates an urgent need for programs to rapidly increase food production in low income, food deficit countries. Even then, food imports, perhaps necessarily in the form of aid, well in excess of recent levels are likely to be necessary to prevent further deterioration of already inadequate diets.

Asia accounts for 40 percent of the total projected deficit, North Africa/Middle East about 25 percent, Sub-Sahara Africa over 20 percent, and Latin America over 10 percent.

The projections in this study assume that production will grow in the next 15 years at the average annual rates of 1960-75. Consumption requirements are based on the UN medium variant population projection and two levels of growth in income. Projections were not made for the People's Republic of China, the USSR, or the centrally planned economies of Asia and Eastern Europe.

The low income countries in which food problems are most pressing are concentrated in Asia and Sub-Sahara Africa. The following tabulation shows the major staple crop deficits, in terms of cereal equivalent, for 1975-76 (actual) and projected to 1990-91 under the low and high income growth assumptions for selected low income DMEs. The indicated deficit is the amount by which projected consumption requirements exceed projected production.

	Actual 1975		Projected 1990	
	(million metric tons)	(percent of consumption)	(million metric tons)	(percent of consumption)
India	1.4	1	17.6-21.9	10-12
Nigeria	0.4	2	17.1-20.5	35-39
Bangladesh	1.0	7	6.4- 8.0	30-35
Indonesia	2.1	8	6.0- 7.7	14-17
Egypt	3.7	35	4.9	32
Sahel Group	0.4	9	3.2- 3.5	44-46
Ethiopia	0.1	2	2.1- 2.3	26-28
Burma	(0.4)*	(7)*	1.9- 2.4	21-25
Philippines	0.3	4	1.4- 1.7	11-13
Afghanistan	. . .	. . .	1.3- 1.5	19-22
Bolivia & Haiti	0.3	24	0.7- 0.8	35-38

*Surplus

Asian countries contain almost 75 percent of the population in low income, food deficit DMEs. The projected production shortfall by 1990 would be 4 to 5 times the 1975 figure of 13 million metric tons. Production increases would have to rise well above the 1960-75 rate of 2.5 percent to meet the projected increase in consumption.

India with its huge population will account for about a third of the projected gross deficit. Spurred by the Green Revolution, production in India grew at 2.5 percent a year in

1960-75 despite the successive droughts in the country near the end of this period. The output of major staples kept pace with population growth, but fell short of meeting the increased demand resulting from economic growth. Production would have to increase at a 3.3 percent annual rate to meet the projected gross deficit.

Bangladesh and Indonesia both have sizeable deficits projected for 1990 but for contrasting reasons. Output of major staples rose only 1.5 percent in Bangladesh in 1960-75 while population grew 2.4 percent annually. Continuation of the slow output growth would mean a 1990 deficit 7 to 8 times larger than that of 1975. Food production in Indonesia rose at double the Bangladesh rate in 1960-75. Continuation of this rate would meet increased requirements due to population growth by 1990 but would fall short of meeting demands generated by increasing income. The Indonesian economy, stimulated by development of oil resources, has been growing rapidly in the last decade.

Nigeria's projected food deficit almost equals that of India. Production has been rising only half of one percent annually while population has been growing 3 percent a year. Production growth would need to be 4.8 to 5.5 percent annually to meet 1990 consumption projections.

Production shortfalls also are projected for the middle and high income food deficit countries, though their needs are generally less urgent than those of the low income group. Middle income countries have about a fifth of the total DME population. Substantial deficits are projected for Peru, Colombia, Chile, Turkey, several of the smaller North Africa/ Middle East countries, and most Central American nations. The food deficit for middle income countries totaled 11 million metric tons in 1975 and is expected to double by 1990.

The high income countries have 8 percent of the total DME population. This group includes the OPEC nations and other high foreign exchange earners such as the Republic of China and Republic of Korea which have had diversification and rapid economic growth. Demand generally has increased faster than production. Their food deficit, projected at 30-35 million metric tons in 1990, could well be met by commercial imports.

The projected increases in consumption resulting from rising incomes would go only part of the way in meeting the dietary energy needs of the large number of undernourished in the DMEs. This is indicated by estimates for each country of the number of calories needed to bring the population up to a satisfactory standard of nutrition without reducing the intake of those above the standard.

Even if projected market demands are met, large gaps would still remain between the 1990 consumption levels and dietary energy standards in the DMEs. These countries would need an additional 55 million metric tons of food supplies above the projected consumption at low income growth in order for each country to achieve 110 percent of its recommended dietary standard. This energy gap would shrink to 45 million metric tons with higher income growth.

As would be expected, nearly 90 percent of the total 1990 dietary gap would be in low income, food deficit countries. Meeting both projected market demands and energy needs would require production of 170-185 million metric tons above the projected 1990 output of major staples.

Production Trends

Output of staple food crops in the DMEs as a group in 1960-75, the period used for determining the trend of production, rose faster than population. Mainly responsible was a 4 percent growth rate in cereal production in the grain exporting countries. Output in the food deficit countries as a group increased slightly faster than population.

A different picture emerges when the food deficit countries are presented by income categories. Production growth fell below population growth in those countries within the low and high income groups but was higher than population growth in the middle income countries.

Cereal production, which provides four-fifths of the output of staples in DME countries, rose at an average rate of 3 percent a year in 1960-75, well above the population increase of 2.5 percent. The largest increases occurred in Asia and Latin America. Root crop production rose 2.7 percent a year as a declining trend in Asia was offset by increases in Sub-Sahara Africa and Latin America. The growth rate of pulses and groundnuts, however, was only 2 percent a year.

Recent trends in cereal production indicate that the DMEs may find it difficult to maintain production growth at the 1960-75 rate. In the last half of the period, 1967-75, output of cereals rose only 2.4 percent a year. The rise in average yields per hectare was maintained but expansion of the area under cereals slowed. This also was the pattern in Asia, the largest cereal producer.

Food Policy Alternatives

The food deficits emphasized in this study provide indicators of the size of the job facing the food deficit DMEs to provide adequate food supplies for their populations. These food deficits will need to be met either through domestic production, commercial imports or food aid. The only other alternative would be to reduce food consumption from the projected levels through either increased prices or some other form of rationing. This could mean further reductions in the already inadequate consumption levels prevalent in many low income countries.

The projections in Table 1 indicate the magnitude of the potential food production problem. In food deficit DMEs, production is projected to grow annually at 2.4 percent to 1990. A rate of 3 percent would be needed just to maintain per capita consumption at the 1975 per capita level. To meet the additional demands resulting from increases in income would require a production growth rate of 4.1 percent with low income growth and 4.4 percent with high income growth. To achieve the energy targets in the DME countries without regard to market demands, an overall growth rate of 4.4 percent per year also would be required. More rapid growth rates would be needed to meet both market demands and energy targets.

Policy choices vary widely among countries. The high income countries have good prospects for generating foreign exchange. Many may find it advantageous to invest in nonagricultural economic activities and depend on commercial export earnings to purchase their food import needs. Some middle income countries also have favorable foreign exchange prospects. Several, such as Mexico and Brazil, have been able to attain rapid rates of growth in food production. However, others such as Peru, Chile and Turkey may face difficult problems unless food production can be increased much more rapidly than in the past.

In most low income countries, policy choices are limited. Food consumption of much of the population already is below dietary energy requirements. Only a few have attained rapid increases in food production. Commercial imports of the huge projected deficits are doubtful because of the large amount of foreign exchange that would be required (US$ 14-17 billion at 1975 import prices) and the need to finance other development activities. The oil countries, Indonesia and Nigeria, and perhaps a few others, may be exceptions but most will find it difficult to finance enough food imports to meet the large deficits projected. Prospects for obtaining such massive quantities of food aid also appear unlikely.

In order to narrow the projected food gap, development efforts in these countries must emphasize policies to radically improve production performance. Large increases in investments in agriculture accompanied by appropriate policies and effective programs to improve production performance will be required. Even so, it appears unlikely that the increases

Table 1--Annual growth rates of staple crop production needed by food deficit developing market economies to meet consumption requirements in 1990, by IFPRI category and region

IFPRI Category	Projected Production Growth Rate 1975-1990	Required Production Growth Rate to Meet Consumption Requirement in 1990a/			
		At 1975 Per Capita Level	Low Income Growth	High Income Growth	At 110% of Energy Requirement
Low income	2.4	3.0	3.7	3.9	4.4
Middle income	3.5	3.7	4.3	4.5	3.9
High income	2.4	5.9	7.2	7.6	6.4
Total DME*	2.7	3.4	4.1	4.4	4.4
Region					
Asia	2.5 (2.8)	3.1 (3.0)	3.7 (3.6)	4.0 (3.9)	4.3 (4.1)
North Africa/ Middle East	2.5	4.2	4.9	5.2	5.0
Sub-Sahara Africa	2.2	3.2	4.0	4.4	4.6
Latin America	3.7 (3.6)	3.9 (2.6)	4.5 (3.2)	4.6 (3.3)	4.1 (2.8)
Total DME*	2.7 (2.9)	3.4 (3.1)	4.1 (3.8)	4.4 (4.0)	4.4 (4.0)

Note: The figures in parenthesis include the grain-exporting countries.

* Developing market economies.

a/ Based on the trend value of production for 1975.

in production will come quickly enough to meet the food needs of the 1980s. At the projected production growth rate of 2.7 percent a year, food deficits arising from expanding market demand would increase at an average of around 5 million metric tons a year during the next decade. However, several years will likely be required before additional investments and improved agricultural policies can raise production growth rates to 4 percent or more a year. Moreover, serious production shortfalls arising from adverse weather conditions in a number of developing countries are likely to continue to occur. Consequently, increases in food aid programs beyond the target of the World Food Council of 10 million metric tons per year are likely to be necessary in the next decade if the basic human need for food is to be met.

Closely related is the question of how to come to grips with the problem of the malnourished. Meeting food demand which arises from economic growth will only partly alleviate the conditions of the underfed in most low income countries. In the past, the number of poor and underfed in most developing countries has increased despite economic growth. In order to reduce their numbers, policies must be developed to increase the income and effective demands of the poor. Approaches would include effective intervention programs to meet critical food needs and longer term programs to generate employment opportunities and improve income distribution.

Other important questions arise from this report, questions that have no answers now but need to be pursued. The supply/demand balance of trade of the developed market economies, the USSR, the People's Republic of China and other centrally planned countries can have a great effect on the ability of the DMEs to feed their people while they are increasing their production. Also important would be the development of supply management policies to provide adequate food security for developing countries during periods of seriously adverse weather fluctuations. Equally important is the need for a better assessment of the foreign exchange and trade prospects in relation to prospective food import needs of the low income, food deficit countries. A better understanding of the causes of the rapid production growth attained in several of the developing countries is also needed to provide guidelines for rapid agricultural development in other food deficit countries in similar circumstances.

2. METHODS AND ASSUMPTIONS

This assessment of the future food needs is based on projections of food production and consumption. It is important to clearly understand the assumptions on which these projections rest and the methods used in making them. Consequently, some of the basic elements in the methodology are summarized here. (More detailed discussions are presented in Annexes 1 and 2.)

Food deficits (or surpluses) represent the difference between projected production of cereals and selected food crops (root crops, pulses and groundnuts) based on historical trends and projected demand arising from assumed rates of growth in population and income.

Production (expressed in terms of cereal equivalent) was projected to 1990 by extending the 1960-75 trend. It is recognized that extension of the past has many shortcomings as a guide to the future. Some countries will do better as they exploit more advanced technology and perform more efficiently in administering production programs and policies. Others may do worse as land and water resources become more limited without compensating improvements elsewhere. Moreover, in some countries where production fluctuations are wide, the historical trend may reflect, in part, periods of good or bad weather. Nevertheless, projection of the trend provides a baseline from which to judge the additional investment and other factors required to raise production to meet food needs.

Four consumption targets are projected for 1990:

1. <u>Food needs to provide 1975 average per capita consumption levels for the increased population in 1990.</u> In this circumstance, consumption levels in most developing countries would continue below minimum nutrition levels and the number of poor and underfed would increase substantially.

2. <u>Food needs under a low income growth assumption.</u> Economic growth in most non-OPEC developing countries has slowed appreciably in recent years which has dampened demand for food to some extent. For the future, it is assumed that

the high energy costs will continue to impede economic progress, and consequently, growth in demand.

3. Food needs under a high income growth assumption. This assumes that non-OPEC DME countries will resume their long-term economic growth rate; those with slow growth will increase their growth rates to 1.5 percent a year.

4. Food needs to meet minimum calorie recommendations. For the purpose of approximating dietary energy requirements by country it has been assumed that a nutritional target of 110 percent of the recommended minimum dietary energy supply as calculated by FAO would provide countries with a physical capability of meeting or closely approaching their dietary energy needs. This assumption has been used by FAO for similar purposes.

Population projections are based on the UN medium variant projections for 1975-90, which is used in most projection studies. Income elasticities were largely derived from the FAO report, Agricultural Commodity Projections 1970-80, adjusted for high and low income growth assumptions. A zero income elasticity has been assumed for root crops in all countries, since FAO has projected zero or negative elasticities for most countries for the 1980s. However, per capita consumption of root crops continues to expand in some countries of Africa, and it is possible that with improvements in varieties and processing such increases will continue. In most countries, however, cereals represent the preferred food, and therefore, root crop consumption per capita is not generally expected to increase with income.

Per capita income growth projections were derived from the 1976 World Bank Atlas and other World Bank materials.

The food deficits (or surpluses) presented in this report indicate the quantities that would be required to bring production and consumption demands in balance at the price relationships of recent years. This would require such adjustments as increasing production more rapidly than in the past and increasing commercial or concessionary imports. The only other option would be to reduce consumption by raising prices or rationing. In the absence of changes in these factors, deficits indicate import needs while surpluses indicate the export availabilities. The food gaps calculated in this study represent the requirements above market demand consumption levels that would be required to meet the food energy needs of the underfed.

Grouping of Countries

The food deficit countries include all countries presently with deficits plus those countries that are presumed to have considerable risk of a deficit during much of the period (Figure 1). The food deficit countries are grouped in three categories: low income countries are those where per capita income averaged less than US $300 in 1973 and foreign exchange is a constraint. Most of this group is in Asia and Sub-Sahara Africa. In many of these countries, the major option is to increase food production more rapidly while supplementing supplies as far as possible with food aid and commercial imports. Since consumption levels in most of these countries are already below minimum standards there is little room for further reduction.

At the other extreme are countries with high income growth and/or high foreign exchange earnings. This group includes the OPEC countries and such diversified economies in Asia as Republic of China, Republic of Korea, and Malaysia. These countries can afford commercial imports to meet their food needs. For some, notably the OPEC countries of North Africa/Middle East, the agricultural resource base is quite limited and investment in other enterprises is likely to be more rewarding.

The middle income countries, largely Latin American and non-OPEC North Africa/Middle East, are somewhat better off than the low income countries in economic growth and performance in agriculture. Nevertheless, most also require additional investment to improve production to meet food needs. Most are in a better position to supplement supplies with commercial imports, but some at the margin may also need food aid.

A fourth group represents major cereal exporters. Thailand, Argentina, Surinam and Uruguay are projected to continue to export foodgrains. Pakistan, with a high production growth rate, particularly in the last eight years, is likely to move to an export position. Zaire and Burundi also were projected to have significant positive net balances but were not included as exporters since the surpluses presumably would be largely root crops which are difficult to store and export. Surpluses in other developing countries were either not significant or not projected to continue at a significant level. (The countries in each category are listed in Annex 3.)

Finally, in interpreting the projections of production/consumption and surplus/deficit for individual countries, there is an inevitable element of error which stems from the inadequate statistical bases for most developing countries, particularly in the low income countries of Sub-Sahara Africa. Nevertheless, in most cases it appears unlikely that the margins of error would significantly alter the increasing food shortfalls projected to occur.

Figure 1. Developing Market Economies by IFPRI Category

[a]Also categorized as high foreign exchange earners.

[b]With foreign exchange constraints.

3. THE PRODUCTION RECORD, 1960-75

Around 80 percent of the current output of major staples in the DMEs is cereals, about 10 percent root crops, and the remainder groundnuts and pulses.1/ Table 2 and Figure 2 present the relative distribution of production of major staples within DME regions in 1975-76. Percentages are based on cereal weights, with the output of root crops, pulses and groundnuts converted into wheat equivalent based on their calorie contents.

The pattern of production of these crops varies widely. Cereals largely dominate the output of major staples in Asia (83 percent), North Africa/Middle East (91 percent) and Latin America (80 percent). In Sub-Sahara Africa where the other staples, particularly root crops, are more important, the share of cereals is 55 percent.

In Asia rice comprises almost 60 percent of cereal production. More than half of the region's cereal output comes from India. In North Africa/Middle East, wheat accounts for 55 percent and coarse grains 39 percent of cereal production. More than one-third of the region's output is accounted for by Turkey. In Latin America, coarse grains account for almost 70 percent of the cereals grown while wheat, produced mostly in Argentina, Mexico and Brazil, represents about 20 percent. Around 87 percent of Sub-Sahara African cereal production is coarse grains.

Root crops make up 30 percent of the major staples produced in Sub-Sahara Africa and 13 percent in Latin America. Groundnuts and pulses contribute a relatively minor portion of the production of major staples in the DMEs, ranging from a combined share of 6 percent of North Africa/Middle East to 15 percent in Sub-Sahara Africa.

1/ Major staples, as used here, include cereals (rice, wheat and coarse grains) root crops, groundnuts and pulses. Root crops are an important source of calories in several countries. Although of lesser importance, groundnuts and pulses are also significant sources of protein and energy.

Table 2--Relative distribution of the production of major staples in developing market economies, by region, 1975-76 a/

(percent)

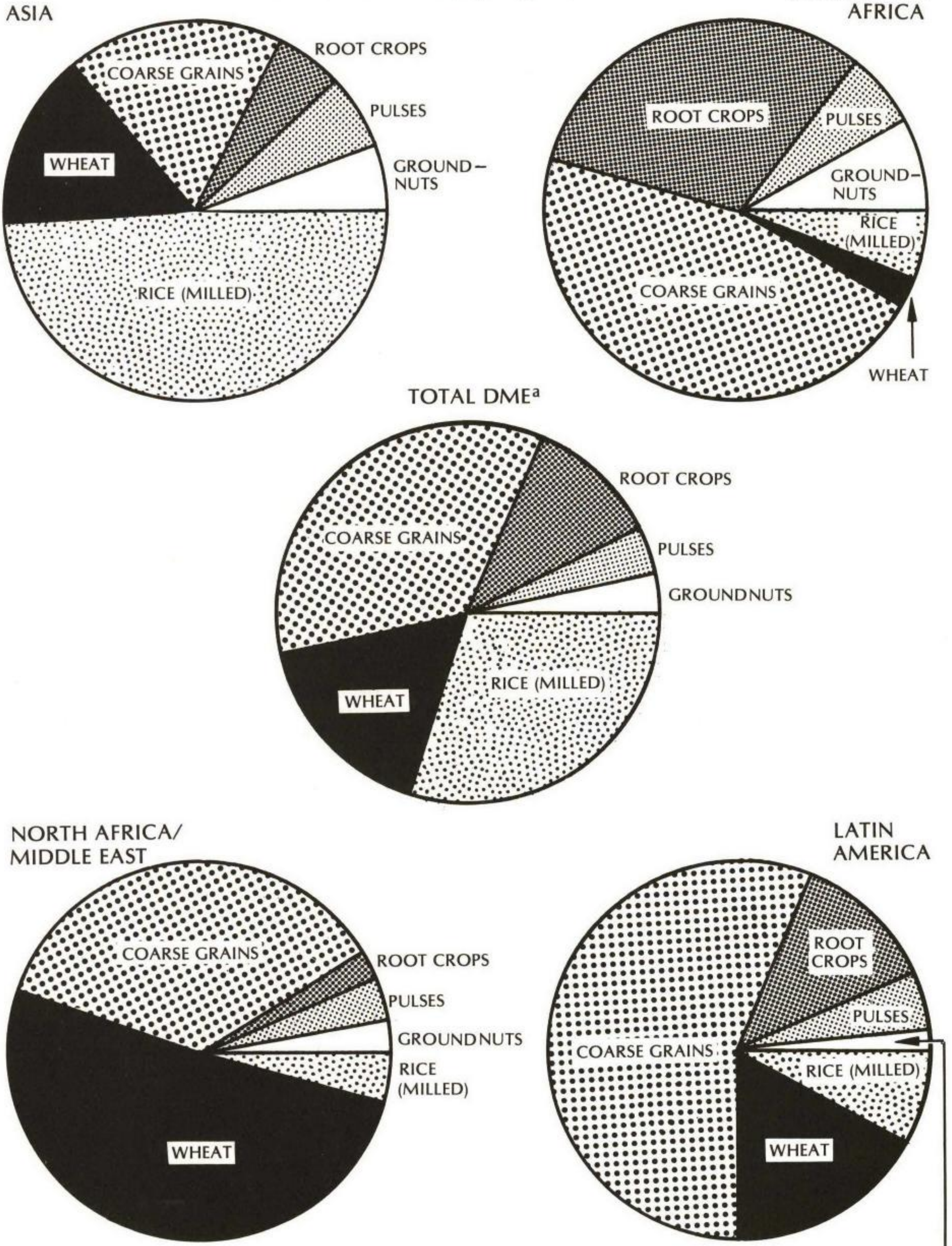
Major Staples	Asia	North Africa/ Middle East	Sub-Sahara Africa	Latin America	All DME*
Cereals	83.4	91.3	55.1	80.0	79.9
Rice (milled)	49.1	5.1	5.5	9.6	28.3
Wheat	14.7	50.2	1.6	15.5	18.1
Coarse grains	19.6	36.0	48.0	54.9	33.5
Selected crops	16.6	8.7	44.9	20.0	20.1
Root crops	5.4	2.2	30.0	13.1	10.0
Pulses	4.7	3.6	6.3	5.2	5.4
Groundnuts	5.5	2.9	8.6	1.7	4.7

Sources of basic data: FAO Production Tapes, 1975.

* Developing market economies.

a/ Based on output weights from 1975 FAO data, except in the case of Republic of China for which USDA data was used. For the selected crops, output data were converted to wheat equivalent based on caloric content.

Figure 2. Distribution of the Production of Major Staples in Developing Market Economies, by Region, 1975–76*



*See Table 2 and Annex 4 for contries included.

[a]Developing market economies.

Production Trends of Major Staples

For the DME countries as a whole, the rate of growth in the production of all major staples during 1960-75 well exceeded that of the population, due largely to the 4 percent annual growth rate of cereal output in the grain-exporting countries (Table 3). Food output exceeded population growth in middle income DMEs but fell behind in low and high income countries. Much more rapid increases in food production will be needed to reduce current deficits, and satisfy future increases in food demand arising from the growth in per capita income.

In the aggregate, food output in the food deficit DME countries during the 15 year period was not poor relative to population growth. Production of major staples grew slightly faster than population. Cereal production increased at an average rate of 2.8 percent per year while output of non-cereal staples rose at a slower pace.

In low income, food deficit countries, which contain around two-thirds of the total DME population, the annual rate of growth of 2.4 percent in the output of major staples in 1960-75 fell slightly behind the population. There were only slight increases in cereal production during the early part of the period, all of it in coarse grains. After 1966, increased wheat and rice production as a result of the Green Revolution in Asia boosted the 1960-75 growth rate for cereals to 2.6 percent. However, the rate for non-cereal staples, particularly pulses and groundnuts, fell below 2 percent.

Production of major staples by the middle income, food deficit DMEs as a group, grew at an annual rate of 3.5 percent, outpacing population growth during the past 15 years. Output of non-cereal staples rose at a slower pace but the rate was still significantly higher than for population. Most of the increase for the group was due to the fairly rapid growth in Brazil, Mexico, Morocco, Tunisia and Ghana where annual rates exceeded 3.5 percent. These five countries accounted for more than 60 percent of the food production of this group of DMEs.

As expected, 1960-75 food production in the high income food deficit DMEs grew at a much lower rate than population. Food output in these countries consists mainly of cereals and accounts for less than 10 percent of the production of major staples in the food deficit DMEs. With increasing dependence on food imports, the growth rate in cereal output in these countries declined significantly during the later part of 1960-75.

The grain-exporting group of DMEs registered a 4 percent growth rate in cereal production during 1960-75. Cereal output by this group represents around 12 percent of the total

Table 3--Average annual growth rates of population and food production in developing market economies, by IFPRI category and region, 1960-75 and 1975-90.

(percent)

IFPRI Category	Population 1960-75	Population 1975-90	Food Production: Cereals 1960-75	Food Production: Other Staples 1961-74 a/	Food Production: All Major Staples 1975-90
Food deficit	2.6	2.6	2.8	2.3	2.7
Low income	2.5	2.6	2.6	1.8	2.4
Middle income	2.8	2.9	3.6	3.1	3.5
High income	2.7	2.7	2.4	...	2.4
Grain exporters	2.6	2.9	4.0	...	4.0
Total DME*	2.6	2.7	3.0	2.3	2.9
Region					
Asia	2.5	2.5	3.1	-1.0	2.8
North Africa/Middle East	2.7	2.9	2.5	2.9	2.5
Sub-Sahara Africa	2.6	2.9	1.8	3.5	2.2
Latin America	2.8	2.8	3.7	3.1	3.6
Total DME*	2.6	2.7	3.0	2.3	2.9

Sources of basic data: Population: United Nations Economic and Social Affairs Department. "Selected World Demographic Indicators by Countries, 1950-2000" (GSA/P/WP.55) May, 1975.
Cereals: USDA, Foreign Agricultural Service, Computer Printout on Production, 1975.
Other Staples: FAO, Production Tapes, 1975.

* Developing market economies.

a/ Other staples include root crops, pulses and groundnuts where these are important components in the diet of the population. The cereal equivalent of their output, computed on the basis of calorie content, was used in calculating the combined growth rates.

production of major staples in the DMEs. The group includes Pakistan, which was a food deficit country in 1975 but will soon become an exporter if their 1960-75 performance continues. The overall growth in cereal output of the grain exporters was much faster in the first part of the period than during the last eight years. Grain exporters in both Asia and Latin America contributed to the increase in the earlier years. During the later period, the rapid increases in cereal output by Pakistan failed to offset the declines in the rate of cereal production in Thailand and the Latin American exporting countries.

Among the DME regions, the most rapid growth in food production during 1960-75 was registered by Latin America where the output of major staples grew nearly one percent per year faster than the population. Most of the region's increase was accounted for by the major countries, particularly Brazil, Mexico and Argentina. In several other countries, such as Chile, Ecuador, Haiti, Honduras and Peru, the food production growth rate lagged behind population. Growth in output of root crops, pulses and groundnuts in Latin America was much slower than the rate for cereals, but was significantly faster than population increase.

Food production in Asia also exceeded population growth during the period. The 3.1 percent growth rate for cereals more than offset the declining trend for root crops, pulses and groundnuts. Non-cereal staples are relatively minor crops in the region. Root crops are important mainly in Indonesia where the patterns of consumption and production have been shifting to grains. Most of the increases in food output in Asia occurred in Pakistan, Malaysia, Thailand, the Philippines and Indonesia where national growth rates in food production of 3 percent or more were registered in 1960-75. India, which produces about 55 percent of Asia's food output, had a food production rate of 2.5 percent, slightly faster than population growth.

Population growth outstripped food output in North Africa/Middle East and Sub-Sahara Africa in 1960-75. If these trends continue, most of the food deficit DMEs in these regions will have mounting food problems in the years ahead. In North Africa/Middle East, output of root crops, groundnuts and pulses rose at a rate of 2.9 percent, but these are relatively minor crops in the area. A few other countries also registered growth rates of 2.9 percent or more in food output in 1960-75, among them Morocco, Iran, Sudan and Tunisia. But in most countries of the region, the production rates of major staples were much lower than population growth.

Sub-Sahara Africa as a whole performed poorly in food production in 1960-75, although lack of data makes accurate measurement difficult. Cereal output expanded at an annual average rate of less than two percent, but the recorded production growth for root crops, which are of major importance in the region, was significantly above population. Production trends varied widely among countries. Growth rates of over 4 percent a year were achieved in Burundi, Zaire, Zambia, Ghana and Cameroon, but in the Sahel countries and Mozambique production declined. In most of the low income DME countries in the region, production growth has been below that of the population. For the 1975-90 period, population is projected to grow at significantly higher rates than in 1960-75. This would result in a critical food problem for the region unless production performance in most countries can be significantly improved over the levels of the past 15 years.

4. SOURCES OF GROWTH IN CEREAL PRODUCTION

A study of the changes that have occurred in the two components of crop production, namely, area and output per hectare, provides useful insights into the sources of growth in cereal output. For the DME countries as a whole, the 2.7 percent per year growth in production during the 1960-75 period breaks down into an expansion of 1.1 percent per year in area and a growth in output per hectare of 1.6 percent per year (Table 4).1/ Thus, about 40 percent of the growth in output was due to area expansion and the other 60 percent to increases in output per hectare. Most of the increase in cereal production in Asia and in North Africa/Middle East during 1960-75 came from increased yields but in Sub-Sahara Africa and Latin America area expansion was the principal source.

In the earlier 1960-66 period, most of the increase (58 percent) in production came from area expansion, while in the 1967-75 period nearly 70 percent came from increases in output per hectare. The significant increases in output per hectare during the later period can be largely associated with the spread of new wheat and rice varieties, particularly in the Asian countries, during the late 1960s and early 1970s.

1/ The production growth rates for cereals were calculated from totals for DMEs as a whole, regions and economic categories to obtain comparability in the relative contributions of area and output per hectare to the growth of output among regions between periods, and thus differ slightly from the annual rates of growth of cereal production used elsewhere in the report. Since yield per hectare is a measure derived from estimates of total output and crop area for any particular crop, the growth rates of yield per hectare and crop area always add up to the growth rate of production. Changes in output per hectare primarily reflect the changes in the yields of individual cereal crops although changes in the mix of crops, insofar as their yields vary, may to some extent also affect the changes in output per hectare.

Table 4--Average annual growth rates of production, area and yield of cereals in developing market economies, by region, 1960-75, 1960-66 and 1967-75.

(percent)

Region	Period	All Cereals			Rice			Wheat			Coarse Grains		
		Production	Area	Output per Hectare	Production	Area	Output per Hectare	Production	Area	Output per Hectare	Production	Area	Output per Hectare
Asia	1960-75	2.9	1.0	1.9	2.4	1.0	1.4	6.6	2.7	3.9	1.7	0.2	1.5
	1960-66	0.7	0.7	...[a]	0.4	1.0	-0.6	0.6	0.3	0.4	1.1	0.5	0.6
	1967-75	2.7	0.8	1.9	2.4	1.0	1.4	6.9	3.2	3.7	0.9	-0.4	1.3
North Africa/ Middle East	1960-75	2.3	0.5	1.8	3.0	1.2	1.8	2.9	1.0	1.9	1.3	-0.2	1.5
	1960-66	1.7	-0.2	1.9	5.5	2.5	2.9	1.9	0.5	1.3	1.0	-1.4	2.4
	1967-75	1.0	0.4	0.6	-0.9	-0.5	-0.4	2.1	0.5	1.6	...[a]	0.4	-0.4
Sub-Sahara Africa	1960-75	1.3	1.2	0.1	2.8	2.9	-0.1	2.5	0.3	2.2	1.1	1.0	0.1
	1960-66	2.6	2.3	0.3	4.0	2.7	1.4	3.7	2.3	1.4	2.4	2.3	0.1
	1967-75	0.5	0.6	-0.1	1.9	3.3	-1.4	-0.8	-2.6	1.8	0.4	0.4	...[a]

Table 4--Continued

Region	Period	All Cereals			Rice			Wheat			Coarse Grains		
		Production	Area	Output per Hectare	Production	Area	Output per Hectare	Production	Area	Output per Hectare	Production	Area	Output per Hectare
Latin America	1960-75	3.5	2.1	1.4	2.7	2.7	...a/	1.7	1.0	0.7	4.2	2.2	1.9
	1960-66	5.6	3.4	2.2	3.8	4.7	-0.8	5.7	2.2	3.4	5.8	3.5	2.4
	1967-75	2.9	1.0	1.9	3.8	2.3	1.5	2.3	0.7	1.6	2.9	0.7	2.1
Total DME*	1960-75	2.7	1.1	1.6	2.5	1.2	1.3	4.1	1.6	2.5	2.3	0.8	1.5
	1960-66	2.1	1.2	0.9	0.9	1.3	-0.4	2.4	0.7	1.6	2.9	1.3	1.6
	1967-75	2.4	0.7	1.6	2.4	1.2	1.2	4.0	1.5	2.5	1.4	0.2	1.2

Source of basis data: USDA, Foreign Agricultural Service, Computer Printout on Production, 1975.

* Developing market economies.

a/ Less than 0.05.

Growth in output per hectare in Asia, where more than half of the cereals are produced, contributed about two-thirds of the growth in cereal production during the 1960-75 period. Much of the increase in yields could be attributed to the rapid spread of the new fertilizer-responsive varieties and substantial increases in land under irrigation in 1967-75. Output per hectare in this later period grew at an average annual rate of 2 percent after holding nearly constant in 1960-66. Increases in cereal production during the earlier period came almost solely from the growth in the area.1/

Around 60 percent of the 1960-75 average growth rate in the production of both rice and wheat in Asia was contributed by rising yields per hectare and the remainder by expansion of area. In the case of coarse grains, production growth came almost wholly from increased output per hectare; the total area under these crops remained about constant. There has been less technological improvement in maize and other coarse grains than in rice and wheat. The downy mildew disease continues to hold down maize yields per hectare in the region.

In North Africa/Middle East, increased output per hectare accounted for 78 percent of the 1960-75 average growth rate in cereal production. The rate of growth in cereal output had not been encouraging, averaging about 1.7 percent a year in 1960-66 and only 1 percent a year in 1967-75. Wheat and coarse grains are the major cereals. The wheat area expanded at a low and constant rate in both 1960-66 and 1967-75. Increased yield per hectare contributed from two-thirds to three-fourths of the growth rate in production during both periods. However, the increases in yield were lower than those achieved in Asia and particularly in the more recent 1967-75 period. The yield increase of 1.8 percent per year was associated with the increased use of fertilizers and above average rates of growth of wheat yield in several countries.

Growth in output per hectare of coarse grains sustained the long-term uptrend in production in North Africa/Middle East. The area under coarse grains either remained constant or declined. This pattern was even more pronounced in 1960-66 when the area utilized for these crops decreased sharply. This reduced growth rate in production to 1 percent a year

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1/ Output trend for Asia is greatly influenced by India which accounts for nearly 55 percent of the cereal output of the region. India's serious droughts during the earlier period resulted in a cereal production growth rate of 0.7 percent a year. The rate of growth for Asia, excluding India, in 1960-66 was 2.7 percent a year, about two-thirds of which was due to growth in area.

despite a 2.4 percent annual growth rate in output per hectare. The production performance during 1967-75 was even poorer. Slight increases in area were wholly offset by declines in output per hectare. As a consequence, coarse grain production in the period showed little change.

Cereal production in Sub-Sahara Africa, which makes up 55 percent of total production of major staples, grew only 1.3 percent a year in 1960-75. Area expansion contributed more than 90 percent of output increases. Growth in production of rice was solely due to increases in area, while improvements in yield boosted production of wheat. However, coarse grains make up more than 85 percent of cereal output in Sub-Sahara Africa. As in Asia the output per hectare of coarse grains in the region remained practically unchanged during 1960-75.

During 1960-66, increases in the area under coarse grains, wheat and rice made possible an average annual growth rate in output of 2.6 percent. The 1967-75 period, however, brought drastic declines in the production growth rates of all the cereal items. The average rate for all cereals was only half a percent a year.1/

In Latin America, which accounted for about 22 percent of cereal output in the DMEs in 1975, the long-term annual rate of growth in cereal production was 3.5 percent. About 60 percent is attributed to the growth in area and 40 percent to increases in output per hectare. Expansion in both area and output per hectare slowed down with the growth of cereal output decreasing from an impressive 5.6 percent a year during 1960-66 to 2.9 percent in 1967-75. Area expansion was the major contributor to growth in 1960-66 while increases in output per hectare were the main source in the later period.

Much of the overall area expansion occurred in Brazil where nearly 90 percent of the increase in output during the 1960-75 period came from area expansion. The increases in output per hectare (1.4 percent annually) were associated with rapid increases in the use of fertilizer, the use of high yielding varieties of wheat in Mexico, and increasing yields of rice and maize in some countries.

Among individual cereals in Latin America, area expansion in 1960-75 accounted for 52 percent of growth in production of coarse grains, 59 percent of wheat, and almost 100

1/ Considerable caution is suggested in drawing inference from the short-term trends in Sub-Sahara Africa since variations in weather in several of the countries caused wide fluctuations in area and output per hectare. Moreover, the available statistics on these crops are not entirely satisfactory.

percent of rice. For wheat growth, yields per hectare in 1960-66 and 1967-75 consistently contributed more to production growth than changes in area, while increases for coarse grains and rice were largely due to expansion of area. All of the decline in the cereal output growth rates from 1960-66 to 1967-75 was in wheat and coarse grain which account for more than 80 percent of the cereal total. Production of rice, a relatively minor cereal in Latin America, was maintained during 1967-75 by improvements in yield per hectare which offset the large decrease in the growth rate for area. (Annual growth rates of production, area and yield of cereals for the periods discussed above are also presented by economic category in Annex 4, Table 18.)

Other Major Staples

For the DMEs as a whole, the rate of growth in root crop output has been considerably more rapid than for pulses and groundnuts.1/ Increases in output per hectare were more important than expansion of area. The increase in the production of pulses and groundnuts, on the other hand, was due solely to the expansion in area, with a slight decrease indicated in output per hectare.

The 1961-74 growth rates (in percent) for these crops in all DME countries are presented:

	Production	Area	Output per Hectare
Root crops	2.6	1.1	1.5
Pulses and groundnuts	0.7	0.7	-0.1

1/ No detailed analysis of the sources of growth in root crops, pulses and groundnuts has been made because of the inadequacy of country and regional statistics. Considerable margins of error are believed to exist in the available data on these crops. Moreover, there are substantial differences between USDA and FAO estimates of production in some countries and regions.

5. A GLOBAL VIEW OF FOOD NEEDS

The projected increases in consumption of the major staples in the food deficit DMEs between 1975 and 1990 range from 241 million metric tons at low rates of increase in per capita income to 264 million metric tons at higher rates of income growth (Table 5 and Figure 3). The increased consumption would represent around two-thirds of the 1975 consumption level. About 182 million metric tons or 69-75 percent of the projected increases would come from population growth. Projections by the UN indicate that the population in these countries will increase from 1.8 billion in 1975 to 2.7 billion in 1990. About half the world population lived in food deficit DMEs in 1975.

World concern regarding the food problem focuses on the low income, food deficit DME countries where food deficits have more than doubled during the last 15 years (Figure 4). These countries will account for almost two-thirds of all people in DME countries in 1990. Projected increases in consumption requirements for low income countries would be 143 million metric tons with low growth in income, and 156 million metric tons under the high income assumption. These increments are 59 percent and 65 percent of estimated total consumption in 1975. Around 107 million metric tons would be due to population growth with rising income accounting for 24-31 percent of the total increase.

Nearly 30 percent of the total consumption increase in the food deficit countries would arise in the middle income countries, where the 1975 consumption is projected to rise by more than two-thirds. Some 12 percent of the increase would occur in the high income countries where consumption would rise by more than four-fifths. For the high income, food deficit DMEs, about 36 to 45 percent of the projected increases in consumption requirements would be due to growth in income. But in the middle income DMEs, the projected 2.9 percent growth rate in population is higher than in either high or low income, food deficit countries. Income growth would account for only 20-26 percent of the projected total increase in consumption requirements.

Table 5--Food production and consumption in developing market economies, by IFPRI category and region, 1975 and 1990.

(million metric tons)

IFPRI Category	Food Production 1975	Food Production 1990	Food Consumption 1975	Food Consumption 1990 At 1975 Per Capita Level	Food Consumption 1990 Low Income Growth	Food Consumption 1990 High Income Growth
Food deficit	351.8	510.2	385.2	566.9	626.6	649.4
Low income	230.6	318.8	242.0	349.4	384.5	398.3
Middle income	99.2	160.0	108.6	165.1	179.6	184.5
High income	21.9	31.4	34.6	52.3	62.4	66.6
Grain exporters	47.2	88.4	34.9	51.9	55.6	56.5
Total DME*	399.0	598.6	420.1	618.8	682.2	705.9
Region						
Asia	201.8	298.2	211.2	305.7	336.6	348.1
North Africa/ Middle East	50.9	70.5	60.5	90.1	100.3	104.3
Sub-Sahara Africa	56.6	77.9	58.8	90.4	101.6	106.6
Latin America	89.7	151.9	89.7	132.7	143.6	146.9
Total DME*	399.0	598.6	420.1	618.8	682.2	705.9

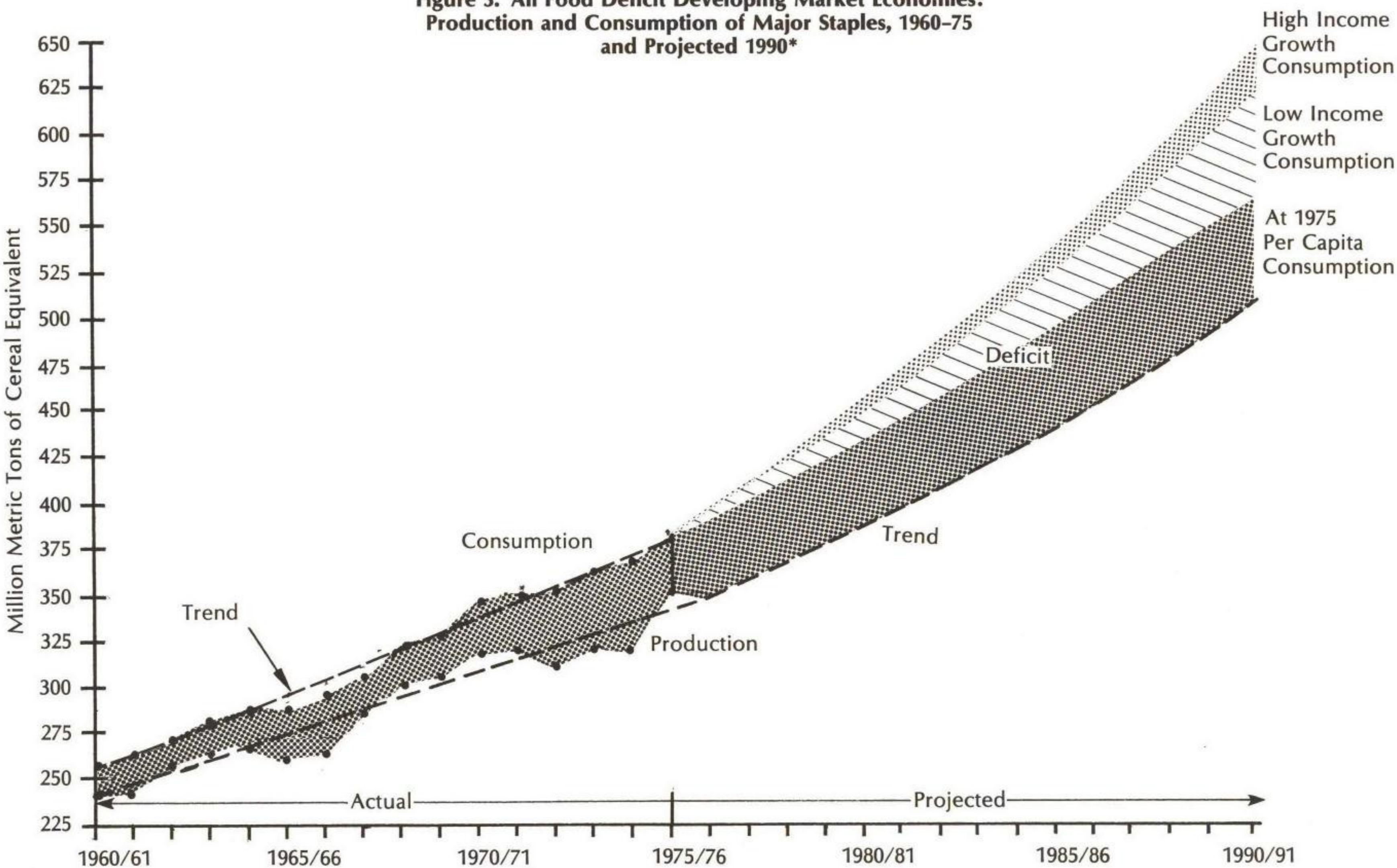
Sources of basic data: UN Economic and Social Affairs Department. "Selected World Demographic Indicators by Countries"(ESA/P/WP.55) May, 1975.

USDA, Foreign Agricultural Service, Computer Printout on Production, 1975.

FAO. Production Tapes, 1975.

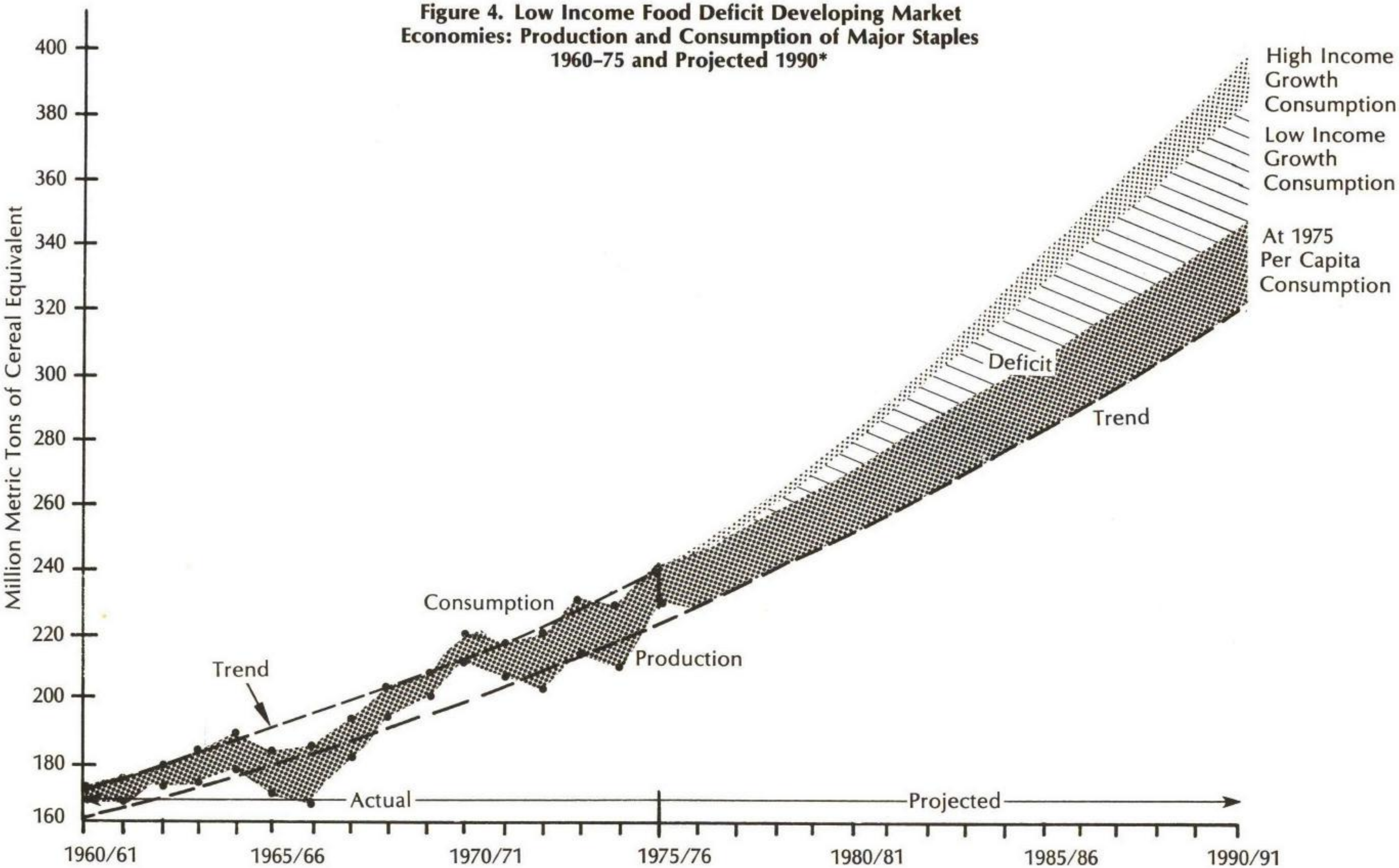
* Developing market economies.

Figure 3. All Food Deficit Developing Market Economies: Production and Consumption of Major Staples, 1960–75 and Projected 1990*



*See Annex 4 for countries included.

Figure 4. Low Income Food Deficit Developing Market Economies: Production and Consumption of Major Staples 1960–75 and Projected 1990*



*See Annex 4 for countries included.

For all DME countries, including the grain exporters, the projected increase in consumption demand for the major staples would range between 262 and 286 million metric tons or about 8-9 percent above the total for the food deficit DME countries. Almost 200 million metric tons would be due to population growth or about the same proportions of the total consumption increases as indicated for the food deficit DME countries.

As expected, Asia would have the largest share of the projected increase in food needs between 1975 and 1990, accounting for around 48 percent under both income growth assumptions. However, this is considerably less than proportionate to its 58 percent share of the population because Asia has the lowest average per capita consumption among the four DME regions. North Africa/Middle East, which contains some 12 percent of the DME population, shows a 15 percent share of the total increment in food requirements. About 16 percent of the projected increase of the DME food needs is indicated for Sub-Sahara Africa which has 14 percent of the people. The remaining 21 percent of the expansion in projected consumption is accounted for by Latin America which contains 17 percent of the DME population but has the highest average per capita consumption.

Under the low income growth assumption, about three-fourths of the projected increase in food requirements in Asia, North Africa/Middle East and Sub-Sahara Africa, and about four-fifths of that for Latin America, would come from population growth. Under the high income assumption, Asia would need an additional 12 million metric tons of major staples, Africa 5 million, North Africa/Middle East 4 million and Latin America 3 million. (Figure 5 shows the projected production and consumption levels of major staples in the DMEs for 1990.)

Gross Deficits

Gross deficits[1/] of the major staples of the food deficit countries in 1990 will total 121-143 million metric tons, depending on the rate of income growth (Table 6). Gross deficits represent the amount that projected consumption in 1990 would exceed production if it increases at the average rate of 1960-75. On this basis, the production shortfall would be three to four times larger than in 1975 when output

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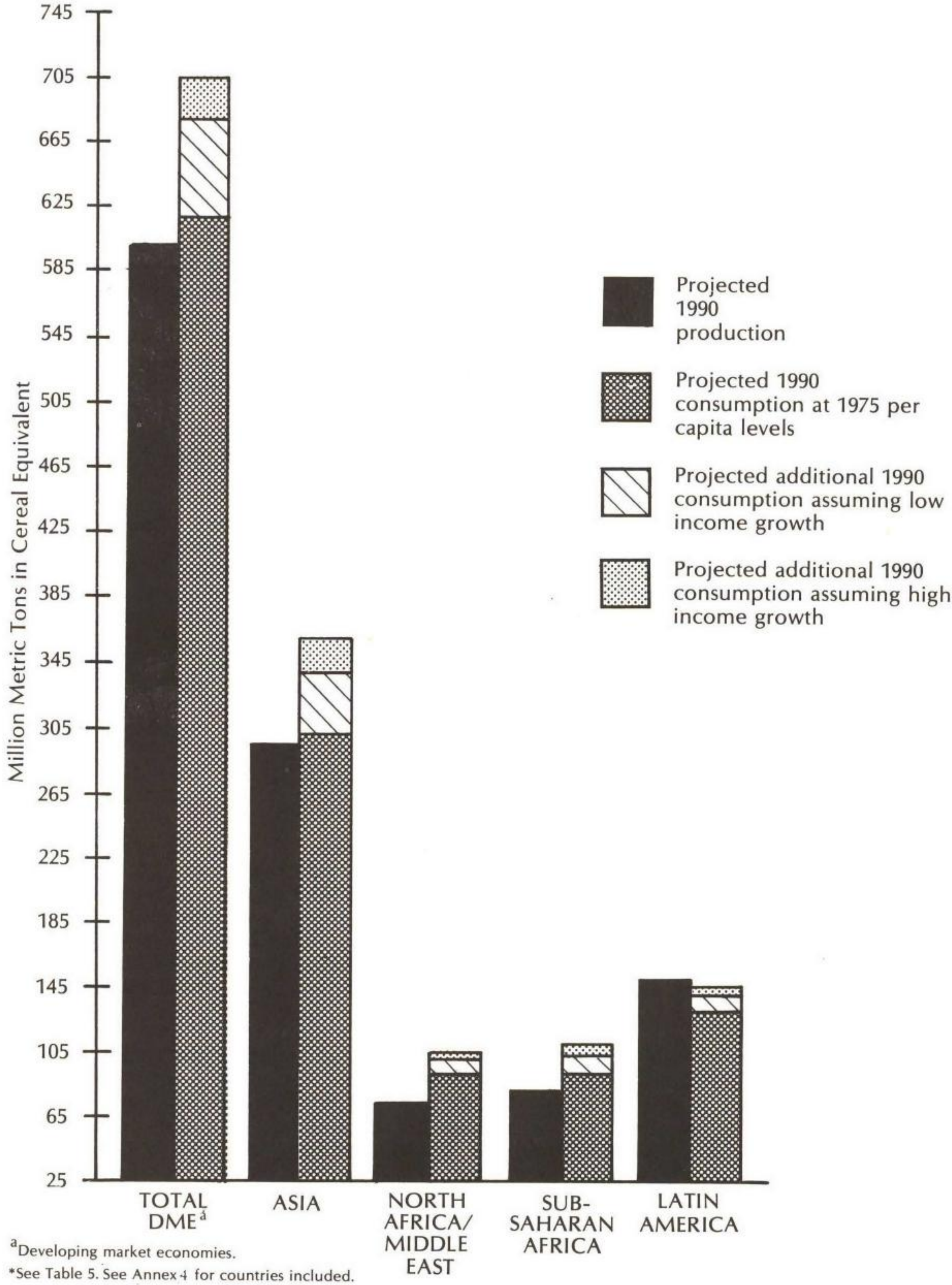
1/ Gross deficit represents the sum of the deficits of major staples in food-short countries. Net deficit is gross deficit minus the surpluses of major staples of some countries, if any, within a group of countries; it is also equal to the difference between total production and total consumption of the country group.

Figure 5. Developing Market Economies: Projected 1990 Production and Consumption of Major Staples, by Region*



[a]Developing market economies.

*See Table 5. See Annex 4 for countries included.

Table 6--Gross and net deficits of major staples in developing market economies, by IFPRI category and region, 1975 and 1990 a/

(million metric tons)

IFPRI Category	1975		1990: At 1975 Per Capita Level		1990: Low Income Growth		1990: High Income Growth	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net
Food deficit	36.2	33.4	71.6	56.7	121.1	116.4	143.1	139.2
Low income	12.1	11.4	35.9	30.6	69.0	65.7	82.6	79.5
Middle income	11.4	9.3	14.8	5.1	21.1	19.6	25.3	24.5
High income	12.7	12.7	21.0	21.0	31.1	31.1	35.2	35.2
Grain exporters	0.7	(12.2)	...	(36.5)	...	(32.8)	...	(31.9)
Total DME*	36.9	21.2	71.6	20.2	121.1	83.5	143.1	107.3

Table 6--Continued

(million metric tons)

	1975		1990					
			At 1975 Per Capita Level		Low Income Growth		High Income Growth	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net
Region								
Asia	13.5	9.3	22.3	7.5	49.6	38.4	60.3	50.0
North Africa/Middle East	11.5	9.6	20.8	19.5	30.0	29.8	34.1	33.8
Sub-Sahara Africa	2.6	2.2	17.1	12.4	27.4	23.7	32.1	28.7
Latin America	9.3	(0.0)	11.5	(19.3)	14.1	(8.3)	16.6	(5.1)
Total DME*	36.9	21.2	71.6	20.2	121.1	83.5	143.1	107.3

Note: The figures in parenthesis indicate surpluses. * Developing market economies.

a/ Gross deficit represents the sum of the production deficits of major staples in food-short countries of the indicated group of DMEs. Net deficit is gross deficit minus the surpluses of major staples of countries within the group; it is also equal to the difference between total production and total consumption of the group.

of major staples was 3 percent above trend. The projected 1990 production would be 72 million metric tons less than the amount needed to meet the projected consumption due to population growth alone.

Although surpluses are projected for a number of food deficit countries in 1990, their exports most likely will be available on commercial terms. Most such exports now go to non-DME countries.

Gross deficits in the low income, food deficit countries would reach 69-83 million metric tons in 1990, six to seven times larger than the deficit in 1975. Projected production would fall short of the increased consumption to meet population growth by around 36 million metric tons. An additional 33 million metric tons would be needed for increased market demand under the low income growth assumption, and another 14 million metric tons with higher income growth rates. The projected gross deficits would be about 18 percent and 21 percent of the projected consumption requirements under the low and high income assumptions.

The combined gross deficit of high income and middle income DME countries in 1990 would range from 52 million metric tons with low income growth to about 61 million metric tons with high income growth. Many of these countries do not have serious production constraints nor do they lack foreign exchange. The projected production shortfalls would be only two to two and one-half times their 1975 deficits.

Based on output and demand projections, the high income DMEs would increase their food deficits from around 37 percent in 1975 to 50-53 percent of their projected consumption in 1990. Growth of food output in the high income countries is about the same as that of the low income group but they are not expected to have problems in filling their consumption needs through commercial imports. The middle income DME countries as a group have a bright production record and the total food deficit may only increase from 9 percent of food needs in 1975 to 12-14 percent in 1990. However, the situation varies widely by country. Some middle income countries, such as Morocco, Ghana, Brazil and Mexico have good production prospects and may shift from deficit to surplus positions by 1990. Others may face serious food problems in the next 15 years but they are better able to import food than the low income, deficit DMEs.

Asia will have more than two-fifths of the global gross food deficit in 1990, North Africa and the Middle East about one-quarter, Sub-Sahara Africa 22 percent, and Latin America 12 percent. The projected gross deficits for Sub-Sahara Africa would be 10 to 12 times that of 1975. Asia's projected production shortfall by 1990 would be three and one-half times as large. The Latin American gross deficit, smallest of the 4 regions, would be less than twice the 1975 level.

Figure 6 shows the projected deficits of major staples among regions under the high income growth assumption.

Net Deficit

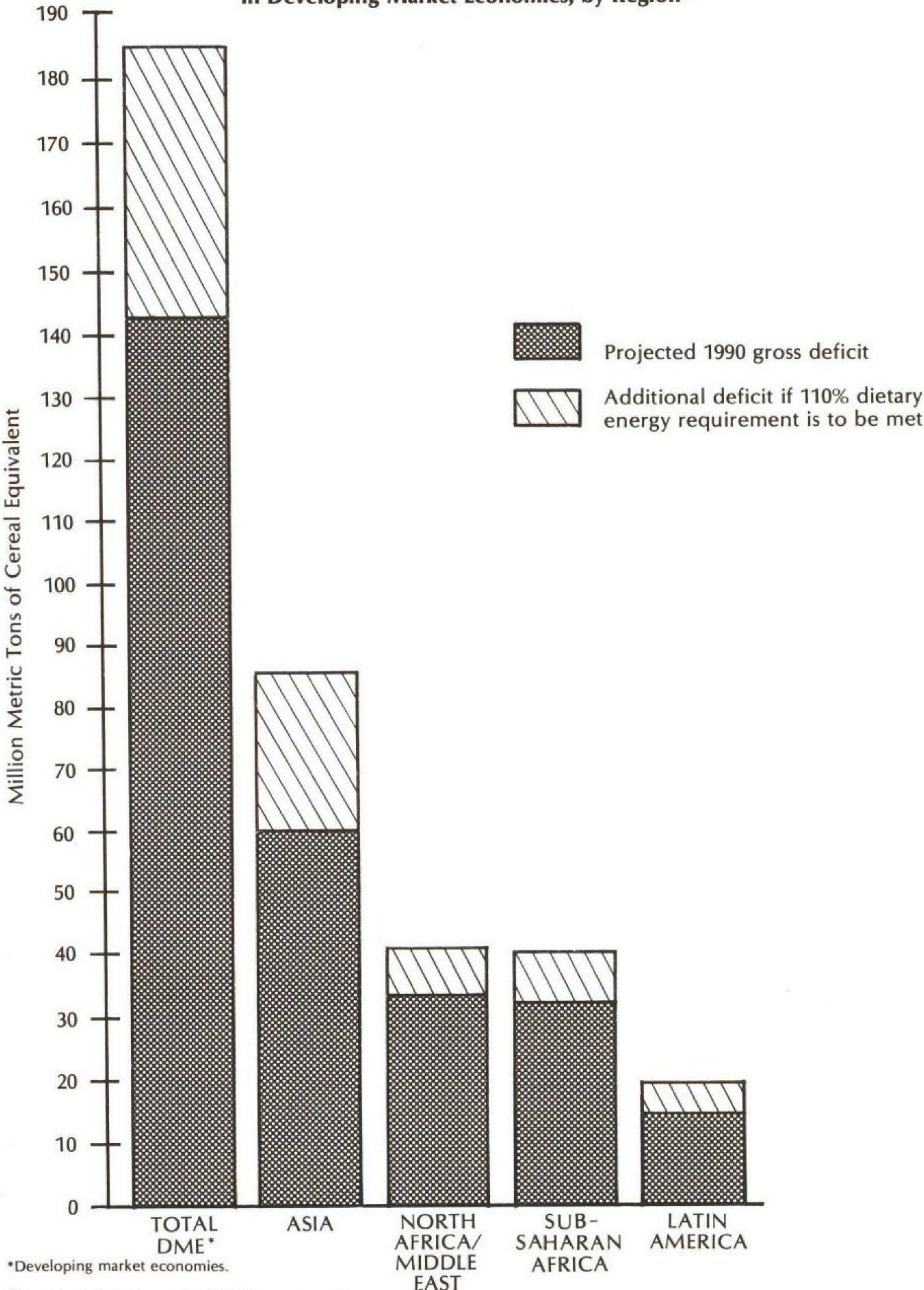
The projected net deficits shown in Table 6 reflect the amounts that would be required to make the country groups self-sufficient in food staples. For the food deficit group as a whole, the food surpluses projected in 1990 could total about 4.7 million metric tons (low income growth) or 3.9 million metric tons (high income growth). Of these amounts, the low income DMEs would contribute about 3.3 million metric tons under the low income assumption and about 3.1 million metric tons under the high. The remainder in each case would come from the middle income DMEs. These projected surpluses, however, represent less than 5 percent of the total gross deficits.

Assuming that the projected surpluses of major staples in the grain exporting countries and in the food deficit DMEs could be used to fill the projected gross deficits, the 1990 shortfall for all DME countries would be reduced to 84 million metric tons at low income growth and 107 million for the high income situation. This assumption is not realistic. However, the amounts represent the lowest possible levels of world food needs that would exist in 1990 if production and consumption turn out as projected. They serve as indicators of the amount that would have to be met by increased food production in the DMEs and by commercial or other negotiated arrangements between these countries and the developed economies.

The food deficits projected for 1990 are so large and costly that they are unlikely to be filled by cereal imports from the developed economies. This is especially so in the case of the greatly increased deficits projected for many of the low income countries which face serious foreign exchange constraints. In addition, some of the middle income countries would likely meet problems in financing the projected levels of food imports. Unless the production of major staples in these DMEs improves significantly more than during 1960-75, reductions in per capita consumption would appear likely. For many of the low income, food deficit countries this would mean further decreases in consumption levels which are now generally below recommended dietary requirements.

The extent to which these economies can achieve their consumption targets by 1990 will depend on development of their production potentials. This in turn will depend on national and international policies and programs concerning

Figure 6. Projected 1990 Gross Deficits to Meet Market Demand and Energy Standards in Developing Market Economies, by Region[a]



*Developing market economies.

[a]Based on Table 9, assuming high income growth.

investment in agriculture, output and input pricing, and foreign trade. Furthermore, considerable efforts may have to be made in order to ensure that the available food reaches the low consuming groups in the population. Towards this end, income and employment policies in these countries also require attention.

6. EFFECTS OF CHANGING PRODUCTION AND POPULATION ASSUMPTIONS ON PROJECTED GROSS DEFICITS

In order to appraise changes in rates of growth in population and food production on projected gross deficits, two additional sets of projections were made, based on the following assumptions:

1. Production of major staples would increase at 1967-75 rates in place of the 1960-75 period used in the original projections. While relatively short for projection purposes, this period is of considerable interest since it includes the effects through 1975 of changes in technology occuring during the Green Revolution in wheat and rice.

2. The UN low variant projections of the population in the DMEs were used for calculating consumption requirements under the two income growth assumptions, instead of the medium variant. The low variant projection of total DME population for 1990 is about 5 percent lower than the medium variant, with reductions ranging from 4.2 percent to 5.1 percent among income groups and from 4.2 percent to 5.3 percent among regions.

Table 7 shows the resulting changes in the projections of gross deficits.

Change in Production Projections

Despite the Green Revolution, average production growth rates of the major staples, especially the cereals, in the DMEs during 1967-75 were lower than those during 1960-75. Accordingly, the projected levels for 1990 are lower for production and higher for gross deficits. The total 1990 gross deficit would increase by about 37 million metric tons. The deficit under the low growth situation is 30 percent higher, and with high income 26 percent higher, than those projected under 1960-75 production trend.

Among the DME regions, Latin America shows the largest increase in projected gross deficits. This is due mainly to

Table 7--Effects of alternative production and population assumptions on the projected gross deficits of major staples in developing market economies, by IFPRI category and region for 1990

IFPRI Category	Using 1967-75 Production Growth Rate a/				Using Low Variant Population Projections b/			
	Low Income Growth		High Income Growth		Low Income Growth		High Income Growth	
	million metric tons	% change	million metric tons	% change	million metric tons	% change	million metric tons	% change
Food deficit								
Low income	+2.1	+3.0	+2.3	+2.8	-13.9	-20.2	-14.4	-17.4
Middle income	+26.4	+125.4	+26.5	+105.0	-2.0	-9.6	-3.8	-15.1
High income	+8.1	+26.0	+8.0	+22.7	-1.8	-5.6	-1.8	-5.2
Total DME*	+36.6	+30.2	+36.9	+25.8	-17.7	-14.6	-20.0	-14.0
Region								
Asia	-0.2	-0.5	-0.3	-0.5	-11.8	-23.7	-12.1	-20.1

Table 7--Continued

Region	Using 1967-75 Production Growth Rate a/				Using Low Variant Population Projections b/			
	Low Income Growth		High Income Growth		Low Income Growth		High Income Growth	
	million metric tons	% change	million metric tons	% change	million metric tons	% change	million metric tons	% change
North Africa/Middle East	+13.8	+45.8	+13.4	+39.2	-2.6	-8.8	-2.8	-8.1
Sub-Sahara Africa	+5.3	+19.3	+5.7	+17.7	-2.3	-8.3	-2.4	-7.5
Latin America	+17.8	+126.5	+18.1	+109.0	-1.0	-7.2	-2.7	-16.4
Total DME*	+36.6	+30.2	+36.9	+25.8	-17.7	-14.6	-20.0	-14.0

Sources of basic data: USDA, Foreign Agricultural Service, Computer Printout on Production, 1975.
UN Economic and Social Affairs Department. "Selected World Demographic Indicators by Countries, 1950-2000" (ESA/P/WP.55) May, 1975.

Note: Plus (+) indicates that the deficit has risen and a minus (-) indicates the deficit has decreased.

*Developing market economies. a/ With medium variant population projections.

b/ With 1960-75 production growth rates.

the reduced projected outputs of 30 percent for Mexico and 11 percent for Brazil compared to those calculated using the 1960-75 trend. These countries account for around 80 percent of the production of major staples of the region's food deficit countries and more than half of the output of the middle income group of DMEs.

A substantial increase in gross deficit of 13-14 million metric tons or 46 percent above the original level is indicated for North Africa/Middle East. This is about 38 percent of the increase for all food deficit DMEs. Turkey, a middle income country which contributes around one-third of the region's major staple output, shows a 16 percent reduction in projected production.

Sub-Sahara Africa would have an 18-19 percent increase in the projected gross deficit in 1990. The rate of area expansion which has been the main source of growth of food production in this region declined in the 1967-75 period.

In Asia, where the Green Revolution in wheat and rice has been more important, the 1967-75 production trend was about the same as during 1960-75. The region's gross deficit would decline half a percent under the short-term production projection.

Among the DME income groups, the largest increase in the projected gross deficit occurs for middle income food deficit countries. Production growth in these countries during 1967-75 was considerably slower than in 1960-75. Middle income DMEs account for more than 70 percent of the total increase in projected gross deficits. Projected production shortfalls are 125 percent under the low income growth assumption and 105 percent under the high. For the low income DMEs, which contain the bulk of the population in food deficit countries, there was little difference in the production growth rates of 1960-75 and 1967-75. Projected gross deficits increased only 2.1-2.3 million metric tons, or about 3 percent of the original projections under both income assumptions. In the high income DMEs, the lower rate of growth in the output of major staples during the 1967-75 period would increase projected gross deficits by 23-26 percent, or around 8 million metric tons above the original calculations. These countries, however, are not expected to meet with difficulty in acquiring their increased food needs through commercial channels.

If the future production performance in the grain exporting countries should follow the 1967-75 trends, output in 1990 would be about 5 million metric tons below the long-term trend projections.

Change in Population Projection

The UN presents three sets of population projections by countries: medium, high and low variants. These variants reflect different assumptions about the factors affecting population growth, especially fertility and mortality rates. The set most commonly used is the medium variant which, according to the UN, is "intended to represent the most plausible future population trend in view of what is known of past experience and current circumstances in each country."1/

The low variant population projections used in this section of the report indicate that the 1990 population of the DME countries would be about 5 percent lower than that based on the medium variant assumption. The reductions by income groups are 5.1 percent of the low income DMEs, 4.7 percent for the middle income group, and 4.2 percent for the high income countries. The population in the grain exporting countries in 1990 would be about 5 percent less under the low variant assumption. Among regions, the reductions from the medium variant projections are 5.3 percent in Asia, 4.2 percent in North Africa/Middle East, 4.3 percent in Sub-Sahara Africa, and 5.2 percent in Latin America.

Table 7 shows that by using the low variant population projections, the projected level of gross deficits of the major staples in 1990 will be reduced by 17.7-20.0 million metric tons, or around 14-15 percent less than the original calculations.

The low income DME countries would account for nearly four-fifths of the 18-20 million metric tons decrease in the projected gross deficit for all DMEs. India alone would account for 40-45 percent of the total. The middle income and high income groups of DMEs would have decreases of around 2 million metric tons each under the low income growth assumption. Under the high income assumption, the reduction of gross deficit of the middle income group would be double that under the low income assumption. This is because, with the medium variant population projections, Brazil would move from a food surplus to a food deficit position with higher growth in per capita income. Under the low variant projections, Brazil would be in a surplus situation under both income growth assumptions.

Regionally, Asia accounts for two-thirds of the total reduction in the projected gross deficits of all DMEs. The region's shortfall would decrease by around 12 million metric

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1/ United Nations Department of Social and Economic Affairs, World Population Prospects as Assessed in 1973 (1970-2000), Population Studies No. 60, (ST/ESA/SER.A/60), 1977, p. 12.

tons, representing reductions of 20-24 percent under the two income assumptions. In North Africa/Middle East and Sub-Sahara Africa, reductions of 8-9 percent in the projected gross deficit in 1990 would occur under the low variant population projections. The smallest reduction under the low income situation is one million metric tons for Latin America. However, this is a decrease of 7 percent from the original calculations. Under the high income situation, however, Brazil would remain a food surplus country under the low variant assumption and the projected gross deficit for Latin America would be reduced by 2.7 million metric tons, or 16 percent below original calculations.

Comparison of Changes

These calculations indicate that if 1967-75 rather than 1960-75 production growth rates were to continue until 1990, the projected gross deficit of major staples in the DME countries would increase from the original projection by 37 million metric tons; if the low variant rather than the medium variant population growth rates were to prevail during the next 15 years, deficits would decrease by some 18-20 million tons. With this projection method, changes in the gross deficits are much more sensitive to a given change in production than to a given change in population. A 1 percent change in the level of the 1990 production of major staples in the DMEs resulted in a 5.6 percent change in the opposite direction in the projected gross deficit. On the other hand, a 1 percent change in the 1990 population projection of the food deficit countries would result in a 2.8 percent change in the same direction in the level of gross deficits.

Because of the large variations in production in several of the DME countries, especially in Sub-Sahara Africa and North Africa/Middle East, some caution is indicated in assuming the reliability of the short-term trend. With regard to population trends, considerable changes in the projected rates of fertility and mortality would be required to achieve large reductions in the projected 1990 populations.

7. THE DIETARY ENERGY GAP IN DMEs

Previous discussion has focused on projected food deficits arising from projected increase in market demand. These projections provide useful insights into the potential food situation for nations and regions. But they do not measure the requirements for meeting the serious nutritional deficiencies in the developing market economies. Recent studies by IFPRI and the World Bank indicate that there are 1.3 billion persons in the developing world too poor to have an adequate diet, based on calorie energy intakes, the principal overall nutritional indicator. The estimates are based on recommended average dietary energy requirements established by the Joint FAO/WHO *Ad Hoc* Committee on Energy and Protein Requirements.1/ Caloric intake in the low income developing countries increased less than 1 percent from the early 1960s to the mid-1970s, even though per capita dietary energy consumption data suggest a marked increase (4 percent) in world dietary energy intake.2/

In light of the large numbers of underfed in the developing world this study presents estimates of the amounts of food required to meet dietary energy requirements in the various developing countries. The standard used for estimating these requirements was taken to be the amount of calories required to bring the entire population of a country up to a satisfactory standard of nutrition without reducing the food intake of those above the standard. In the absence of income distribution data for most DME countries, the approach used

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1/ International Food Policy Research Institute, *Recent and Prospective Developments in Food Consumption: Some Policy Issues*, Research Report No. 2, July 1977 and Shlomo Reutlinger and Marcelo Selowsky, *Malnutrition and Poverty: Magnitude and Policy Options*, Occasional Paper No. 23 (Baltimore: Johns Hopkins University Press for the World Bank, 1976).

2/ United States Department of Agriculture, Economic Research Service, "Global Food Production and Needs," 1977 (To be published).

here raised the national average dietary energy requirement by 10 percent to allow for the additional consumption of individuals whose consumption exceeds the average recommended requirement, because of variations in income and other factors. A recent comparison of this approach with a more sophisticated analysis based on income distribution patterns supports the validity of the 110 percent of the calorie energy standard "as a general guide to allow for maldistribution."1/ However, intervention programs would be required to channel additional food to the underfed. Also its validity is greater for countries with moderate variations in incomes among the various segments of the population.

Using this standard, the amounts of staple crops required to provide each developing country with the capability of meeting minimum food energy needs of its underfed people have been calculated. These nutritional standards for the base year were derived by adjusting the country's base year staple crop consumption by the cereal equivalent of the difference between the 110 percent of the country's recommended dietary energy standard and its actual total dietary energy consumption. These nutrition targets were then projected to 1990 on the basis of population growth. Although expressed in terms of food staples, other foods also would be used in meeting dietary energy requirements. The projected 1990 standard assumes that the pattern of distribution between direct human consumption of grain and use of grain for livestock feed would remain the same as in 1975.

To bring consumption levels in the DME countries up to the dietary energy target in 1975 would have required nearly 60 million metric tons of cereal equivalent. Most of the nutrition problem was in low income, food deficit countries where requirements totaled over 50 million metric tons (Table 8).

Economic growth would reduce the overall size of the calorie gap in the developing countries by 1990, assuming food supplies are available to meet the projected consumption levels. The gap is projected to decline to 54 million metric tons of cereal equivalent with low income growth and to 45 million metric tons with high income growth. The bulk of the food gap would continue to be in Asia, but the relative importance of the food gap in Sub-Sahara Africa and North Africa/Middle East would increase.

In about one-third of the countries, the projected 1990 food consumption, if met, would be sufficient to close the energy gap, assuming programs to the underfed are developed. But, the gap is projected to increase in many other countries.

1/ IFPRI, Recent and Prospective Developments in Food Consumption: Some Policy Issues, p. 20.

Table 8--Staple crop requirements to meet the dietary energy gap in developing market economies, by IFPRI category and region, 1975 and 1990

(million metric tons, cereal equivalent)

IFPRI Category	Amount Required to Meet 110% Dietary Energy Requirement a/		Gross Dietary Energy Gap b/		
				Projected 1990	
	1975	1990	1975	Low Income Growth	High Income Growth
Food deficit	439.4	653.7	61.4	53.8	44.5
Low income	291.2	427.3	52.2	47.4	39.1
Middle income	110.8	170.4	6.0	4.6	3.9
High income	37.4	56.1	3.2	1.8	1.4
Grain exporters	36.9	54.1	2.5	1.2	0.6
Total DME*	476.3	707.8	63.9	55.0	45.1
Region					
Asia	247.4	360.5	38.2	32.6	25.5
North Africa/ Middle East	66.9	102.0	8.2	8.2	7.3
Sub-Sahara Africa	71.4	110.1	13.1	11.4	10.0
Latin America	90.6	135.3	4.4	2.8	2.3
Total DME*	476.3	707.8	63.9	55.0	45.1

Sources of basic data: Food and Agriculture Organization of the United Nations. The State of Food and Agriculture, 1974 (1975). UN Economic and Social Affairs Department. "Selected World Demographic Indicators by Countries, 1950-2000" (ESA/P/WP.55) May, 1975.

*Developing market economies.

a/ Dietary energy standards are based on 110 percent of the dietary energy requirement for each country.

b/ Total for all countries with dietary energy targets above respective consumption levels; dietary energy gap for 1975 was calculated from consumption trend estimates.

In most of these, the present per capita dietary energy standard exceeds substantially the consumption levels and the aggregate size of the energy gap would increase even with appreciable increases in per capita consumption. However, in some of the countries, particularly in Sub-Sahara Africa and North Africa/Middle East, food consumption may actually grow somewhat faster than projected on the basis of the estimated elasticities for cereals and root crops.1/

The dominant dietary energy problem in 1990 would still be in the low income, food deficit countries, where projected additional requirements to meet food energy targets total some 39-47 million tons of cereal equivalents. Food gaps totaling about 4.5 million tons would also persist in several of the middle income countries in North Africa/Middle East, Sub-Sahara Africa and Latin America. In most of the high income countries, consumption would exceed 110 percent of the average per capita calorie requirements, although many of the countries would require effective food policies and intervention programs to meet nutritional objectives. Also, in surplus countries such as Pakistan and Burundi, the question would be one of national policy. The projected consumption levels in these countries fall below dietary energy requirements, even though projected supplies would be much more than needed to fill the projected gap.

Because of data and conceptual problems, the dietary energy gap projections are significant only for countries where the indicated gaps (or deficits) are relatively large. In particular, because of wide variations in the pattern of income distribution among the DME countries, the "110 percent of standard" may not accurately reflect the calorie supply required to achieve satisfactory nutritional levels for the entire populations of some countries. Despite its limitations, however, the projections can provide useful insights into the food requirements and policies needed to provide satisfactory nutritional levels for the underfed.

The extent to which the 110 percent target would be sufficient to meet the 1990 nutritional needs will depend greatly on the national policies. Under past circumstances, increasing food supplies to meet the calorie standard would still likely leave the poverty stricken undernourished. Effective policies of income distribution and government intervention would be required to redirect food supplies to the underfed.

1/ This would appear particularly likely in the African countries with projected increases in the projection per capita of root crops and in some of the high income North Africa/Middle East countries with very low income elasticities for cereals.

Appropriate development policies can substantially reduce the magnitude of direct intervention programs to distribute more food to the underfed. These include policies to channel a larger share of future growth in income to the poor and underfed, policies to improve the food distribution, and limits on use of grain for livestock feed.

Production Deficits

The total of over 700 million metric tons of cereal equivalent required to enable the developing market economies to meet the 1990 food energy targets would mean a somewhat larger gross production deficit than that projected with high income growth. But projections based solely on dietary energy targets understate the size of the food deficits that might arise because in several developing countries projected consumption levels are substantially above the dietary targets. In many other countries, the dietary energy target is substantially above projected market demands. Consequently, the quantities required to fill both market demands and the dietary energy gap must be considered in assessing gross deficits for the world, the regions, and IFPRI country categories.

Meeting both market demand and closing the dietary energy gap would substantially raise the projected aggregate food deficit. The total DME deficit would rise from 121 to 143 million metric tons (Table 9 and Figure 6). Some 90 percent of the increase in the deficit required to reach the energy target would fall in the low income countries. The largest impact would be in Asia, where the projected deficit would increase 40 to 60 percent.

Most of the increase in the deficit would be concentrated in a relatively few countries. Over three-fourths of the total would be accounted for by India, Bangladesh, the Philippines, Afghanistan, Sudan, Ethiopia, Tanzania and the Sahel group. In addition, some of the smaller countries such as Angola, Somalia, Bolivia, Haiti, and the People's Democratic Republic of Yemen would face large and increasing deficits relative to their projected energy target levels. Because of the concentration of the increased deficits in particular countries, the implication of filling the dietary energy target on production growth rate requirements can best be assessed from the data in the sections that follow.

Most of the increase in supplies needed to meet the nutritional needs of the underfed in these low income, food deficit countries probably will need to come from increased internal food production in view of foreign exchange and food aid constraints. Current shipments of food aid amount to some 8.5 million tons of cereals plus relatively small quantities of other foods. Even if food aid were doubled by 1990

Table 9--Projected 1990 total deficits for meeting market demand and energy requirements in developing market economies, by IFPRI category and region

(million metric tons, cereal equivalent)

IFPRI Category	Projected Deficit			Additional Amount for 110% Dietary Energy Requirement a/		Total to Meet Market Demand and Energy Requirement	
	Low Income Growth	High Income Growth	Energy Target	Low Income Growth	High Income Growth	Low Income Growth	High Income Growth
Food deficit							
Low income	69.0	82.6	110.1	45.4	37.5	114.4	120.1
Middle income	21.1	25.3	18.8	3.9	3.4	24.9	28.6
High income	31.1	35.2	24.7	1.8	1.5	32.9	36.7
Total DME*	121.1	143.1	153.6	51.1	42.3	172.2	185.4
Region							
Asia	49.6	60.3	72.6	31.2	24.9	80.8	85.2
North Africa/Middle East	30.0	34.1	31.4	8.0	7.0	38.0	41.1

Table 9--Continued

(million metric tons, cereal equivalent)

Region	Projected Deficit			Additional Amount for 110% Dietary Energy Requirement a/		Total to Meet Market Demand and Energy Requirement	
	Low Income Growth	High Income Growth	Energy Target	Low Income Growth	High Income Growth	Low Income Growth	High Income Growth
Sub-Sahara Africa	27.4	32.1	34.1	9.3	8.2	36.7	40.3
Latin America	14.1	16.6	15.4	2.6	2.2	16.7	18.9
Total DME*	121.1	143.1	153.6	51.1	42.3	172.2	185.4

* Developing market economies.

a/ Differs from the energy gap given in Table 8 because in some countries the dietary energy requirements can be met from domestic production, and in a few additional countries the projected production exceeds projected consumption under one or both of the income growth assumptions.

it would cover only a fraction of the projected additional requirements. In several of the countries food aid can be very important, however, in meeting production shortfalls and in some cases providing a basis for increases in industrial and agricultural production. The real challenge is the development of a combination of national and international policies to attack all facets of the problem of hunger and malnutrition in the low income, food deficit countries. This would include increased investments in resources devoted to food production, enlarged and more effective food aid programs, policies and programs to improve income and food distribution, and measures to slow growth in population.

8. THE COUNTRY VIEW

Data on projected food production and consumption are presented in Annex 4, Table 19 for 82 DME countries and summarized here for 48 countries and country groups. Smaller countries within income categories have been grouped together based on population. The production growth rates required to achieve the 1990 consumption targets in each country are shown in Annex 4, Table 20. In drawing inferences from these data the following points should be kept in mind:

A number of developing countries have not yet been able to develop reliable data on food production and consumption. Even the population estimates of some are subject to a considerable margin of error.

In some countries, production trends in the base periods used in this study may reflect unusually large variations in weather. Moreover, recent technological advances in food production may not be reflected in the production record.

The demand projection, in some cases, may be inaccurate because past consumption trends may not continue in the future due to changes in tastes or in food processing technologies.

Historical trends and relationships may reflect policies, programs or social conditions that will not continue. For example, the civil disturbances in Nigeria and Chile lowered the food production trends during the 1960-75 period. Similar situations may adversely affect future food production progress in some countries. On the other hand, a number of countries are giving increasing attention to investments in food production capabilities.

Asia

(Tables 10 and 11, Figure 7)

Low Income Group

These countries account for almost 75 percent of the people in the low income, food deficit DMEs that form the

Table 10--Asian developing market economies: food production and consumption, 1975 and 1990

(thousand metric tons)

IFPRI Category/ Country	Food Production		Food Consumption				
				1990			
	1975	1990	1975	At 1975 Per Capita Level	Low Income Growth	High Income Growth	At 110% of Energy Requirement
Low income	165,892	232,139	171,344	244,597	267,363	275,928	296,723
Bangladesh	13,281	15,019	14,236	20,472	21,373	22,983	27,506
Burma	6,290	7,238	5,853	8,666	9,134	9,674	9,047
India	111,933	156,137	113,343	160,455	173,702	178,016	195,517
Indonesia	23,551	37,138	25,678	36,714	43,123	44,794	41,378
Nepal	2,972	3,260	2,889	3,719	3,752	3,791	4,323
Philippines	7,073	11,654	7,349	11,731	13,097	13,392	15,286
Sri Lanka	792	1,693	1,996	2,840	3,182	3,278	3,666

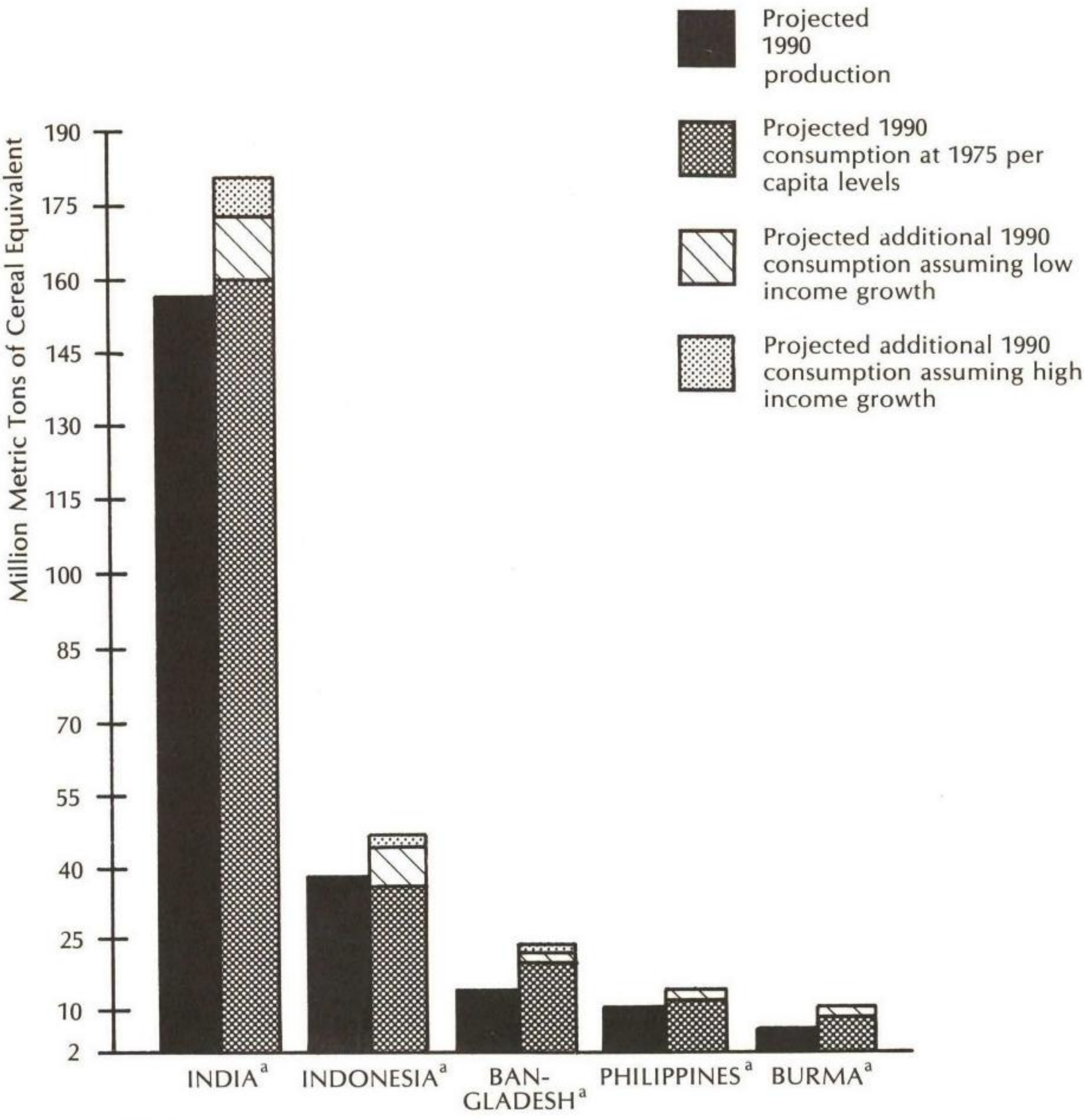
Table 10--Continued

(thousand metric tons)

IFPRI Category/ Country	Food Production 1975	Food Production 1990	Food Consumption 1975	Food Consumption 1990 At 1975 Per Capita Level	Food Consumption 1990 Low Income Growth	Food Consumption 1990 High Income Growth	Food Consumption 1990 At 110% of Energy Requirement
High income	10,893	15,649	17,779	25,051	30,033	32,196	23,690
China, Republic of	2,487	3,076	4,815	6,669	8,946	9,961	6,543
Hong Kong and Singapore	7	2	1,392	1,715	2,319	2,640	1,559
Korea, Republic of	7,021	9,429	9,337	13,306	15,239	15,999	12,312
Malaysia	1,378	3,142	2,235	3,361	3,529	3,596	3,276
Grain exporters	25,049	50,409	22,039	36,037	39,185	39,968	40,077
Pakistan	11,849	27,775	12,508	21,071	23,523	24,105	24,752
Thailand	13,200	22,634	9,531	14,966	15,662	15,863	15,325
Total Asian DME*	201,834	298,197	211,162	305,685	336,581	348,092	360,490

* Developing market economies.

Figure 7. Projected 1990 Production and Consumption of Major Staples in Selected Asian Developing Market Economies*



*See Table 10.

[a]Low income countries.

core of the world's food problem. In 1975, the gross shortfall in the production of major staples of this group was estimated at nearly 6 million metric tons; by 1990, projected gross deficits may be 6-7 times larger depending on the growth of per capita incomes. More than 20 million metric tons, about 8 percent of total food requirements, may be needed to fill the projected deficit arising from population growth alone. Poverty is an increasingly serious problem in these countries that, according to recent studies, contain a large portion of the underfed population in the developing world. The magnitude of the nutrition problem of this group of countries can be gauged by the fact that the projected gross deficit in 1990 would be around 65 million metric tons of cereal equivalent if the consumption target is set at 110 percent of dietary energy requirements.

To achieve the projected consumption in 1990, total production of major staples in this group of countries would have to rise well above the 1960-75 average annual rate of 2.5 percent. Yearly rates of 3.5 percent would be required under the low income growth assumption, 3.7 percent under high income, and 4.2 percent if the energy deficit is to be filled. In some countries, however, particularly Burma and Indonesia, per capita consumption is relatively high and the dietary energy target would be achieved before the projected consumption requirement at low income growth is reached.

While production of major staples of the low income group of countries in Asia during the last 15 years has kept pace with population growth, food output would need to grow faster in order to cover the current deficit and to meet increased food demand due to economic growth; a more rapid production growth rate would be required if the energy gap is to be narrowed.

Bangladesh. Unless food production in Bangladesh improves considerably, the country will have serious problems in the years ahead. Output of major staples expanded only 1.5 percent a year from 1960 to 1975 while population grew 2.4 percent per year. Population growth is projected to increase to 2.9 percent in the next 15 years. If the historical food production trend continues, the projected deficit under the two income growth assumptions would reach 6.5-8 million metric tons or about 7-8 times larger than the estimated shortfall in 1975. With a large part of the population underfed, the country would require an additional 4.5-6 million metric tons of major staples to meet the nutritional target.

Based on these indications, domestic food output in Bangladesh would need to grow at an average annual rate of 4-4.5 percent to meet the increase in food demand arising from population growth and the assumed increase in per capita

Table 11--Asian developing market economies: gross deficits in the production of major staples, 1975 and 1990

(thousand metric tons)

IFPRI Category/ Country	1975	1990: At 1975 Per Capita Level	1990: Low Income Growth	1990: High Income Growth	1990: At 110% of Energy Requirement
Low income	5,972	12,882	35,224	43,789	64,584
Bangladesh	955	5,453	6,354	7,964	12,487
Burma	(437)	1,428	1,896	2,436	1,809
India	1,410	4,318	17,565	21,879	39,380
Indonesia	2,127	(424)	5,985	7,656	4,240
Nepal	(83)	459	492	531	1,063
Philippines	276	77	1,443	1,738	3,632
Sri Lanka	1,204	1,147	1,489	1,585	1,973
High income	6,886	9,402	14,384	16,547	8,041
China, Republic of	2,328	3,593	5,870	6,885	3,467
Hong Kong and Singapore	1,385	1,713	2,317	2,638	1,557

Table 11--Continued

(thousand metric tons)

IFPRI Category/ Country	1975	1990: At 1975 Per Capita Level	1990: Low Income Growth	1990: High Income Growth	1990: At 110% of Energy Requirement
Korea, Republic of	2,316	3,877	5,810	6,570	2,883
Malaysia	857	219	387	454	434
Grain exporters	659	(14,372)	(11,224)	(10,441)	(10,332)
Pakistan	659	(6,704)	(4,252)	(3,670)	(3,023)
Thailand	(3,669)	(7,668)	(6,972)	(6,771)	(7,309)
Total Asian DME*					
Gross deficit	13,517	22,284	49,608	60,336	72,625
Net deficit	9,328	7,488	38,384	49,895	62,293

Note: Gross deficit represents the sum of the production deficits of food-short countries for the indicated group of DMEs; if no country in the group reflects a deficit, only the surplus (given in parenthesis) is shown. Net deficit, shown for the regional total, is gross deficit minus surpluses, if any, of countries in the region.

* Developing market economies.

income; a higher growth rate of over 5.5 percent each year would be required if the projected energy deficit is to be filled.

Burma. Although Burma had an estimated food surplus of more than 0.4 million metric tons in 1975, its food production record in the past 15 years is not encouraging, growing only 1.3 percent a year. With a population growth rate of about 2.4 percent a year projected for 1975-90, the country would shift to a deficit position if the 1960-75 growth rate in production continues. Burma already has reduced the proportion of the rice crop exported to augment supplies for domestic consumption. The country would have to increase output of major staples by nearly 1.5 million metric tons in 1990 just to maintain the 1975 per capita consumption levels.

Food output in 1990 is projected to fall 2-2.5 million metric tons short of market demand depending on the rate of growth in per capita income. Such a deficit would be about 20-25 percent of consumption requirements. Although with a food surplus situation in 1975, Burma had an estimated energy deficit of half a million metric tons, based on 110 percent of dietary energy requirements. This could increase to nearly 2 million metric tons in 1990 unless production trends change.

India. As a major beneficiary of the Green Revolution, India achieved increases in food production that kept pace with population growth during 1960-75 despite the serious droughts in 1965-67. However, growth in output failed to equal growth in demand. The country's food problem is magnified by the sheer size of population. India accounts for more than half the people in the DME countries of Asia and about a third of the DME total. Its population growth rate is not projected to decline until the 1980s. In 1975, the production shortfall was estimated at less than 1.5 million metric tons, but the consumption level was more than 20 million metric tons below 110 percent of dietary energy requirements.

The projected domestic demand for major staples in 1990 would exceed projected production by 18 million metric tons with low income growth and 22 million metric tons under high income. Roughly double these amounts would be required to fill the indicated energy deficit. Domestic production would need to expand at an annual average of 3.3 percent to sustain market demand and 4.0 percent to satisfy 110 percent of energy requirements, compared with 2.5 percent during the 1960-75 period.

India's food production, particularly of cereals, performed well during the past decade and the country was able to reduce significantly its dependence on imported grain between the mid-1960s and the early 1970s. Much of the growth in cereal production came from the impressive increases in wheat output with the advent of the Green Revolution. Expansion of rice production was constrained by the lack of suitable areas for development into paddies, but wheat production benefited from both expansion in area and increases in yield per hectare. However, as the modern varieties spread and area expanded rapidly, average wheat yields per hectare started to decline possibly due to use of land not well suited to the new varieties. Unless reversed, this trend in wheat yields would make it difficult for the country's output to meet projected consumption levels. Further developments in yield-increasing technology are important in meeting India's food problems.

Indonesia. Spurred by development of the country's oil resources, the Indonesian economy grew rapidly in the past decade. World Bank estimates show that the GNP per capita of Indonesia increased at the average rate of 4.1 percent per year in 1965-74. Food production rose at an annual rate of about 3 percent in 1960-75, output of cereals increasing an average of 4 percent a year. Although root crops are an important staple, production has declined as consumption shifted to the higher valued cereals.

If the fairly high growth rate in food production is maintained, output of major staples in Indonesia would more than meet the increased food requirements due to population growth until 1990. But it would fall short of the increased demand arising from increases in income. The estimated level of food deficit, amounting to 2.1 million metric tons in 1975, would increase to 6-7.5 million metric tons.

The energy deficit is relatively minor in Indonesia. The production shortfall to be filled in order to meet 110 percent of dietary energy requirements would be less than the projected deficit under the low income growth assumption. Food production growth rates necessary for Indonesia to attain the consumption targets in 1990 would need to be increased from 3 percent a year to 3.7 percent a year to meet the energy deficit and 4-4.5 percent a year to meet the market demand for food caused by economic growth. These calculations, based on average per capita levels, indicate the country may need to focus attention on intervention policies that would help get food to the poorer sector of the population.

Nepal. Like Burma, Nepal was a food surplus country in 1975 but because of its rapidly increasing population, would shift to a food deficit position in the coming years unless production rises considerably more than the 1960-75 average annual rate of only 1 percent. Population grew 2.1 percent annually in 1960-75 and the rate is projected to increase to 2.6 percent in 1975-90. Based on World Bank estimates, the economy showed practically no growth the past decade.1/

By 1990, Nepal's projected food deficit would reach about half a million metric tons, about 13-14 percent of the projected consumption requirements under the low and high income growth assumptions. More than 85 percent of this projected deficit would result from population growth alone.

Unlike Burma, however, Nepal's consumption level in 1975 was below 110 percent of dietary energy requirements, despite its surplus position. With the country's projected population growth, the energy deficit is expected to expand from less than 100 thousand metric tons in 1975 to more than a million in 1990.

Philippines. The 1960-75 growth rate of 3.9 percent a year in the country's food production was well above the annual rate of increase in population. Even if this production trend continues until 1990, production of major staples would about only meet the increase in consumption arising from population growth. Food output would still fall short of satisfying increases in demand due to rising per capita incomes and would be way below levels necessary to fill the country's energy deficit.

Projected food deficit in 1990 would be around 1.5 million metric tons, 11-13 percent of consumption requirements under the low and high income growth assumptions. Based on 110 percent of the recommended calorie level, the country would require an additional 2 million metric tons to meet the projected energy deficit. Philippine food output would have to expand nearly 5 percent annually to satisfy increases in demand due to rising incomes and nearly 6 percent to fill the energy deficit.

As the site of the International Rice Research Institute and an early beneficiary of the Green Revolution, the Philippines achieved appreciable increases in food output, especially in rice, after the mid-1960s. As in India, rice production was thwarted by a land constraint and much of the growth in later years came from increases in yield per hectare.

Maize is also an important cereal crop in the Philippines, both as foodgrain and as livestock feed. Increases in maize production in past years partly filled the rice deficit in critical years but were used mainly to support the developing feed industry. A significant portion of the cereal requirements in 1990 is projected demand for feed.

1/ World Bank Atlas, 1976.

Sri Lanka. Food output in Sri Lanka, which is less than half a percent of the total food output in the DMEs of Asia, expanded at a fairly rapid rate of 3.4 percent annually during 1960-75. The country produces less than half of its consumption needs. Although the rate of growth of population is projected to decline to only 1.9 percent a year in the next 15 years, food output would have to grow 7 percent annually to meet the requirements of population growth alone, by around 8 percent to meet increases in food demand resulting from increases in per capita income, and by nearly 9 percent to meet the energy deficit.

In 1975, the estimated food deficit in Sri Lanka was about 1.2 million metric tons. The projected levels of food deficit in 1990 are 1.5-1.6 million metric tons under the two growth assumptions, more than 70 percent of which will be required by population growth. A production deficit of nearly 2 million metric tons is projected in 1990 if the country is to provide its population with an average consumption level of 110 percent of dietary energy requirements.

Most of the growth of cereal output in Sri Lanka in 1960-75 came from increases in output per hectare. In particular, rice yields per hectare expanded appreciably between the mid-1960s and the early 1970s. The cereal area grew at less than one percent annually.

High Income Group

These countries contain only about 6 percent of the population and account for around 8 percent of the consumption requirements of major staples of DMEs in the region. Economic growth has been rapid. Annual growth rates in GNP per capita ranged from 3.8 percent in Malaysia to around 10.0 percent in Singapore during the past ten years. As high foreign exchange earners, these countries can easily afford to finance food imports which in 1975 reached about 40 percent of their consumption requirements. By 1990, commercial imports may provide around half of domestic needs.

The Republic of China and Republic of Korea would account for 40 percent each of the projected 14.5-16.5 million metric tons of food deficit. Growth of production in these countries slowed considerably as they shifted to a diet with less cereals and more livestock products, fruits and vegetables. In Malaysia, the economy is becoming increasingly nonagricultural, but the country has pursued self-sufficiency in food as a development goal. The projected rate of growth in food production is twice that of population, and Malaysia would produce much of its food requirements in 1990. Hong Kong and Singapore import practically all their requirements of major staples.

Grain Exporters

Pakistan was still in a food deficit position in 1975 but is expected to become a significant grain exporter because of the country's impressive growth in food production in recent years. Thailand, the only other DME in this category, has long been a traditional exporter of foodgrain, particularly rice. Based on historical production records, these countries would increase their share of Asia's food output from about 12 percent in 1975 to 17 percent in 1990. This would mean an average annual growth rate of nearly 5 percent. Growth in output of the major staples during 1960-75 was equally due to expansion in area under cereals and increases in output per hectare. Growth in area was largely in Thailand and that in output per hectare mostly in Pakistan. The estimated cereal surplus of slightly over 3.5 million metric tons in 1975, all from Thailand, is projected to grow to 10-11 million metric tons in 1990. About 30 percent or more would be contributed by Pakistan. The amounts of these exportable surpluses that would be made available for meeting the large projected gross food deficits in the region will depend on trade policies.

Pakistan. Food output expanded at an average yearly rate of more than 6 percent in 1960-75 and Pakistan could easily move into an exporter position if this trend continues. Projected cereal surpluses in 1990 are more than 4 million metric tons under the two income growth assumptions, and slightly over 3 million metric tons after meeting the energy requirements based on 110 percent of calorie recommendations.

Pakistan has been a major recipient of the benefits of the Green Revolution in Asia. With the irrigation facilities that were developed in the early 1960s, the country was ready to take advantage of the opportunities offered by the modern cereal varieties whose potentials depend largely on the effective control of water. More than 70 percent of the growth in cereal output in 1960-75 came from increases in output per hectare that were achieved with the new varieties of wheat and rice during the later part of the period. The rapid growth in wheat yields raised output substantially between the mid-1960s and the early 1970s. In the case of rice, the new varieties spread rapidly and significant increases in yield were also achieved. Rice output in Pakistan is, however, only about half that of wheat.

Thailand. The fairly high growth rate of 3.9 percent a year in food production during 1960-75, was well above that of the country's population. Thailand continued to maintain its position as the major grain exporter in the region. Rice and maize exports grew from an average of 2.4 million metric tons in 1960-65 to 3.3 million metric tons in 1970-75, or an annual increase of 3.2 percent. An increasing fraction of the rice crop is being held for domestic consumption and rice has given way to maize in terms of the volume of exports. Maize exports, mainly to Japan and Republic of China, grew at the very rapid rate of 9 percent a year from 1960-65 to 1970-75, and accounted for more than half the quantity of cereal exports in 1975.

Assuming that the past production trend of cereals will continue, the cereal surplus in Thailand is projected to increase from 3.7 million metric tons in 1975 to 6.8-7.0 million metric tons in 1990. The average per capita consumption level in the country in 1975 came close to 110 percent of dietary energy requirements and thus the solution to the dietary problem in the country would depend mainly on making food available to the poorer sector of the population.

Unlike Pakistan, the growth of rice output in Thailand during the past 15 years came largely from expansions in rice area. The average yield per hectare was practically constant in most years and even declined in some. The new rice varieties have not been suitable to the major rice-producing areas of Thailand where lack of water control is a problem. In the case of maize, the growth in output was due solely to rapid increases in area. The trend in output per hectare declined, probably because areas unsuitable for the crop had been used.

North Africa/Middle East

(Tables 12 and 13, Figure 8)

Growth in production in the region has been below that of population, and staple food crop deficits, amounting to about 20 percent of consumption in 1975, are projected to double by 1990. Countries in this region vary widely in their economic and food production characteristics. Turkey, Afghanistan and Sudan are substantial staple crop producers while in other countries, notably, Saudi Arabia, Libya and Lebanon, food crop production is very low. Large differences also exist in the prospective availability of foreign exchange to finance the projected food deficits. Prospects are very favorable in the high income OPEC countries but countries such as Afghanistan, Egypt, Yemen PDR and Turkey are likely to face much more difficult problems. Just to maintain 1975 per capita consumption levels would result in substantial deficits in 1990 in all four of these countries.

Growth in staple crop production during 1960-75 was below 2 percent per year in most of the North Africa/Middle East countries. Only in Morocco, Sudan and Tunisia was the production rate significantly above that for population. Production growth rates for Morocco and Tunisia were over

Table 12--North Africa/Middle East developing market economies: food production and consumption, 1975 and 1990

(thousand metric tons)

IFPRI Category/ Country	Food Production		Food Consumption				
				1990			
	1975	1990	1975	At 1975 Per Capita Level	Low Income Growth	High Income Growth	At 110% of Energy Requirement
Low income	15,032	20,623	18,807	26,007	27,599	28,122	32,362
Afghanistan	4,568	5,388	4,578	6,557	6,685	6,924	8,485
Egypt	6,980	10,398	10,680	14,858	15,251	15,329	15,887
Sudan	2,920	4,370	2,823	3,539	4,569	4,693	6,186
Yemen PDR	564	467	726	1,053	1,094	1,176	1,804
Middle income	25,755	35,694	26,877	40,288	44,320	45,923	41,086
Morocco	3,612	9,377	4,904	9,060	9,103	9,106	9,891
Turkey	18,523	21,828	16,720	23,745	26,561	27,760	22,259
Others	3,620	4,489	5,253	7,483	8,656	9,057	8,936

Table 12--Continued

(thousand metric tons)

IFPRI Category/ Country	Food Production 1975	Food Production 1990	Food Consumption 1975	Food Consumption 1990 At 1975 Per Capita Level	Food Consumption 1990 Low Income Growth	Food Consumption 1990 High Income Growth	Food Consumption 1990 At 110% of Energy Requirement
High income	10,097	14,219	14,828	23,756	28,376	30,278	28,537
Algeria	1,365	1,452	3,026	4,685	5,446	5,586	6,389
Iran	6,970	9,671	7,960	11,829	15,090	16,655	13,574
Iraq	1,343	2,633	2,393	4,747	5,346	5,505	5,609
Libya	180	158	615	999	1,042	1,054	947
Saudi Arabia	239	305	834	1,316	1,452	1,478	2,018
Total NA/ME DME*	50,884	70,536	60,512	90,051	100,295	104,323	101,985

* North Africa/Middle East developing market economies.

Table 13--North Africa/Middle East developing market economies: Gross deficits in the production of major staples, 1975 and 1990.

(thousand metric tons)

IFPRI Category/ Country	1975	1990			
		At 1975 Per Capita Level	Low Income Growth	High Income Growth	At 110% of Energy Requirement
Low income	3,872	6,215	6,976	7,499	11,739
Afghanistan	10	1,169	1,297	1,536	3,097
Egypt	3,700	4,460	4,853	4,931	5,489
Sudan	(97)	(831)	199	323	1,816
Yemen PDR	162	586	627	709	1,337
Middle income	2,925	5,072	8,900	10,500	5,392
Morocco	1,292	(317)	(274)	(271)	514
Turkey	(1,803)	1,917	4,733	5,932	431
Others	1,633	3,155 (161)	4,167	4,568	4,447
High income	4,731	9,537	14,157	16,059	14,318
Algeria	1,661	3,413	3,994	4,134	4,937

Table 13--Continued

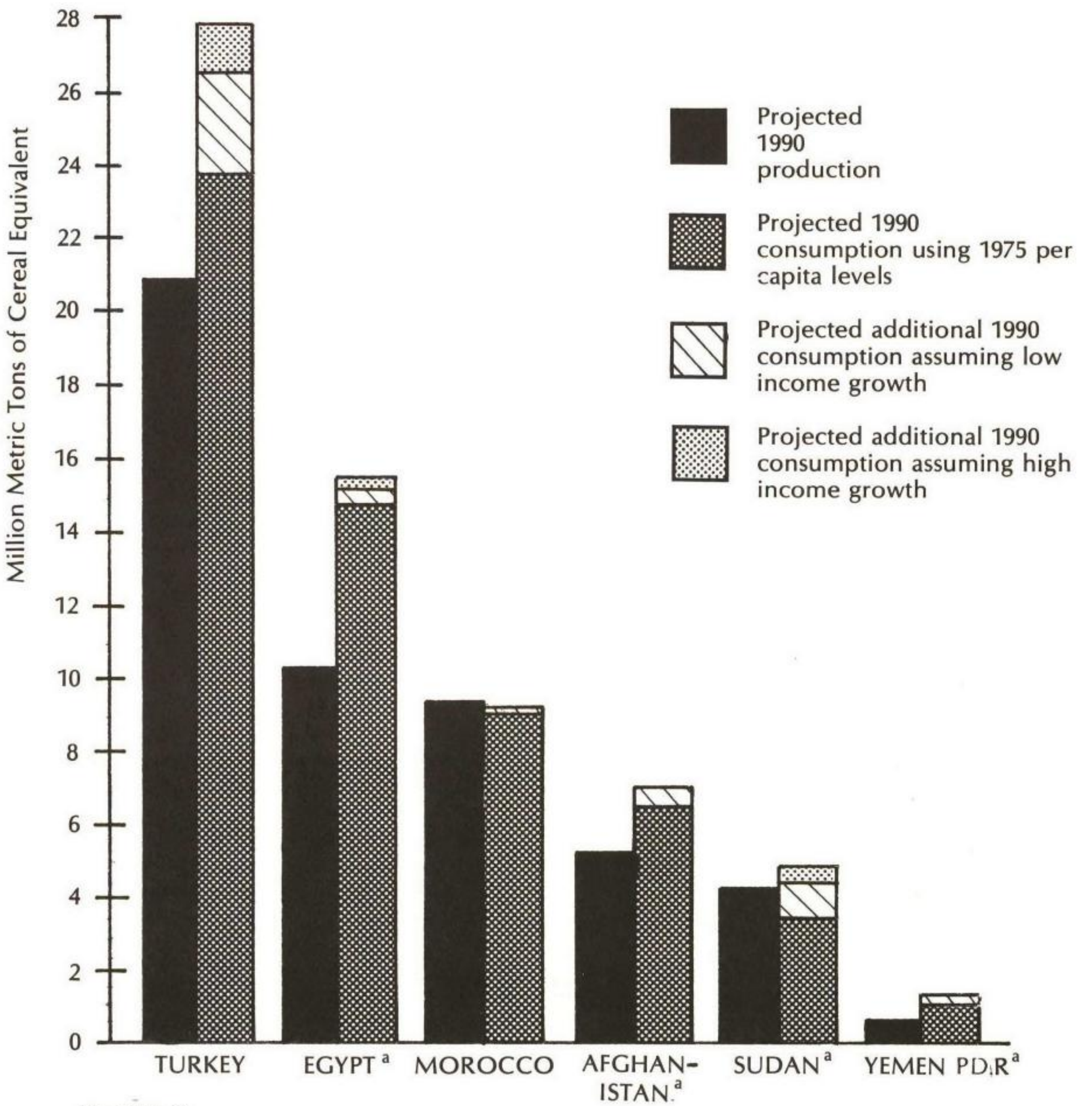
(thousand metric tons)

IFPRI Category/ Country	1975	1990: At 1975 Per Capita Level	1990: Low Income Growth	1990: High Income Growth	1990: At 110% of Energy Requirement
Iran	990	2,158	5,419	6,984	3,903
Iraq	1,050	2,114	2,713	2,872	2,976
Libya	435	841	884	896	789
Saudi Arabia	595	1,011	1,147	1,173	1,713
Total NA/ME DME*					
Gross deficit	11,528	20,824	30,033	34,058	31,449
Net deficit	9,628	19,515	29,759	33,787	31,449

Note: Gross deficit represents the sum of the production deficits of food-short countries for the indicated group of DMEs; net deficit shown for the regional total, is gross deficit minus surpluses, if any, of countries in the region. Surpluses are shown in parenthesis.

* North Africa/Middle East developing market economies.

Figure 8. Projected 1990 Production and Consumption of Major Staples in Selected North Africa/Middle East Developing Market Economies*



*See Table 12.

[a]Low income countries.

4 percent per year, largely reflecting rapid increases in yields of wheat and barley.

For the region as a whole, a deficit of some 30-34 million metric tons is projected for 1990 if market demands are met. An additional 7-8 million metric tons would be required to also meet the projected dietary energy target. Meeting dietary needs would be a serious problem in several countries, especially in Afghanistan, Sudan and Yemen PDR, where the projected dietary gap would amount to over 20 percent of consumption.

Low Income Group

The low income countries of this region, with a projected population of more than 120 million, appear likely to face a serious food problem. Their balance of payments position would limit their ability to finance the food imports that would be needed to meet projected market demand. The financing problem would be especially acute in Afghanistan, Sudan and Yemen PDR, if the additional supplies that would be required to meet the projected dietary energy gap were to be obtained.

Afghanistan. This country appears likely to face a large food deficit as well as a serious problem of meeting dietary energy needs. Per capita income approximates US$ 100 per year and growth in staple food crop production is below that of population. The nation was self-sufficient in 1975, but with inadequate consumption levels. Just to maintain consumption at 1975 levels would result in a deficit of over 1 million metric tons by 1990 compared to market demand that is projected to reach 1.3-1.5 million metric tons in 1990. Production would have to grow 4.7 percent per year to meet market demand and fill the dietary energy gap.

Egypt. The estimated deficit of 3.7 million metric tons accounted for more than one-third of the staple food consumption in 1975. Egypt has been a consistent food importer. The projected growth rate in production is only marginally above population growth and if market demands are met, the food deficit is projected to increase from 3.7 million metric tons to nearly 5 million metric tons in 1990. Moreover the historical production growth rate of 2.4 percent per year has slowed in recent years raising a possibility that past food production growth rates may not be maintained. Food production growth would need to be increased to over 5 percent a year to meet food needs from domestic production.

Sudan. The population growth rate in Sudan is projected to continue at a rapid 3.2 percent per year. If production continues to grow at the 1960-75 rate of 3.9 percent per year, Sudan would be in a deficit position in 1990. Sudan, however, has substantial agricultural resources and if the more recent higher rate of growth in staple crop production is maintained, Sudan would be more than self-sufficient in terms of market demand. However, Sudan would still face a serious dietary deficiency. Projected consumption would need to be raised by nearly 30 percent to meet the food energy target. This would require a food production growth rate of over 6 percent per year.

Yemen PDR. Like Afghanistan, Yemen PDR has very low levels of per capita income, and food supplies are well below dietary energy requirements. Moreover, the 1960-75 trend in staple crops production was downwards and imports in 1975 accounted for over one-fifth of consumption. But in the more recent 1967-75 period the cereal production growth rate rose to 2.2 percent, indicating that the historical trend may be reversed. Even with the 1967-75 rate of increase in production, the food situation would remain very serious. Production would need to grow 5 to 5.5 percent per year to meet market demand in 1990 and rise to over 8 percent per year to meet dietary energy needs.

Middle Income Group

Turkey. Turkey accounts for more than one-third of the staple crop production in the region. The rate of growth was only 2.0 percent per year in 1960-75 and has been even lower in recent years. Continuation of the historical production trend would put Turkey in a substantial deficit position. A deficit of nearly 2 million metric tons would be incurred just to maintain 1975 consumption levels. If market demands are met, the projected cereal deficit would rise to some 4.75-6 million metric tons by 1990 compared with a surplus of 1.8 million metric tons in 1975. The use of high yielding varieties of wheat, the major staple crop, has become widespread, but the effects on yields have been much less than in Pakistan or India. Moreover, the rate of growth in the cereal area has been very low. In most recent years Turkey has been a net importer of cereals, but production was above consumption in 1975 and other favorable crop years.

Morocco. Production increased an average of 4.8 percent per year in 1960-75 but fluctuations in Morocco are very large, and the cereal production trend in recent years has been much lower. Consequently, the surplus position projected for 1990 on the basis of the historical production trend may not materialize.

Other Middle Income Countries. All of the five smaller middle income countries are importers of cereal crops. The food deficit in 1975 of 1.6 million metric tons represented about 30 percent of consumption and is projected to rise to some 4.2-4.6 million metric tons or nearly 50 percent of consumption by 1990. The largest deficits would be in Lebanon and Syria where population growth rates of about 3.3 percent per year are projected. Lebanon produces only a small amount of staple crops, while production growth rates in Syria are only 1.4 percent per year. Small additional deficits totaling some 0.8 to 0.9 million metric tons would be indicated if the 1990 dietary energy targets for Jordan, Syria and Lebanon were met.

High Income (OPEC) Group

This group of countries consists of commercial importers. Their staple food production varies from less than 30 percent of consumption in Saudi Arabia and Libya to about 85 percent in Iran. Production for the group during 1960-75 grew about 2.1 percent per year but the rate of growth declined in 1967-75. With a rapid increase in population (3.1 to 3.4 percent per year) and a rapid rise in per capita income, the food deficit is projected to increase from 4.7 million metric tons in 1975 to some 14 to 16 million metric tons in 1990.

With income elasticity of demand for cereals estimated to be highly inelastic (.08-.09), Saudi Arabia is projected to still have a dietary energy gap in 1990. But, with policies designed to improve the income of the poorer segments of the population, Saudi Arabia's market consumption may increase considerably more than projected for 1990, perhaps enough to close the indicated energy gap. In this case, the market deficits would be larger than the projections indicate.

Sub-Sahara Africa

(Tables 14 and 15, Figure 9)

With the projected food production growth rate substantially below that for population, a dramatic increase in the food deficit in Sub-Sahara Africa is projected for 1990. If food consumption were maintained at 1975 per capita levels, a tenfold increase in gross deficits would occur. With low income growth, the deficit would rise from 2.5 million metric tons in 1975 to 27 million metric tons in 1990; with high income growth, the projected shortfall would reach 32 million metric tons. Nearly two-thirds of the total deficit would be in Nigeria, but large relative increases would occur in most low income countries.

Table 14--Sub-Sahara Africa developing market economies: food production and consumption, 1975 and 1990

(thousand metric tons)

IFPRI Category/ Country	Food Production		Food Consumption				
	1975	1990	1975	1990: At 1975 Per Capita Level	1990: Low Income Growth	1990: High Income Growth	1990: At 110% of Energy Requirement
West							
Low income	25,893	27,811	26,945	40,410	48,634	52,511	49,204
Nigeria	18,471	19,304	18,897	28,763	36,414	39,835	33,928
Sahel	4,542	4,093	4,990	7,164	7,327	7,613	9,804
Others	2,880	4,414	3,058	4,483	4,893	5,063	5,472
Middle income	4,212	7,416	4,547	7,323	7,864	8,146	8,565
Ghana	1,966	3,807	2,071	3,382	3,439	3,559	3,669
Others	2,246	3,609	2,476	3,941	4,425	4,587	4,896

Table 14--Continued

(thousand metric tons)

IFPRI Category/ Country	Food Production		Food Consumption				
				1990			
	1975	1990	1975	At 1975 Per Capita Level	Low Income Growth	High Income Growth	At 110% of Energy Requirement
East							
Low income	22,784	36,872	23,548	36,525	38,821	39,560	46,071
Ethiopia	5,130	6,001	5,231	7,372	8,078	8,310	9,354
Kenya	2,337	2,927	2,167	3,484	3,760	3,822	4,566
Tanzania	3,271	4,980	3,549	5,452	5,951	6,085	7,251
Uganda	2,260	3,827	2,260	3,859	4,064	4,125	4,633
Zaire	4,208	8,569	4,553	6,811	7,168	7,268	9,167
Others	5,578	10,568	5,788	9,547	9,800	9,950	11,100
Middle income Mozambique, Rhodesia, Zambia	3,678	5,823	3,748	6,106	6,314	6,383	6,278
Total Sub-Sahara Africa DME*	56,567	77,922	58,788	90,364	101,633	106,600	110,118

* Developing market economies.

Table 15--Sub-Sahara Africa developing market economies: gross deficits in the production of major staples, 1975 and 1990

(thousand metric tons)

IFPRI Category/ Country	1975	1990			
		At 1975 Per Capita Level	Low Income Growth	High Income Growth	At 110% of Energy Requirement
West					
Low income	1,052	12,984	20,913	24,719	21,512
Nigeria	426	9,459	17,110	20,531	14,624
Sahel	448	3,071	3,234	3,520	5,711
Others	178	454	569	668	1,177
	(9)	(385)	(90)	(19)	(119)
Middle income	335	332	816	978	1,287
Ghana	105	(425)	(368)	(248)	(138)
Others	230	332	816	978	1,287
East					
Low income	934	3,259	5,124	5,753	10,743
Ethiopia	101	1,371	2,077	2,309	3,353

Table 15--Continued

(thousand metric tons)

IFPRI Category/ Country	1975	1990: At 1975 Per Capita Level	1990: Low Income Growth	1990: High Income Growth	1990: At 110% of Energy Requirement
Kenya	(170)	557	833	895	1,639
Tanzania	278	472	971	1,105	2,271
Uganda	0	32	237	298	806
Zaire	345	(1,758)	(1,401)	(1,301)	598
Others	210	827 (1,848)	1,006 (1,774)	1,146 (1,764)	2,076 (1,544)
Middle income	235	490	570	618	589
Mozambique, Rhodesia, Zambia	235 (165)	490 (207)	570 (79)	618 (58)	589 (134)

Table 15--Continued

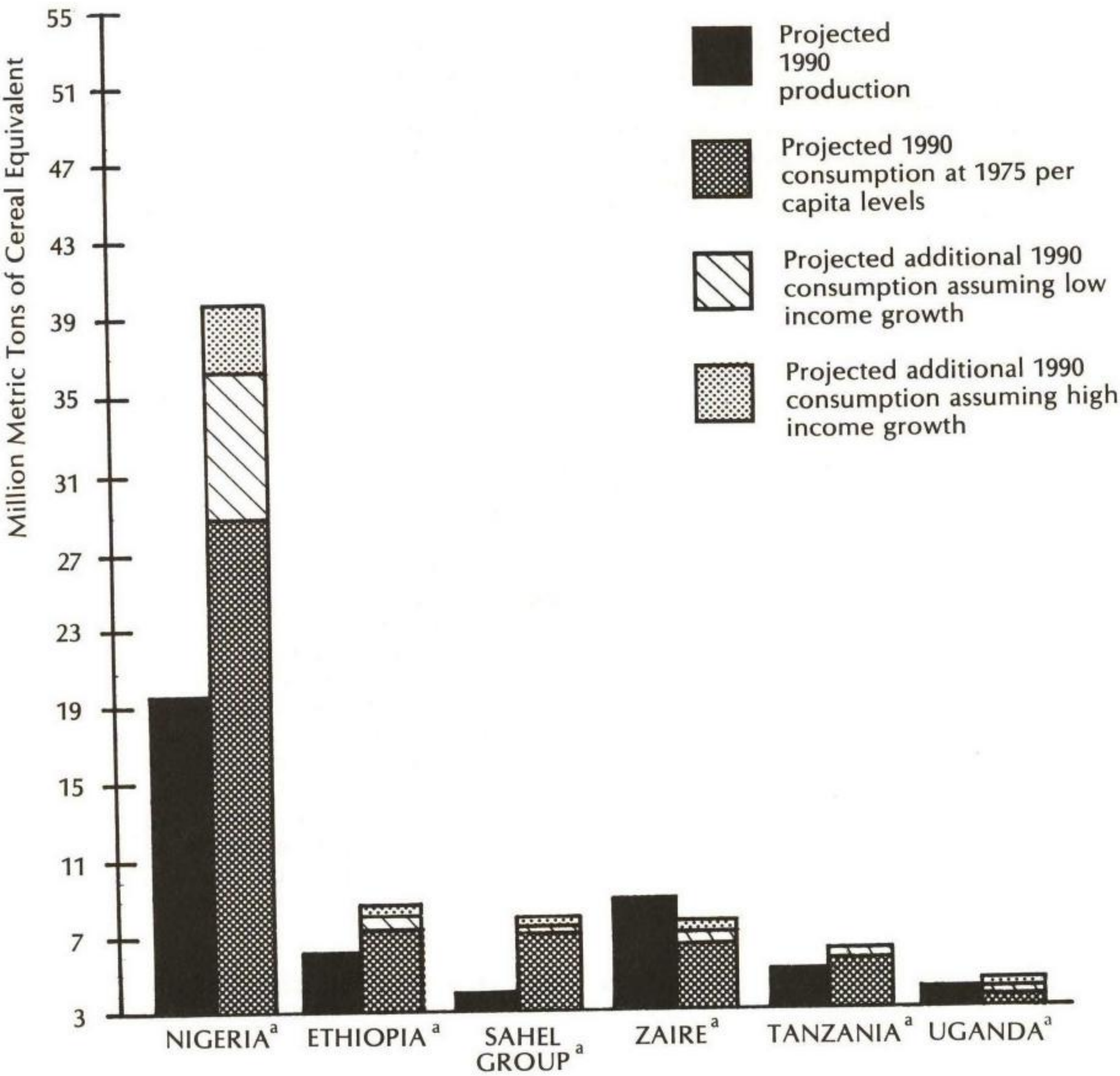
(thousand metric tons)

IFPRI Category/ Country	1975	1990			
		At 1975 Per Capita Level	Low Income Growth	High Income Growth	At 110% of Energy Requirement
Total Sub-Sahara Africa DME*					
Gross deficit	2,556	17,065	27,423	32,068	34,131
Net deficit	2,212	12,442	23,711	28,678	32,196

Note: Gross deficit represents the sum of the production deficits of food-short countries for the indicated group of DMEs; net deficit shown for the regional total, is gross deficit minus surpluses, if any, of countries in the region. Surpluses are shown in parenthesis.

* Developing market economies.

Figure 9. Projected 1990 Production and Consumption of Major Staples in Selected Sub-Sahara African Developing Market Economies*



*See Table 14.

[a]Low income countries.

Rates of growth in staple crop production were particularly low in several low income countries in western Sub-Sahara Africa. Nigeria's average was less than 1 percent per year and the Sahel group showed a slight negative trend. Production growth rates were somewhat higher in low income countries of eastern Sub-Sahara Africa, but below population growth in most. Production growth was relatively high in Ghana, Zaire, Cameroon, Zambia and Burundi, exceeding 4 percent per year in 1960-75.

Sub-Sahara Africa's growth rate in production would have to increase from the 1960-75 rate of 2.2 percent per year to 4.0-4.4 percent to meet projected 1990 market demand. This would entail drastic increases in area and output per hectare. Area expansion has been the main source of increased staple crop output in Africa, but the rate in recent years has declined.

The overall rate of expansion in cereal production in Sub-Sahara Africa was only about 2 percent per year in 1960-75, although rapid rates of growth in maize production in Ghana and Zaire point to a possibility for substantial increases in cereal production in some of the tropical African countries with similar conditions. Root crop production in the region has increased at 2.4 percent per year and relatively rapid rates of growth of over 4 percent per year were attained in Somalia, Burundi, Cameroon and Rwanda. About two-thirds of the increase in root crop production has come from increases in yield per hectare.

Meeting the dietary energy needs in 1990 would be an even greater problem. Some 27-32 million metric tons would be required to meet market demands. If the food energy targets were also met, the projected deficits would be 36 to 40 million metric tons. Meeting the food energy gaps would involve further increases in food supplies in most of the low income Sub-Sahara African countries. Increases in food supply amounting to over 2 million metric tons of cereal equivalent in the Sahel countries and more than a million each in Tanzania and Ethiopia would be needed to meet the dietary energy targets. In addition, Angola, Somalia, Rwanda and Guinea would face very serious nutritional problems with the additional requirements amounting to over 20 percent of their projected consumption in 1990. Furthermore, policies to improve income and food distribution as well as intervention programs to channel the food to the underfed would be required. Many of these low income countries have large year-to-year fluctuations in cereal production which substantially increase the problem of hunger and malnutrition in years of low production.1/

1/ Food and Agriculture Organization of the United Nations, "Instability of Production and Its Impact on Stock

As previously noted, caution should be used in drawing inferences based on past production growth rates in some Sub-Sahara African countries because of weather fluctuations and data problems.

Low Income Countries

Nigeria. The country's population, largest in Sub-Sahara Africa, is growing 3.0 percent a year while production has risen only half a percent annually. Nigeria's projected deficit of 17-20.5 million metric tons is nearly two-thirds of the total for the region. With increasing oil revenues, per capita income levels are projected to rise rapidly.

A production growth rate of 4.8 to 5.5 percent would be needed to meet the projected consumption levels. Shifts toward cereal production would be required if, as assumed, the per capita consumption of root crops does not increase. However, cassava and yams remain preferred foods in much of Nigeria, and improvements in varieties and processing could lead to increases in the per capita consumption of root crops.

Sahel Group. Because of drought during 1970-75, staple crop production trend was negative for the whole 1960-75 period. The dry years aggravated persistent problems of hunger and malnutrition and seriously disrupted the economic and social life of all these countries. The downward trend in production is unlikely to continue as projected, but substantial increases in the production of staple crops would be required in order to fill the projected 1990 deficits. Production growth rates of 3.5 to 3.8 percent would be needed to meet market demands and 5.6 percent to meet the dietary energy target. Because of the disruptive effects of the drought the attainment of such production increases would depend heavily on the availability of outside investment funds.

Ethiopia. The largest deficit in eastern Africa is projected for Ethiopia. The nation's production growth record is only 1.3 percent per year; about 3.6 percent would be required to meet the projected market shortfall of some 2.1-2.3 million metric tons. Even if these consumption levels are attained, Ethiopia would still face a serious dietary energy problem. Closing the food energy gap would increase the deficit to over 3 million metric tons and require a production growth rate of over 4 percent per year.

Requirements," prepared by D. J. Casley, J. B. Simaika and R. P. Sinha, (Monthly Bulletin of Economics and Statistics, Vol. 23), May 1974, pp. 1-8.

Kenya. Kenya is projected to switch from a surplus to deficit position by 1990 if historical growth rates continue. The 1967-75 growth rate in cereal production was substantially below the 1960-75 level, reflecting in part a slower advance in the yields of wheat and maize.

Tanzania. Staple crop production grew 3.1 percent per year in 1960-75 but with one of the highest population growth rates in Africa, 3.2 percent per year, a serious food situation is projected in Tanzania in 1990. The projected food deficit would rise from one-quarter million metric tons in 1975 to 1.0-1.1 million metric tons. A deficit of over 2 million metric tons would be incurred to meet the food energy target. Food production would need to rise to around 4.4 percent to meet market demands from internal production and to over 5.5 percent per year to meet the nutritional target.

Uganda. Projected food production in Uganda would barely keep pace with population which is increasing 3.2 percent per year. A moderate increase in production growth rates would be required to meet projected demand, and a substantial rise to more than 4 percent would be necessary to attain the food energy target.

Zaire. If the high historical growth rate in staple crop production is maintained, Zaire would appear to be in good position to meet its projected staple crop demands. Production of cassava, the major staple crop, has grown rapidly, due mainly to increases in the area planted. The production of cereals has increased at a rate of over 5 percent per year, and cereal imports have risen considerably in recent years. This suggests a shift in food demand toward cereals as in other countries. Thus the attainment of self-sufficiency in staple crops would depend in part on the extent to which production patterns for cereals, root crops and pulses can be adjusted to consumer preferences.

Assuming no further increases in the per capita consumption of root crops, staple crop consumption levels are projected to be about 20 percent below the dietary energy standard. But part of this projected gap might be met from the projected production surplus, if appropriate changes in the production/consumption pattern occur.

Other Low Income Countries. Food deficits are expected to increase greatly in all of the smaller low income countries except Cameroon and Burundi where production growth rates are appreciably above the projected rates for population. Projected requirements to meet dietary energy needs would be over 20 percent above the 1990 consumption levels in Somalia, Rwanda and Guinea.

Middle Income Countries

Ghana. This country has had one of the highest staple crop production growth rates in Sub-Sahara Africa, averaging 4.5 percent per year in 1960-75. Increases for rice, maize and sorghum averaged over 5 percent annually, but production has periodically fluctuated widely. Rapid expansion in the area under staple crops associated with increased mechanization apparently was a major factor in Ghana's production record. If the past production growth rate continues, Ghana would be in a small surplus position by 1990. A major part of the production is from root crops, but demands have been shifting toward cereals with increased imports of wheat and rice.

Other Middle Income Countries. Rhodesia and Zambia also have had relatively high rates of growth in food production. Food output in the two countries in 1990 is projected to approximate consumption levels. Production growth in the other countries has been lower. All show significantly increased food deficits in 1990, with substantial additional supplies required in Angola to meet the dietary energy needs. These countries are oriented toward plantation crops and other export products. Depending on the terms of trade for their exports, they could well be commercial importers in 1990.

Latin America

(Tables 16 and 17, Figure 10)

The projected total staple crop production in Latin America in 1990 would exceed the projected consumption even with high income growth. This reflects the large increases in prospective export availabilities for the grain-exporting countries, Argentina, Uruguay and Surinam. In addition, some of the food deficit countries, notably Brazil, El Salvador, Mexico and Paraguay, would be at or near an export position. In four of these countries, Mexico, Paraguay, Surinam and El Salvador, rates of growth in production in 1960-75 averaged over 4 percent per year.

Substantial increases would occur in the deficits of other Latin American food deficit countries. Achievement of self-sufficiency in these countries during the next 15 years would generally require production growth rates of over 5 percent per year, compared with the historical average of under 3 percent in most of them.

Yield increases were more important than area expansion in increasing cereal production in 1960-75 in the majority of Latin American countries. For the region as a whole,

Table 16--Latin American developing market economies: food production and consumption, 1975 and 1990

(thousand metric tons)

IFPRI Category/ Country	Food Production		Food Consumption				
				1990			
	1975	1990	1975	At 1975 Per Capita Level	Low Income Growth	High Income Growth	At 110% of Energy Requirement
Low income	1,032	1,370	1,350	1,891	2,105	2,207	2,898
(Bolivia & Haiti)							
Middle income	65,601	111,089	73,381	111,398	121,200	124,028	114,491
Brazil	36,215	59,665	37,034	54,438	59,338	60,602	56,207
Chile	1,597	1,645	2,372	3,520	3,627	3,659	3,179
Colombia	3,438	5,184	3,699	5,447	5,909	6,042	6,949
Ecuador	580	748	802	1,280	1,539	1,612	1,688
Mexico	17,235	34,062	19,140	31,084	33,910	34,775	29,623
Peru	1,883	2,333	3,101	4,736	5,197	5,347	5,165
Others	4,653	7,452	7,233	10,893	11,680	11,991	11,680

Table 16--Continued

(thousand metric tons)

IFPRI Category/ Country	Food Production		Food Consumption				
				1990			
	1975	1990	1975	At 1975 Per Capita Level	Low Income Growth	High Income Growth	At 110% of Energy Requirement
High income	956	1,486	2,036	3,521	4,012	4,121	3,824
(Venezuela)							
Grain exporters	22,103	37,993	12,899	15,851	16,367	16,521	14,042
Argentina	20,294	36,460	12,027	14,832	15,328	15,470	13,088
Surinam & Uruguay	1,179	1,533	872	1,019	1,039	1,051	954
Total Latin American DME*	89,692	151,938	89,666	132,661	143,684	146,877	135,255

* Developing market economies.

Table 17--Latin American developing market economies: gross deficits in the production of major staples, 1975 and 1990

(thousand metric tons)

IFPRI Category/ Country	1975	1990 At 1975 Per Capita Level	1990 Low Income Growth	1990 High Income Growth	1990 At 110% of Energy Requirement
Low income (Bolivia & Haiti)	318	521	735	837	1,528
Middle income	7,885	8,910	10,856	13,169	11,498
Brazil	819	(5,227)	(327)	937	(3,458)
Chile	775	1,875	1,982	2,014	1,534
Colombia	261	263	725	858	1,765
Ecuador	222	532	791	864	940
Mexico	1,905	(2,978)	(152)	713	(4,439)
Peru	1,218	2,403	2,864	3,014	2,832
Others	2,685 (105)	3,837 (396)	4,494 (266)	4,769 (230)	4,427 (19)
High income (Venezuela)	1,080	2,035	2,526	2,635	2,338

Table 17--Continued

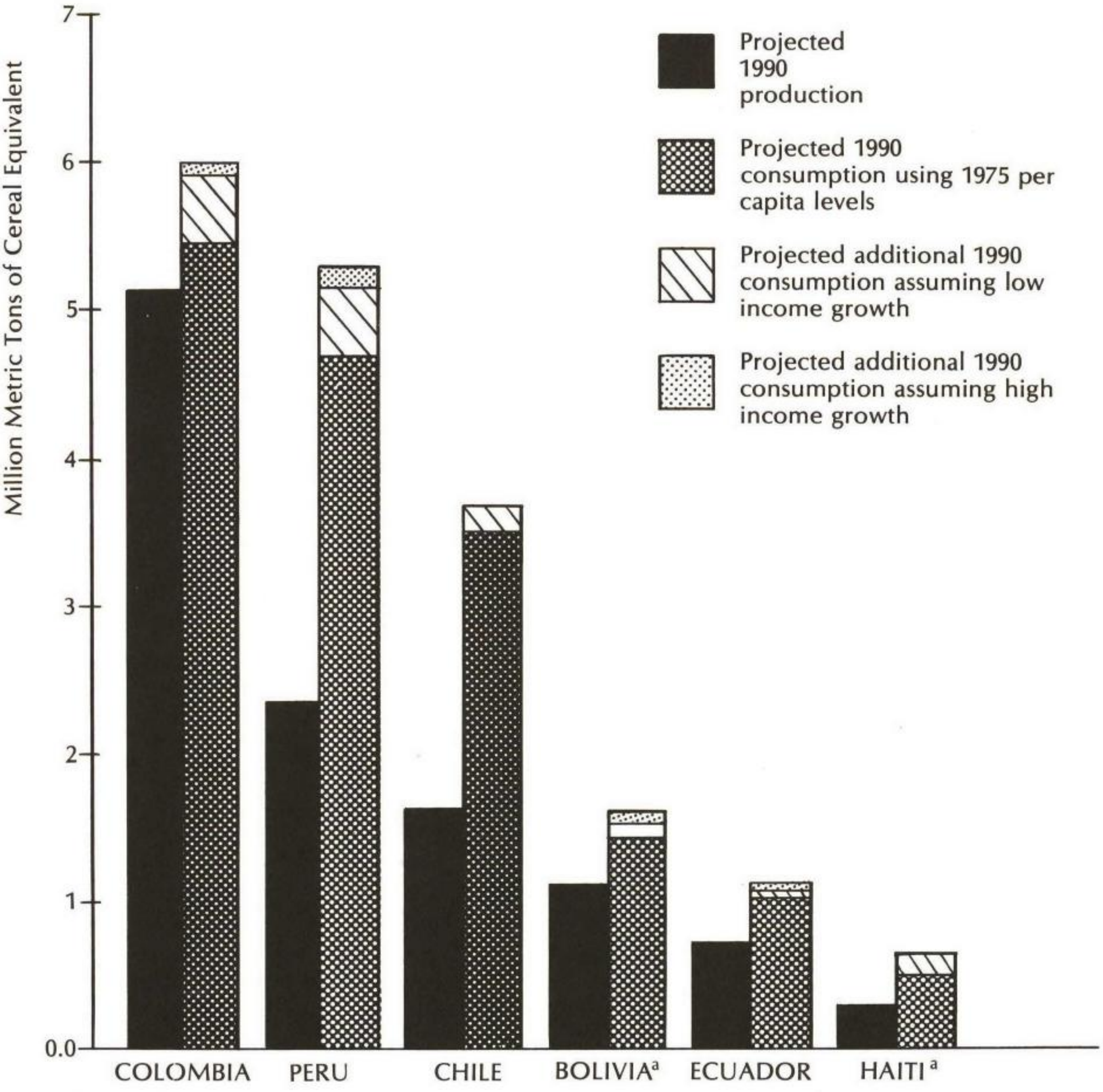
(thousand metric tons)

IFPRI Category/ Country	1975	1990: At 1975 Per Capita Level	1990: Low Income Growth	1990: High Income Growth	1990: At 110% of Energy Requirement
Grain exporters	(9,204)	(22,142)	(21,626)	(21,472)	(23,951)
Argentina	(8,897)	(21,628)	(21,132)	(20,990)	(23,372)
Surinam and Uruguay	(307)	(514)	(494)	(482)	(579)
Total Latin America DME*					
Gross deficit	9,283	11,466	14,117	16,641	15,364
Net deficit	(26)	(19,277)	(8,254)	(5,061)	(16,683)

Note: Gross deficit represents the sum of the production deficits of food-short countries for the indicated group of DMEs; if no country in the group reflects a deficit, only the surplus (given in parenthesis) is shown. Net deficit, shown for the regional total, is gross deficit minus surpluses, if any, of countries in the region.

* Developing market economies.

Figure 10. Projected 1990 Production and Consumption of Major Staples in Selected Latin American Developing Market Economies*



*See Table 16.

[a]Low income countries.

however, area expansion accounted for about three-fifths of the total production increase. Most of it occurred in Brazil whose production accounts for more than one-third of the Latin American total. Area expansion accounted for nearly 90 percent of the production increase in Brazil.

The 1990 consumption levels would exceed 110 percent of the average calorie requirements in most Latin American countries, though substantial dietary energy gaps are projected in Bolivia, Haiti, Honduras and El Salvador.

Programs to reduce inequalities in income distribution as well as to channel food to the underfed would be required to meet the dietary energy needs of the underfed in most countries.

Food consumption in Venezuela, Brazil, Peru and Nicaragua was below the dietary energy target in 1975 but is projected to be above the target by 1990.

Low Income Countries

Bolivia and Haiti. These are the only Latin American countries with average per capita incomes below US$ 300 in 1973. To meet market food demands in 1990, Haiti would need to increase production from about 0.5 percent a year to 3.5-4 percent a year, and Bolivia from 2.5 percent to 5.5-6 percent a year. Production growth rates would need to be increased to about 7 percent a year to provide dietary energy supplies equal to 110 percent of calorie requirements.

Middle Income Countries

Brazil. This country accounts for more than half of the staple crop production of the food deficit countries in the region. In contrast to most of the other food deficit countries, food production and consumption in Brazil is projected to be in approximate balance in 1990. A small surplus would arise under the low income growth assumption and a small deficit with high income growth. The historical production growth rate of 3.6 percent reflects somewhat more rapid increases in production of cereals than in root crops. Because of the substantial income elasticity of demand for cereals in Brazil, a considerable further shift toward cereal production would be required to eliminate the need for grain imports. Most of Brazil's increase in cereal production has been from area expansion, although the trend in output per hectare increased somewhat in 1967-75.

Projected 1990 consumption levels would provide average per capita energy supplies well above 110 percent of requirements. But poverty and malnourishment would be prevalent among some regions and economic groups. Substantial progress in reducing income inequalities as well as direct intervention programs would be required to achieve adequate consumption levels among all groups of the population.

Chile. The 1960-75 production trend declined slightly apparently because of the adverse effects of the civil disturbances in recent years. The trend in 1960-66 was definitely upward, with cereal production increasing about 5 percent per year. While a resumption of an upward trend in cereal production appears likely, staple food crop deficits appear likely to continue to grow. Increased emphasis now is being placed on other agricultural production activities, such as the planting of orchards and vineyards and increases in the production of pulses and vegetables to attain a better utilization of their agricultural resources and to provide export earnings. A staple crop production growth rate of 5.1 percent per year would be required to meet the 1990 market demand. Projected consumption levels are above dietary energy requirements.

Colombia. Food deficits in Colombia would more than double with the 1960-75 production growth rates, which averaged about 3.5 percent per year. Growth rates have been higher in the more recent 1967-75 period, with the growth in cereal production averaging over 4 percent per year. Rice has become increasingly important, with production growing over 10 percent per year. Most of the increase was due to a rapid rise in yield per hectare, about 7.5 percent per year.

An annual production growth rate of some 4.5 percent would be required to meet projected 1990 consumption levels. To provide dietary energy supplies equal to 110 percent of calorie requirements would require a growth in production averaging 5.6 percent. In the 1967-75 period, the output per hectare of cereals increased at a rate of nearly 6 percent per year, but cereal area continued to decline.

Ecuador. Continuation of the low historical production growth rate (1.4 percent) would lead to a deficit of more than 0.75 million metric tons by 1990. Ecuador also has a substantial nutrition problem. If the food energy target were achieved, the deficit would amount to nearly 1 million metric tons. However oil exports are of growing importance and the country appears likely to depend more on imports than domestic production for its cereal supply.

The trend of cereal production in the 1967-75 period was negative, caused by the rapid decline in the area under cereals in recent years.

Mexico. The historical production growth rate has been among the highest in developing countries, 4.6 percent a year. Even though the projected population growth rate of 3.4 percent a year also is high, Mexico would generate a small surplus under the low income growth assumption. But with high income growth more rapid increases in cereal demand, particularly for livestock feed, would result in a deficit in staple crop production. Moreover, 1967-75 trends in production have been substantially below historical growth rates because rates of increase in yields of both wheat and maize declined substantially.

Peru. Growth in cereal production slowed down in recent years and the historical production growth rate for staple crops was only 1.3 percent. Consumption is projected to increase at a rate of more than 3.5 percent per year. On this basis, projected food deficits would be equivalent to over half of Peru's food needs in 1990. To make up the projected deficit internally would require a production growth rate of approximately 7 percent.

Other Middle Income Countries. All the Central American and Caribbean countries usually import cereals which are financed in large part by exports of tropical products. Current imports total about two-fifths of consumption. In 1990, El Salvador could move from a deficit to a surplus position if its very high 1960-75 growth rate of nearly 5.5 percent per year in the production of staple crops is maintained. Rapid increases in the yields of maize have been an important factor in achieving the rapid growth in production.

In the other Central American and Caribbean countries, the production growth rate of the major staples is approximately the same as the population growth rate. The aggregate staple crop deficit for these countries is projected to increase from 2.5 to about 4.5-4.75 million metric tons in 1990. Over 2 million metric tons of this deficit would be incurred by Cuba.

In South America, Guyana is projected to shift from a small net exporter at present to a small deficit position in 1990. Paraguay, on the other hand, would shift from its present net import position to a net exporter if historical production growth rates continue. Production growth rates for cereals in Paraguay, however, were somewhat lower in 1967-75 than in 1960-75.

Even with high income growth, projected 1990 consumption in Honduras, El Salvador and Guyana would fall substantially below the dietary energy targets. Moreover, nutritional problems in most of these countries are aggravated by wide disparities in income.

High Income Country

Venezuela. This country's demand for cereals, particularly for livestock feed, is rising rapidly. An oil exporting country with a GNP per capita of over US$ 1,600 in 1973, Venezuela depends on imports for most of its cereals. Production of staple food crops, though relatively small, increased at the yearly rate of 3.5 percent in 1960-75. Demand is projected to grow at 4.5 to 5 percent a year in the 1975-1990 period and the gross deficit would be 60 percent of projected consumption. While the projected 1990 consumption would exceed the dietary energy target, an improvement in income distribution as well as direct intervention measures would appear needed to achieve adequate dietary energy intake for the underfed.

Grain Exporters

Argentina is a large exporter of cereals with a staple crop production growth rate of 3.2 percent a year and a population growth rate of only 1.2 percent a year. The exportable surplus is projected to more than double by 1990 to over 21 million metric tons. This surplus, alone, would more than meet the projected deficits of the other Latin American countries. In addition, exportable surpluses of Surinam and Uruguay are projected to increase from about one-third of a million metric tons to about 0.5 million metric tons. The high rate of growth in production in Surinam reflects the rapid expansion in production of rice which averaged over 6 percent per year during 1960-75. The production growth rates in Argentina and Surinam has slowed in recent years.

ANNEXES

ANNEX 1: SOURCES OF DATA AND METHODOLOGY

Production/Consumption 1975 Base Year

Data on production and consumption of cereals by country for the years 1960/61 to 1975/76 are from the United States Department of Agriculture (USDA). This is the only available consumption series for cereals for the period. USDA data were incomplete for a few countries, Chad, Liberia and Somalia, and were supplemented by statistics on production and foreign trade from the Food and Agriculture Organization (FAO). The trend estimate for 1975 (based on the 1960-75 period) was used as the base for projections of production and human consumption of cereals to 1990. Average consumption in 1973-75 was established as the base for projecting grain used as feed to 1990. Data were not available for a few of the smaller DME countries which were omitted from the study. Annex 4, Table 18 indicates the countries that were included.

USDA data for 1975 adjusted for major fluctuations of recent years also were used for production of root crops, pulses and groundnuts. These were converted to wheat equivalent tonnage in terms of calories and added to the cereal estimates of production and consumption for those countries where they were important in the diet. This was done only for those commodity groups which usually accounted for 5 percent or more of total calories consumed, as calculated from the FAO report, Food Balance Sheets, 1964-66. In this way, two-thirds or more of the calorie intake of a country was generally covered. Since these crops are usually consumed where produced, it was assumed that consumption was equal to production. Although Nigeria and Niger were significant exporters of groundnuts in the past, exports in recent years have been low, thus obviating the need to make allowances for this factor.

Production Projections 1990

Production of cereals was projected to 1990 by extending the 1960-75 trends. For the other food crops, production was projected from FAO data using 1961-74 as the base period. The latter series was available in computerized form and offered the additional advantage of providing data on area and yield which allowed changes in production to be analyzed. In the case of Zaire, however, USDA data were used in calculating the rates of growth of production in root crops.

The shorter term projection based on the production trend since 1967 was extended from the same 1975 base year.

Consumption Projections 1990

Four sets of consumption targets were computed:

1. Per capita consumption of the selected food crops remains at the base year 1975 level. The changes in total consumption reflect only the impact of population growth.

2. The low income growth target adds to per capita consumption the demand for major staples which would flow from a slow rate of per capita income growth. The assumed per capita rates are more or less in line with recent unsatisfactory growth rates in most developing countries.

3. With high income growth the added amounts are based on assumed rates which generally approximate or exceed the historical trend, and would provide a more rapid increase in food demand.

4. The estimated cereal equivalent required to provide enough additional food for a country to give its underfed the minimum calories needed for an adequate diet is the fourth consumption target.

The basic assumptions, methodology and source materials used in projections of consumption include:

1. Population. The United Nations estimates and medium variant projections for 1960-1990 were used. This is the series usually adopted in most studies of this kind.

Per capita income growth assumptions: These were derived from the 1976 World Bank Atlas, and other World Bank materials.

Under high income growth, the 1960-74 growth rates of GNP per capita were assumed for non-oil exporting countries, with a minimum rate of 1.5 percent per year. For major oil exporting countries, extension of the more rapid rates of 1965-74 generally was assumed, with a minimum of 4 percent a year.

The low income growth rate was assumed to be one fourth slower than the high income assumption, with a minimum of 0.5

percent a year. This assumes that non-oil developing countries will make at least some economic progress in adjusting to high energy costs. The growth rates assumed for each country under the high income and low income assumptions are shown in Annex 4, Table 21.

The consumption data used in this study include post-harvest cereal losses and amounts of cereals used for seed. It is implicitly assumed that rate of growth in these uses would be the same as the projected rate of growth in human consumption.

Estimates of grain used for livestock feed were handled in two ways. In countries where no estimates were made such grain was assumed as part of the consumption data. For a number of major developing countries, however, estimates of grain used for feed are included in the cereal supply/utilization data of the USDA. These data were used in making projections of grain used for feed for countries and regions where available.

2. Income elasticities. The income elasticities used in this report were largely derived from the FAO report, Agricultural Commodity Projections 1970-80,1/ adjusted to accommodate high and low income growth assumption. The income elasticities used in this report are shown in Annex 4, Table 21.

Income elasticities for grain used as feed were generally based on the income elasticity for meat. Statistics for some major feed users among developing countries appear to confirm a close relationship. Zero elasticities were assumed for root crops. This implies that increases in per capita income will be reflected more in demand for cereals with their higher energy and protein content as has been the experience in some countries.

3. Nutrition. Estimates of the additional amount of cereals needed to feed the underfed population in each country in the base period were derived from FAO country data on average calories consumed in 1974 as compared with minimum standards.2/ Following the approach used in IFPRI Research Report No. 2, and earlier by FAO, the national average dietary energy requirements were raised by 10 percent to allow

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1/ Food and Agriculture Organization of the United Nations. Agricultural Commodity Projections 1970-80, Vol. 2, (1971).

2/ Food and Agriculture Organization of the United Nations. Monthly Bulletin of Agricultural Economics and Statistics, April and July/August, 1976.

for individuals whose consumption is above the average recommended requirement.1/ To calculate each country's staple crop nutritional target the difference between 110 percent of the recommended dietary energy requirement and the actual consumption in 1974 was obtained.2/ This difference, expressed in terms of cereal equivalents, was added to the consumption of major staples (including feed for livestock) in 1974 to obtain the 1974 staple crop nutrition target. This was then projected to 1975 and to 1990 on the basis of the projected population growth rate.

This projection implicitly assumes that the consumption of the minor food crops would expand at the same rate as population. However, the staple crops generally account for over two-thirds of the total calorie consumption in the low income, food deficit countries where food gaps are projected in 1990. The 1990 projection also implicitly assumes the 1975 pattern of distribution between the direct human consumption of grain and the grain used for livestock feed will continue.

The projected amounts of cereal equivalent needed to meet the 1990 calorie requirements are compared with the projected consumption under high and low income growth assumption to approximate the additional amounts of cereals or cereal equivalent that would be required to provide 110 percent of the food energy standard in 1990.

Under the circumstances that have existed in the past, increasing food supplies to provide 110 percent of the calorie standard would still likely leave undernourished groups-those bypassed by economic progress. While the overall supplies are likely to be sufficient to provide potential capability for meeting minimum energy needs, effective policies regarding income distribution and government intervention to redirect food distribution to the underfed would be required.

Sources of Growth

The rate of growth for production, area and output per hectare were based on logarithmic time trend equations fitted by ordinary least squares at the levels of country, region,

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1/ International Food Policy Research Institute. Recent and Prospective Developments in Food Consumption: Some Policy Issues, Research Report No. 2, (Washington, D.C.; May, 1977). Food and Agriculture Organization of the United Nations. "Population, Food Supply and Agricultural Development," State of Food and Agriculture, 1974 (1975).

2/ The dietary energy requirements were based on the national average per capita dietary energy requirements calculated by FAO.

economic category, and total DME. USDA data were used to calculate the trends for cereals, and FAO data were used to calculate the global trends presented for root crops and pulses. While trends in the yield of individual crops generally reflect changes in the use of productive inputs they may be to some extent also affected by weather conditions and changes in the quality of the land used during the period. The output per hectare of groups of crops may, in addition, be affected by changes during the period in the crop mix to the extent that significant differences exist in the yields of the various crops.

ANNEX 2: A NOTE ON METHODOLOGY

Production

Following the procedure in IFPRI Research Report No. 1, the production of each of the cereals and other food crops was projected from 1975 to 1990 by using the logarithmic time trend of historical data (1960-75 for cereals and 1961-74 for root crops, pulses and groundnuts) fitted by ordinary least squares. Projected production was obtained from the equation

$$y_t = e^{a_o + a_1 (t - t_o)}$$

where

y_t = projected production for each crop in year t

a_o = estimated constant term

a_1 = estimated annual rate of growth of production

t_o = base year 1960 for cereals and 1961 for root crops, pulses and groundnuts

In the analysis of the components of growth in cereal output, the annual growth rates of production, area and output per hectare were also estimated for two shorter periods, 1960-66 and 1967-75.

Consumption

1. The trend value of per capita consumption of cereals in 1975 was used as a base for projections to 1990 under various assumptions as to real per capita income changes and consumption levels. A logarithmic time trend was fitted by ordinary least squares to the 1960-75 data on per capita consumption and the 1975 trend value was obtained using the equation

$$c_{1975} = e^{b_o + 15b_1}$$

where

b_o = estimated constant term

b_1 = estimated annual rate of growth of per capita consumption from 1960 to 1975

2. Projected per capita consumption in year <u>t</u> was then obtained from the equation

$$c_t = c_{1975}(1 + gz)^{t - 1975}$$

where

g = assumed annual growth rate of real per capita income

z = assumed income elasticity of consumption.

The above equation was also used for projecting the per capita consumption of root crops, pulses and groundnuts. Feed used for livestock was also added to per capita human consumption when these estimates were available.

3. Estimates of total consumption were then obtained using UN population data.

ANNEX 3: IFPRI COUNTRY CATEGORIES

A. DEVELOPED EXPORTERS

1. Australia
2. Canada
3. South Africa
4. United States

B. DEVELOPED IMPORTERS

1. East Europe
    a. Albania
    b. Bulgaria
    c. Czechoslovakia
    d. East Germany
    e. Hungary
    f. Poland
    g. Romania
    h. Yugoslavia

2. EEC: Euro-Six
    a. Belgium
    b. France
    c. Germany
    d. Italy
    e. Luxembourg
    f. Netherlands

3. EEC: Euro-Three
    a. Denmark
    b. Ireland
    c. United Kingdom

4. Japan

5. USSR

6. Other Importers
    a. Austria
    b. Finland
    c. Greece

d. Iceland
e. Israel
f. Malta
g. New Zealand
h. Norway
i. Portugal
j. Spain
k. Sweden
l. Switzerland

C. DEVELOPING GRAIN EXPORTERS

1. Argentina
2. Pakistan
3. Thailand
4. Other Exporters: Surinam, Uruguay

D. DEVELOPING COUNTRIES WITH FOREIGN EXCHANGE 1/

1. Asia Group
   a. Malaysia
   b. Republic of Korea
   c. Republic of China
   d. Other Asia: Brunei, Hong Kong, Singapore

2. North Africa/Middle East (OPEC Group)
   a. Algeria
   b. Iraq
   c. Iran
   d. Libya
   e. Saudi Arabia
   f. Other OPEC: Bahrain, Kuwait, Oman, Qatar, United Arab Emirates

3. Latin America: Venezuela

E. DEVELOPING COUNTRIES WITH FOREIGN EXCHANGE CONSTRAINTS 2/
(Countries with asterisks (*) are oil exporters which are likely to improve reserve positions.)

1. Asia Market Economies
   a. Bangladesh
   b. Burma
   c. India
   *d. Indonesia
   e. Nepal

1/ Also categorized as high income countries.

2/ The developing market economies are grouped by income based on the average 1973 GNP per capita: Middle income, US$ 300 or more; and low income, less than US$ 300. The Asian market economies all fall under the low income group.

f. the Philippines
g. Sri Lanka
h. Other Asia: Bhutan, Macao, Pacific Islands, Papua New Guinea, Maldive Islands

2. Centrally Planned Asia
   a. People's Republic of China
   b. Other Centrally Planned Asia: Cambodia; Laos; Mongolia; Vietnam, Socialist Republic of; Korea, Democratic People's Republic of

3. North Africa/Middle East (Non-OPEC)
   a. Middle Income
      (1) Morocco
      (2) Turkey
      (3) Other Middle Income: Cyprus, Jordan, Lebanon, Syria, Tunisia
   b. Low Income
      (1) Afghanistan
      (2) Egypt
      (3) Sudan
      (4) Yemen Arab Republic
      (5) Yemen, People's Democratic Republic of

4. Sub-Sahara Africa

   West

   a. Middle Income
      (1) Ghana
      (2) Other Middle Income: *Angola, Cape Verde Isles, Ceuta and Melilla, Congo, *Gabon, Guinea-Bissau, Ivory Coast, Liberia, Namibia, Sao Toma & Principe, Spanish Sahara
   b. Low Income
      *(1) Nigeria
      (2) Sahel Countries: Chad, Mali, Mauritania, Niger, Senegal, Upper Volta
      (3) Other Low Income: Benin, Cameroon, Central African Empire, Equatorial Guinea, Gambia, Guinea, Sierra Leone, Togo

   East

   a. Middle Income
      (1) Mozambique, Rhodesia, Zambia
      (2) Other Middle Income: French Territory of Afars & Issas, Mauritius, Reunion, Seychelles Islands, Swaziland
   b. Low Income
      (1) Ethiopia
      (2) Kenya
      (3) Tanzania
      (4) Uganda

(5) Zaire
(6) Other Low Income: Botswana, Burundi, Comoros Islands, Lesotho, Malagasy, Malawi, Rwanda, Somalia

5. Latin America
   a. Middle Income
      (1) Brazil
      (2) Chile
      (3) Colombia
      *(4) Ecuador
      (5) Mexico
      (6) Peru
      (7) Other Latin America: Bahamas, Barbados, Belize, Bermuda, Costa Rica, Cuba, Dominican Republic, El Salvador, French Guiana, Guatemala, Guyana, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Puerto Rico, *Trinidad and Tobago, other Caribbean Isles

   b. Low Income: Bolivia, Haiti

ANNEX 4: TABLES

NOTE: The data for Gambia, presented in Table 20, refers only to rice, and therefore, underestimates food production and consumption.

ANNEX 4: Tables

Table 18-Average annual growth rates of production, area and yield of cereals in developing market economies, by IFPRI category, 1960-75, 1960-66 and 1967-75

(percent)

IFPRI Category	Period	All Cereals			Rice			Wheat			Coarse Grains		
		Production	Area	Output per Hectare	Production	Area	Output per Hectare	Production	Area	Output per Hectare	Production	Area	Output per Hectare
<u>Food deficit</u>	1960-75	2.6	1.0	1.6	2.4	1.1	1.3	4.5	1.8	2.7	1.9	0.7	1.2
	1960-66	1.6	1.0	0.6	0.4	1.2	-0.7	1.6	0.1	1.5	2.6	1.3	1.3
	1967-75	2.1	0.7	1.4	2.3	0.8	1.5	4.2	2.1	2.1	1.0	0.1	0.9
<u>Low income</u>	1960-75	2.4	0.9	1.4	2.4	1.0	1.4	6.0	2.7	3.3	1.1	0.5	0.6
	1960-66	0.3	0.8	-0.5	-0.3	0.9	-1.2	0.2	0.0	0.2	1.1	0.9	0.1
	1967-75	2.2	0.7	1.5	2.2	0.7	1.5	6.7	3.3	3.4	0.4	0.0	0.4

Table 18-Continued

(percent)

IFPRI Category	Period	All Cereals			Rice			Wheat			Coarse Grains		
		Production	Area	Output per Hectare	Production	Area	Output per Hectare	Production	Area	Output per Hectare	Production	Area	Output per Hectare
Middle income	1960-75	3.2	1.4	1.8	2.5	2.5	-0.0	3.3	1.0	2.3	3.4	1.5	1.9
	1960-66	4.8	1.8	2.9	3.5	4.2	-0.7	3.6	-1.1	4.6	5.4	2.8	2.6
	1967-75	2.5	1.4	1.1	3.7	2.2	1.5	2.7	2.0	0.6	2.2	0.8	1.3
High income	1960-75	2.1	0.3	1.8	2.5	0.9	1.6	2.6	1.6	1.3	0.8	-1.5	2.3
	1960-66	2.2	0.9	1.3	4.4	1.8	2.6	0.9	2.5	-1.6	0.5	-1.8	2.3
	1967-75	0.3	-0.9	1.2	2.3	0.4	1.9	-0.4	-0.6	0.2	-1.9	-2.3	0.4

Table 18-Continued

(percent)

IFPRI Category	Period	All Cereals: Production	All Cereals: Area	All Cereals: Output per Hectare	Rice: Production	Rice: Area	Rice: Output per Hectare	Wheat: Production	Wheat: Area	Wheat: Output per Hectare	Coarse Grains: Production	Coarse Grains: Area	Coarse Grains: Output per Hectare
Grain exporters	1960-75	3.8	1.8	2.1	3.3	2.5	0.9	2.8	0.9	1.9	5.1	2.0	3.1
	1960-66	5.1	2.6	2.4	5.0	2.7	2.3	4.8	3.5	1.3	5.2	1.6	3.6
	1967-75	3.5	1.0	2.5	3.1	4.0	-0.9	3.2	-0.9	4.2	3.9	0.6	3.3
Total DME*	1960-75	2.7	1.1	1.6	2.5	1.2	1.3	4.1	1.6	2.5	2.3	0.8	1.5
	1960-66	2.1	1.2	0.9	0.9	1.3	-0.4	2.4	0.7	1.6	2.9	1.3	1.6
	1967-75	2.3	0.7	1.6	2.4	1.2	1.2	4.0	1.5	2.5	1.4	0.2	1.2

Source of basic data: USDA, Foreign Agricultural Service, Computer Printout on Cereal Production, 1975

* Developing market economies.

Table 19-Basic data used in production and consumption projections, by country, 1975 and 1990

(thousand metric tons)

IFPRI Category/ Country	1975 Production Actual	1975 Production Trend	1975 Consumption Actual	1975 Consumption Trend	1975 Consumption 110% of Energy Requirement	1990 Production	1990 Consumption At 1975 Per Capita Level	1990 Consumption Low Income Growth	1990 Consumption High Income Growth	1990 Consumption 110% of Energy Requirement
ASIA										
Low income Food deficit										
Bangladesh	13,281	12,000	14,236	13,397	17,993	15,019	20,472	21,373	22,983	27,506
Burma	6,290	5,932	5,853	6,076	6,339	7,238	8,666	9,134	9,674	9,047
India	111,933	108,252	113,343	112,450	136,788	156,137	160,455	173,702	178,016	195,517
Indonesia	23,551	23,848	25,678	25,450	28,654	37,138	36,714	43,123	44,794	41,378
Nepal	2,972	2,805	2,889	2,548	2,963	3,260	3,719	3,752	3,791	4,323
Philippines	7,073	6,599	7,349	7,449	9,684	11,654	11,731	13,097	13,392	15,286
Sri Lanka	792	1,028	1,996	2,147	2,768	1,683	2,840	3,182	3,278	3,666
High income Food deficit										
China, Republic of	2,487	2,477	4,815	4,554	4,472	3,076	6,669	8,946	9,961	6,543
Hong Kong	7	6	672	658	707	2	801	826	833	861
Korea, Republic of	7,021	6,898	9,337	10,019	9,256	9,429	13,306	15,239	15,999	12,312

Table 19-Continued

(thousand metric tons)

IFPRI Category/ Country	1975 Production Actual	1975 Production Trend	1975 Consumption Actual	1975 Consumption Trend	1975 Consumption 110% of Energy Requirement	1990 Production	1990 Consumption At 1975 Per Capita Level	1990 Consumption Low Income Growth	1990 Consumption High Income Growth	1990 Consumption 110% of Energy Requirement
Malaysia	1,378	1,391	2,235	2,230	2,168	3,142	3,361	3,529	3,596	3,276
Singapore	...	...	720	727	554	...	914	1,493	1,807	698
Grain exporters										
Pakistan	11,849	12,618	12,508	13,144	15,432	27,775	21,071	23,523	24,105	24,752
Thailand	13,200	12,793	9,531	9,454	9,666	22,634	14,966	15,662	15,863	15,325
NORTH AFRICA/MIDDLE EAST										
Low income Food deficit										
Afghanistan	4,568	4,264	4,578	4,400	5,690	5,388	6,557	6,685	6,924	8,485
Egypt	6,980	7,270	10,680	10,604	11,329	10,398	14,858	15,251	15,329	15,887
Sudan	2,920	2,451	2,823	2,577	3,840	4,370	3,539	4,569	4,693	6,186
Yemen PDR	564	530	726	672	1,151	467	1,053	1,094	1,176	1,804
Middle income Food deficit										
Morocco	3,612	4,646	4,904	5,704	6,266	9,377	9,060	9,103	9,106	9,891

Table 19-Continued

(thousand metric tons)

IFPRI Category/ Country	1975					1990				
	Production		Consumption				Consumption			
	Actual	Trend	Actual	Trend	110% of Energy Requirement	Produc-tion	At 1975 Per Capita Level	Low Income Growth	High Income Growth	110% of Energy Requirement
Turkey	18,523	16,222	16,720	16,149	15,124	21,828	23,745	26,561	27,760	22,259
Others										
Cyprus	135	127	337	357	329	127	419	419	419	386
Jordan	63	186	404	449	588	218	734	769	791	962
Lebanon	81	59	600	644	843	41	1,041	1,138	1,174	1,363
Syria	2,201	1,554	2,445	2,000	2,449	1,910	3,257	3,482	3,555	3,991
Tunisia	1,140	955	1,467	1,353	1,486	2,193	2,032	2,848	3,118	2,232
<u>High income Food deficit</u>										
Algeria	1,365	1,596	3,026	2,945	3,869	1,452	4,865	5,446	5,586	6,389
Iran	6,970	6,320	7,960	7,513	8,612	9,671	11,829	15,090	16,655	13,574
Iraq	1,343	2,144	2,393	2,878	3,397	2,633	4,747	5,346	5,505	5,609
Libya	180	141	615	628	595	158	999	1,042	1,054	947
Saudi Arabia	239	254	834	837	1,284	305	1,316	1,452	1,478	2,018

Table 19-Continued

(thousand metric tons)

IFPRI Category/ Country	1975					1990				
	Production		Consumption				Consumption			
	Actual	Trend	Actual	Trend	110% of Energy Requirement	Production	At 1975 Per Capita Level	Low Income Growth	High Income Growth	110% of Energy Requirement
Sub-Sahara Africa										
West Africa										
Low income Food deficit										
Nigeria	18,471	17,898	18,897	18,354	21,682	19,304	28,763	36,414	39,835	33,928
Sahel										
Chad	499	499	545	545	778	195	751	780	839	1,072
Mali	913	865	933	890	1,352	662	1,322	1,386	1,426	2,007
Niger	1,110	1,072	1,160	1,117	1,574	1,018	1,716	1,746	1,802	2,417
Senegal	899	789	1,205	1,141	1,368	1,032	1,656	1,685	1,743	1,984
Upper Volta	1,121	1,126	1,147	1,181	1,621	1,186	1,719	1,730	1,803	2,324
Others										
Benin	743	726	734	727	880	966	1,107	1,131	1,162	1,339
Cameroon	1,173	1,213	1,254	1,296	1,488	2,218	1,833	2,128	2,199	2,099
Gambia	20	23	31	35	48	27	48	59	63	65
Guinea	528	533	586	588	808	720	871	893	938	1,196
Sierra Leone	416	367	444	421	522	483	624	682	701	773

Table 19-Continued

(thousand metric tons)

IFPRI Category/ Country	1975					1990				
	Production		Consumption				Consumption			
	Actual	Trend	Actual	Trend	110% of Energy Requirement	Production	At 1975 Per Capita Level	Low Income Growth	High Income Growth	110% of Energy Requirement
Middle income Food Deficit										
Ghana	1,966	1,973	2,071	2,123	2,304	3,807	3,382	3,439	3,559	3,669
Others										
Angola	797	885	872	928	1,370	1,195	1,373	1,557	1,608	2,025
Ivory Coast	1,249	1,268	1,357	1,464	1,597	2,190	2,206	2,460	2,554	2,406
Liberia	200	200	247	247	318	224	362	408	425	465
East Africa										
Low income Food deficit										
Ethiopia	5,130	4,949	5,231	5,061	6,430	6,001	7,372	8,078	8,310	9,354
Kenya	2,337	2,263	2,167	2,088	2,737	2,927	3,484	3,760	3,822	4,566
Tanzania	3,271	3,155	3,549	3,392	4,514	4,980	5,452	5,951	6,085	7,251
Uganda	2,260	2,425	2,260	2,434	2,922	3,827	3,859	4,064	4,125	4,633
Zaire	4,208	4,172	4,553	4,495	6,058	8,569	6,811	7,168	7,268	9,167
Others										
Burundi	1,277	1,334	1,277	1,341	1,546	3,850	2,002	2,076	2,086	2,306

Table 19-Continued

(thousand metric tons)

IFPRI Category/ Country	1975 Production Actual	1975 Production Trend	1975 Consumption Actual	1975 Consumption Trend	1975 110% of Energy Requirement	1990 Production	1990 Consumption At 1975 Per Capita Level	1990 Consumption Low Income Growth	1990 Consumption High Income Growth	1990 Consumption 110% of Energy Requirement
Malagasy	1,872	1,960	2,033	2,132	2,171	2,827	3,406	3,429	3,468	3,467
Malawi	1,051	1,262	1,076	1,314	1,560	1,879	1,955	2,067	2,080	2,320
Rwanda	1,059	1,057	1,059	1,057	1,363	1,616	1,653	1,676	1,726	2,133
Somalia	319	a/	343	a/	564	396	531	552	590	874
Middle income Food deficit										
Mozambique	455	648	580	734	763	576	1,066	1,137	1,159	1,107
Rhodesia	2,094	1,751	1,929	1,673	1,790	3,011	2,868	2,932	2,953	3,069
Zambia	1,129	1,208	1,239	1,329	1,288	2,236	2,172	2,245	2,271	2,102
LATIN AMERICA										
Low income Food deficit										
Bolivia	729	714	964	954	1,428	1,051	1,406	1,601	1,655	2,105
Haiti	303	300	386	369	604	319	485	504	542	793

Table 19-Continued

(thousand metric tons)

IFPRI Category/ Country	1975					1990				
	Production		Consumption				Consumption			
	Actual	Trend	Actual	Trend	110% of Energy Requirement	Production	At 1975 Per Capita Level	Low Income Growth	High Income Growth	110% of Energy Requirement
Middle Income Food deficit										
Brazil	36,215	35,039	37,034	36,066	37,199	59,665	54,438	59,338	60,602	56,207
Chile	1,597	1,726	2,372	2,700	2,436	1,645	3,520	3,627	3,659	3,179
Colombia	3,438	3,086	3,699	3,502	4,460	5,184	5,447	5,909	6,042	6,949
Ecuador	580	603	802	807	1,063	748	1,280	1,539	1,612	1,688
Mexico	17,235	17,278	19,140	18,864	17,966	34,062	31,084	33,910	34,775	29,623
Peru	1,883	1,917	3,101	3,093	3,374	2,333	4,736	5,197	5,347	5,165
Others										
Costa Rica	159	143	305	285	289	190	422	468	483	428
Cuba	398	337	1,738	1,873	1,587	544	2,538	2,580	2,665	2,152
Dominican Republic	251	257	516	498	621	486	826	1,023	1,082	1,030
El Salvador	691	641	732	717	955	1,414	1,151	1,262	1,292	1,532
Guatemala	983	981	1,072	1,094	1,338	1,520	1,688	1,840	1,881	2,066
Guyana	215	145	123	120	144	162	164	166	166	197
Honduras	420	445	513	507	664	488	834	873	885	1,092
Jamaica	65	65	413	413	339	162	501	540	552	412
Nicaragua	448	417	435	461	476	733	751	836	869	776
Panama	175	169	230	239	254	191	361	412	429	383

Table 19-Continued

(thousand metric tons)

IFPRI Category/ Country	1975					1990				
	Production		Consumption				Consumption			
	Actual	Trend	Actual	Trend	110% of Energy Requirement	Produc-tion	At 1975 Per Capita Level	Low Income Growth	High Income Growth	110% of Energy Requirement
Paraguay	832	849	927	914	870	1,539	1 406	1,425	1,431	1,340
Trinidad and Tobago	16	14	229	216	234	23	251	255	256	272
<u>High Income Food deficit</u>										
Venezuela	956	886	2,036	2.301	2,498	1,486	3,521	4,012	4,121	3,824
<u>Grain exporters</u>										
Argentina	20,924	22,624	12,027	12,487	11,009	36,460	14,832	15,328	15,470	13,088
Surinam	111	110	59	66	64	275	108	122	127	104
Uruguay	1,068	900	813	791	738	1,258	911	917	924	850

Sources of basic data: USDA, Foreign Agricultural Service, Computer Printout on Production, 1975. FAO, Production Tapes, 1975. FAO, <u>State of Food and Agriculture, 1974</u> (1975). UN Department of Economic and Social Affairs, "Selected World Demographic Indicators by Countries, 1950-2000," (ESA/P/WP.55), May, 1975.

a/ Estimates of "actual" used.

Table 20-1975 estimates and projected growth rates of population, and 1975-90 target growth rates of major staple production in developing market economies

		Average Annual Growth Rate (percent)						
		Population		Major Staple Production, 1975-90				
					Needed to Meet 1990 Consumption Target			
Region/ Country	1975 Population (thousands)	1960-1975	1975-1990	1960-75 Trend Projected	At 1975 Per Capita Levels	Low Income Growth	High Income Growth	At 110% of Dietary Energy Requirement
Asia	1,120,965	2.53	2.53	2.8	3.0	3.6	3.9	4.1
Bangladesh	74,791	2.43	2.87	1.5	3.6	3.9	4.4	5.7
Burma	31,617	2.30	2.40	1.3	2.6	2.9	3.3	2.8
China, Republic of	16,195	2.75	2.57	1.5	6.8	8.9	9.7	6.7
Hong Kong and Singapore	6,520	2.08	1.40	-7.1	a/	a/	a/	a/
India	620,929	2.43	2.41	2.5	2.6	3.2	3.4	4.0
Indonesia	137,830	2.59	2.48	3.0	2.9	4.0	4.3	3.7
Korea, Republic of	34,285	2.13	1.92	2.1	4.5	5.4	5.8	3.9

Table 20-Continued

Region/ Country	1975 Population (thousands)	Average Annual Growth Rate (percent): Population 1960-1975	Population 1975-1990	Major Staple Production, 1975-1990: 1960-75 Trend Projected	Needed to Meet 1990 Consumption Target: At 1975 Per Capita Levels	Low Income Growth	High Income Growth	At 110% of Dietary Energy Requirement
Malaysia	12,273	2.88	2.79	5.6	6.1	6.4	6.5	5.9
Nepal	12,729	2.14	2.55	1.0	1.9	2.0	2.0	2.9
Pakistan	71,721	2.93	3.20	5.4	3.5	4.2	4.4	4.6
Philippines	45,164	3.24	3.09	3.9	3.9	4.7	4.8	5.8
Sri Lanka	14,128	2.26	1.89	3.4	7.0	7.8	8.0	8.8
Thailand	42,784	3.17	3.12	3.9	1.1	1.4	1.4	1.2
North Africa/ Middle East	236,943	2.81	2.80	2.5	4.2	4.9	5.2	5.0
Afghanistan	19,542	2.31	2.70	1.6	2.9	3.0	3.3	4.7
Algeria	17,076	3.03	3.40	-0.6	7.7	8.5	8.7	9.7

Table 20-Continued

Region/ Country	1975 Population (thousands)	Average Annual Growth Rate (percent): Population, 1960-1975	Population, 1975-1990	Major Staple Production, 1975-90: 1960-75 Trend Projected	Needed to Meet 1990 Consumption Target: At 1975 Per Capita Levels	Low Income Growth	High Income Growth	At 110% of Dietary Energy Requirement
Cyprus	677	1.09	1.08	0.0	8.3	8.3	8.3	7.7
Egypt	37,982	2.49	2.28	2.4	4.9	5.1	5.1	5.3
Iran	33,445	2.88	3.08	2.9	4.3	6.0	6.7	5.2
Iraq	11,260	3.27	3.40	1.4	5.4	6.3	6.5	6.6
Jordan	2,734	3.14	3.34	1.1	9.6	9.9	a/	a/
Lebanon	2,915	2.95	3.25	-2.4	a/	a/	a/	a/
Libya	2,291	3.47	3.15	0.8	a/	a/	a/	a/
Morocco	17,775	2.78	3.09	4.8	4.6	4.6	4.6	5.2
Saudi Arabia	9,103	2.76	3.06	1.2	a/	a/	a/	a/
Sudan	21,769	4.09	3.23	3.9	2.5	4.2	4.4	6.4

Table 20-Continued

Region/ Country	1975 Population (thousands)	Average Annual Growth Rate (percent)						
		Population		Major Staple Production, 1975-90				
					Needed to Meet 1990 Consumption Target			
		1960-1975	1975-1990	1960-75 Trend Projected	At 1975 Per Capita Levels	Low Income Growth	High Income Growth	At 110% of Dietary Energy Requirement
Syria	7,378	3.15	3.31	1.4	5.0	5.5	5.7	6.5
Tunisia	5,825	2.11	2.75	5.7	5.2	7.6	8.2	5.8
Turkey	40,402	2.51	2.61	2.0	2.6	3.3	3.6	2.1
Yemen PDR	6,769	2.78	3.04	-0.8	4.7	5.0	5.5	8.5
Sub-Sahara Africa	268,700	2.57	2.91	2.3	3.2	4.0	4.4	4.6
Angola	6,432	2.02	2.64	2.0	3.0	3.8	4.1	5.7
Benin	3,117	2.55	2.84	1.9	2.8	3.0	3.2	4.2
Burundi	3,814	1.76	2.70	7.3	2.7	3.0	3.0	3.7
Cameroon	6,464	1.85	2.32	4.1	2.8	3.8	4.0	3.7
Chad	4,066	2.04	2.16	-6.1	2.8	3.0	3.5	5.2

Table 20-Continued

Region/ Country	1975 Population (thousands)	Average Annual Growth Rate (percent): Population: 1960-1975	Population: 1975-1990	Major Staple Production, 1975-90: 1960-75 Trend Projected	Needed to Meet 1990 Consumption Target: At 1975 Per Capita Levels	Low Income Growth	High Income Growth	At 110% of Dietary Energy Requirement
Ethiopia	28,313	2.26	2.53	1.3	2.7	3.3	3.5	4.3
Gambia	515	1.80	2.08	1.1	5.0	6.5	7.0	7.2
Ghana	10,021	2.55	3.15	4.5	3.7	3.8	4.0	4.2
Guinea	4,473	2.23	2.65	2.0	3.3	3.5	3.8	5.5
Ivory Coast	4,951	2.40	2.77	3.7	3.8	4.5	4.8	4.4
Kenya	13,478	3.33	3.47	1.7	2.9	3.4	3.6	4.8
Liberia	1,730	2.09	2.57	0.8	4.0	4.9	5.2	5.8
Malagasy	8,143	2.73	3.17	2.5	3.8	3.8	3.9	3.9
Malawi	4,979	2.34	2.68	2.7	3.0	3.3	3.4	4.1
Mali	5,770	2.25	2.67	-1.8	2.9	3.2	3.4	5.8

Table 20-Continued

Region/ Country	1975 Population (thousands)	Average Annual Growth Rate (percent): Population 1960-1975	Population 1975-1990	Major Staple Production, 1975-90: 1960-75 Trend Projected	Needed to Meet 1990 Consumption Target: At 1975 Per Capita Levels	Low Income Growth	High Income Growth	At 110% of Dietary Energy Requirement
Mozambique	9,348	2.27	2.51	-0.8	3.4	3.8	4.0	3.6
Niger	4,656	3.04	2.90	-0.3	3.2	3.3	3.5	5.6
Nigeria	63,838	2.59	3.03	0.5	3.2	4.8	5.5	4.4
Rhodesia	6,389	3.86	3.66	3.7	3.3	3.5	3.5	3.8
Rwanda	4,263	2.88	3.03	2.9	3.0	3.1	3.3	4.8
Senegal	4,473	2.37	2.51	1.8	5.1	5.2	5.4	6.3
Sierra Leone	3,022	2.27	2.65	1.8	3.6	4.2	4.4	5.1
Somalia	3,215	2.40	2.96	1.4	3.4	3.7	4.2	7.0
Tanzania	15,683	2.90	3.21	3.1	3.7	4.3	4.5	5.7
Uganda	11,529	2.77	3.12	3.1	3.1	3.5	3.6	4.4

Table 20-Continued

Region/ Country	1975 Population (thousands)	Average Annual Growth Rate (percent)						
		Population		Major Staple Production, 1975-90				
					Needed to Meet 1990 Consumption Target			
		1960-1975	1975-1990	1960-75 Trend Projected	At 1975 Per Capita Levels	Low Income Growth	High Income Growth	At 110% of Dietary Energy Requirement
Upper Volta	6,103	2.14	2.43	0.3	2.9	2.9	3.2	4.9
Zaire	24,814	2.80	2.80	4.9	3.3	3.7	3.8	5.4
Zambia	5,102	3.02	3.32	4.2	4.0	4.2	4.3	3.8
Latin America	323,369	2.78	2.75	3.6	2.6	3.2	3.3	2.8
Argentina	25,548	1.39	1.16	3.2	b/	b/	b/	b/
Bolivia	5,482	2.43	2.62	2.6	4.6	5.5	5.8	7.5
Brazil	111,303	2.89	2.79	3.6	3.0	3.6	3.7	3.2
Chile	10,348	2.01	1.79	-0.3	4.9	5.1	5.1	4.2
Colombia	26,296	3.30	3.00	3.5	3.9	4.4	4.6	5.6

Table 20-Continued

Region/ Country	1975 Population (thousands)	Average Annual Growth Rate (percent): Population, 1960-1975	Population, 1975-1990	Major Staple Production, 1975-90: 1960-75 Trend Projected	Needed to Meet 1990 Consumption Target: At 1975 Per Capita Levels	Low Income Growth	High Income Growth	At 110% of Dietary Energy Requirement
Costa Rica	2,021	3.13	2.66	1.9	7.5	8.2	8.4	7.6
Cuba	9,582	2.02	2.05	3.2	a/	a/	a/	a/
Dominican Republic	5,205	3.27	3.43	4.3	8.1	9.6	10.0	9.7
Ecuador	7,204	3.34	3.13	1.4	5.2	6.4	6.8	7.1
El Salvador	4,174	3.29	3.20	5.4	4.0	4.6	4.8	6.0
Guatemala	6,221	2.91	2.94	3.0	3.7	4.3	4.4	5.1
Guyana	800	2.32	2.10	0.7	0.8	0.9	0.9	2.1
Haiti	4,592	1.52	1.83	0.4	3.2	3.5	4.0	6.7
Honduras	3,089	3.28	3.37	0.6	4.3	4.6	4.7	6.2
Jamaica	2,043	1.47	1.31	6.3	a/	a/	a/	a/

Table 20-Continued

Region/ Country	1975 Population (thousands)	Average Annual Growth Rate (percent)						
		Population		Major Staple Production, 1975-90				
					Needed to Meet 1990 Consumption Target			
		1960-1975	1975-1990	1960-75 Trend Projected	At 1975 Per Capita Levels	Low Income Growth	High Income Growth	At 110% of Dietary Energy Requirement
Mexico	60,209	3.30	3.39	4.6	4.0	4.6	4.8	3.6
Nicaragua	2,357	3.09	3.31	3.8	4.0	4.7	5.0	4.2
Panama	1,701	2.95	2.78	0.8	5.2	6.1	6.4	5.6
Paraguay	2,686	2.72	2.92	4.0	3.4	3.5	3.5	3.1
Peru	15,551	2.90	2.88	1.3	6.2	6.9	7.1	6.8
Surinam	428	2.54	3.32	6.3	b/	0.7	1.1	b/
Trinidad and Tobago	1,014	1.19	1.00	3.4	a/	a/	a/	a/

Table 20-Continued

Region/ Country	1975 Population (thousands)	Population: 1960-1975	Population: 1975-1990	Major Staple Production, 1975-90: 1960-75 Trend Projected	Needed to Meet 1990 Consumption Target: At 1975 Per Capita Levels	Low Income Growth	High Income Growth	At 110% of Dietary Energy Requirement
		Average Annual Growth Rate (percent)						
Uruguay	3,123	1.13	0.95	2.3	0.1	0.1	0.2	0.1
Venezuela	12,394	3.16	2.88	3.5	9.6	a/	a/	a/
Total DME*	1,946,770	2.60	2.67	2.9	3.1	3.8	4.0	4.0

Sources of basic data: Population: UN Department of Economic and Social Affairs "Selected World Demographic Indicators by Countries, 1950-2000" (ESA/P/WP.55) May, 1975. Production/Consumption: USDA, Foreign Agricultural Service, Computer Printout on Production, 1975; and the FAO Production Tape, 1975.
Nutrition: FAO. State of Food and Agriculture, 1974 (1975).

* Developing market economies. a/ Higher than 10 percent. b/ Lower than zero.

Table 21-Assumed growth rates of GNP per capita and estimated income elasticities for major staples

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals			
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth	Pulses/ Groundnuts	Meat a/
ASIA						
Low income Food deficit						
Bangladesh	1.5	0.5	0.49	0.50	...	1.17
Burma	1.5	0.7	0.49	0.50	0.38	1.17
India	1.5	1.1	0.45	0.47	0.50	1.17
Indonesia	4.1	3.1	0.39	0.42	0.30	1.17
Nepal	1.5	0.5	0.08	0.10	0.50	1.20
Philippines	2.4	1.8	0.25	0.30	0.30	1.08
Sri Lanka	2.1	1.6	0.46	0.48	0.15	1.17

Table 21-Continued

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals			
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth	Pulses/ Groundnuts	Meat a/
High income Food deficit						
China, Republic of	6.5	4.9	0.02	0.04	0.24	1.00
Hong Kong	6.6	5.0	0.40	0.41	0.08	...
Korea, Republic of	7.3	5.5	0.01	0.03	0.50	1.16
Malaysia	3.9	2.9	0.05	0.05	0.34	1.07
Singapore	7.6	5.7	0.05	0.05	0.07	1.00
Grain exporters						
Pakistan	3.4	2.6	0.23	0.25	0.30	1.17
Thailand	4.6	3.4	0.03	0.04	0.22	1.13

Table 21-Continued

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals		Pulses/ Groundnuts	Meat a/
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth		
NORTH AFRICA/MIDDLE EAST						
Low income Food deficit						
Afghanistan	1.5	0.5	0.24	0.25	0.70	1.08
Egypt	1.5	1.1	0.14	0.16	0.50	0.97
Sudan	1.7	1.3	0.49	0.50	0.86	0.80
Yemen PDR	1.5	0.5	0.49	0.50	0.69	0.72
Middle income Food deficit						
Morocco	1.8	1.4	0.04	0.05	0.30	1.09
Turkey	3.9	2.9	0.00	0.00	0.51	0.93

Table 21-Continued

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals			
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth	Pulses/ Groundnuts	Meat a/
Others						
Cyprus	5.4	4.0	0.00	0.00	0.01	0.44
Jordan	1.5	0.9	0.07	0.07	0.52	1.12
Lebanon	3.1	2.3	0.03	0.03	0.42	0.76
Syria	4.0	3.0	0.04	0.05	0.44	1.17
Tunisia	3.9	2.9	0.69	0.74	0.50	1.04
High income Food deficit						
Algeria	4.0	3.0	0.23	0.25	0.68	1.01
Iran	7.7	5.8	0.08	0.08	0.60	0.95
Iraq	4.8	3.6	0.21	0.22	0.59	0.89
Libya	4.5	3.4	0.08	0.08	0.52	0.93
Saudi Arabia	9.7	7.3	0.08	0.09	0.53	0.77

Table 21-Continued

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals		Pulses/ Groundnuts	Meat a/
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth		
SUB-SAHARA AFRICA						
West Africa						
Low income Food deficit						
Nigeria	8.4	6.3	0.49	0.50	0.51	1.13
Sahel						
Chad	1.5	0.5	0.49	0.50	0.20	0.85
Mali	1.5	0.9	0.34	0.35	0.30	0.98
Niger	1.5	0.5	0.18	0.20	0.30	1.04
Senegal	1.5	0.5	0.24	0.24	0.29	0.84
Upper Volta	1.5	0.5	0.29	0.29	0.23	1.24
Others						
Benin	1.5	0.7	0.48	0.48	0.49	1.05

Table 21-Continued

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals		Pulses/ Groundnuts	Meat a/
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth		
Cameroon	3.1	2.3	0.39	0.40	0.34	0.87
Gambia	3.8	2.8	0.49	0.50	0.35	1.02
Guinea	1.5	0.5	0.48	0.48	0.37	1.05
Sierra Leone	1.6	1.2	0.49	0.50	0.22	1.07
Middle income Food deficit						
Ghana	1.5	0.5	0.49	0.50	0.28	0.98
Others:						
Angola	3.7	2.8	0.41	0.43	0.40	0.89
Ivory Coast	3.5	2.6	0.49	0.50	0.35	0.94
Liberia	2.2	1.6	0.49	0.50	0.47	0.98

Table 21-Continued

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals			
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth	Pulses/ Groundnuts	Meat a/
EAST AFRICA						
Low income Food deficit						
Ethiopia	2.2	1.6	0.35	0.37	0.51	0.75
Kenya	3.2	2.4	0.18	0.20	0.42	1.01
Tanzania	2.6	2.0	0.31	0.32	0.60	1.00
Uganda	1.8	1.4	0.27	0.27	0.46	1.06
Zaire	2.6	2.0	0.47	0.50	0.44	0.88
Others						
Burundi	1.5	1.3	0.48	0.49	0.21	1.11
Malagasy	1.5	0.5	0.10	0.10	0.60	1.01
Malawi	3.9	2.9	0.09	0.09	0.50	0.98

Table 21-Continued

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals			
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth	Pulses/ Groundnuts	Meat a/
Rwanda	1.5	0.5	0.47	0.50	0.41	1.09
Somalia	1.5	0.5	0.47	0.50	0.56	0.93
Middle income Food deficit						
Mozambique	2.8	2.1	0.20	0.20	0.50	1.19
Rhodesia	1.9	1.4	0.10	0.10	0.40	0.93
Zambia	2.3	1.7	0.10	0.10	0.40	0.97
LATIN AMERICA						
Low income Food deficit						
Bolivia	2.5	1.9	0.44	0.45	0.50	0.86
Haiti	1.5	0.5	0.49	0.50	0.44	1.05

Table 21-Continued

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals			
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth	Pulses/ Groundnuts	Meat a/
Middle income Food deficit						
Brazil	4.0	3.0	0.07	0.10	0.03	0.48
Chile	1.7	1.3	0.00	0.00	0.30	0.69
Colombia	2.6	2.0	0.26	0.27	0.50	0.69
Ecuador	4.0	3 0	0.38	0.42	0.50	0.88
Mexico	3.3	2.5	0.09	0.10	-0.16	0.61
Peru	2.0	1.5	0.36	0.37	0.60	0.77
Others						
Costa Rica	2.9	2.2	0.18	0.18	0.30	0.64
Cuba	1.5	0.5	0.22	0.22	0.20	0.56
Dominican Republic	3.1	2.3	0.45	0.50	0.40	0.85

Table 21-Continued

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals			
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth	Pulses/ Groundnuts	Meat a/
El Salvador	1.8	1.4	0.29	0.30	0.40	0.70
Guatemala	3.3	2.5	0.15	0.16	0.40	0.70
Guyana	1.5	1.1	0.09	0.09	0.40	0.91
Honduras	1.6	1.2	0.17	0.18	0.40	0.65
Jamaica	3.6	2.7	0.20	0.21	0.18	0.80
Nicaragua	3.0	2.2	0.25	0.25	0.20	0.61
Panama	4.1	3.1	0.18	0.18	0.25	0.70
Paraguay	2.0	1.5	0.10	0.10	0.20	0.31
Trinidad and Tobago	4.0	3.0	0.04	0.04	0.21	0.95
High income Food deficit						
Venezuela	4.0	3.0	0.15	0.19	0.30	0.46

Table 21-Continued

IFPRI Category/ Country	Annual Per Capita GNP Growth Rate (percent)		Estimated Income Elasticity			
			Cereals			
	High Income Growth	Low Income Growth	High Income Growth	Low Income Growth	Pulses/ Groundnuts	Meat a/
Grain Exporters						
Argentina	2.8	2.1	0.00	0.00	0.12	0.18
Surinam	3.6	2.7	0.29	0.30	0.30	0.84
Uruguay	1.5	0.5	0.00	0.00	0.10	0.11

Source of basic data: GNP: World Bank Atlas, 1976 and other IBRD materials. Income Elasticities: FAO. Agricultural Commodity Projections, 1970-1980. (1971).

a/ The income elasticity for meat was used for projecting the demand of grain used for livestock feed.

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IFPRI

Research Highlights 1978

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Research Highlights

The establishment of a food policy research institute was recommended to the Consultative Group on International Agricultural Research by its Technical Advisory Committee in July 1974. Three nongovernmental organizations which are members of the Consultative Group (The International Development Research Centre, The Ford Foundation and the Rockefeller Foundation) agreed to accept initial responsibility for financing such an institute.

Following the World Food Conference in November 1974, the three sponsors reviewed the need for the institute and agreed to go ahead. The International Food Policy Research Institute was incorporated on March 5, 1975. The Board of Trustees numbers 14 including members from 11 nations; seven Board members are from developing countries. The senior research staff has grown from six at the beginning of 1976 to 15 by the beginning of 1977 and to 21 during 1978, and now includes 14 nationalities. Fifteen senior research staff are from developing countries. Highlights of the initial flow of research results are stated here with emphasis on their policy implications.

The Size of the Food Problem

IFPRI's initial research shows dramatically what an immense food problem the Third World and the world generally face over the next few decades. Research Report 3, *Food Needs of Developing Countries: Projections of Production and Consumption to 1990,* provides detailed country-by-country data on consumption and production trends for the 82 developing market economy (DME) countries (developing countries, excluding those with centrally planned economies such as the People's Republic of China). The analysis projects food production trends to 1990 from the period 1960-1975 and compares those projections with expected growth in demand. The demand projections are derived from the U.N. medium-variant population projection and per capita consumption projections are derived using Food and Agriculture Organization (FAO) income elasticities and two alternative estimates of per capita income growth. A "high" estimate projected the 1960-74 growth rate for non-oil exporters, and the 1965-74 rate for oil exporters; while a "low" estimate assumed 25 percent lower growth based on the three retarded growth years following the dramatic increase in oil prices.

Given the apparently conservative assumptions, the projected food deficits of 120 million tons with slow growth in income and 145 million tons with the higher growth rate are strikingly large, especially in light of actual gross imports of 37 million tons by the DME countries in 1975.

Even if the demand in 1990 were satisfied at the higher growth rate, widespread hunger as defined by the FAO calorie standard would persist. Ending hunger by 1990 requires at least 170 million tons of grain equivalent above projected production. Research Report 2, *Recent and Prospective Developments in Food Consumption: Some Policy Issues*, reviews these nutritional needs and assesses their implications.

Closing the Food Gap

Each of the alternative means of reducing the projected food deficits has chastening implications.

Expanded trade may meet some of the projected food deficit. Indeed for the rising middle income Third World countries, imports will have to meet a significant part of the burgeoning demand induced by per capita income growth. But trade can only expand if developed nations accommodate the growing export potentials of developing countries in manufactures and in agricultural commodities, particularly those produced through labor intensive processes. The immense difficulties as well as the potential gains from expansion in trade are explored in Occasional Papers 1, *Commodity Trade Issues in International Negotiations,* and 2, *Potential of Agricultural Exports to Finance Increased Food Imports in Selected Developing Countries.*

Food aid, on a scale much more generous than present or even past efforts, could significantly alleviate the food deficits of low income countries in the short run, but offers no permanent solution.

Nor is it likely that IFPRI's assumptions about population or per capita income growth significantly overstate projected food demand. Of course, the anticipated reduction in population growth rates is important, especially in the longer run, and could prove larger than expected. But the age distribution of foregone births is such that unexpected reduction in birth rates is unlikely to affect food demand significantly by 1990. Reduced demand caused by rates of per capita income growth lower than those assumed is distressing to contemplate. In any case, the development efforts of the past few decades are much more likely to result in faster than in slower per capita income growth rates.

Unfortunately, more rapid per capita income growth cannot necessarily be equated with more equitable income distribution. Indeed, if increased production, trade and aid are insufficient to close the food gap, it is all too likely to be closed by widening income disparities to the detriment of lower income people. When rising per capita incomes boost demand and force up food prices, the poor, who spend most of their income on food, must necessarily have their real income, food intake and nutritional status decline. The same result occurs if the pace of employment growth slackens. The large extent to which the burden of shortfalls in food availability and rising food prices fall on the lower income population is shown dramatically in another paper by IFPRI staff *Agricultural Price Policy and Income Distribution in Low Income Nations.*

The magnitude of the food gap and the tendency for the burden of closing it to fall largely on the poor is doubly disturbing in these days of increased emphasis on broadened participation in growth and on meeting basic needs of the poor. Thus, IFPRI's research leads firmly to the conclusion that greatly increased supplies of food are essential to improved income and welfare of the poor in DME countries.

To close the nutritional gap solely through increased production in developing countries will require annual growth in food output of at least 4 percent. That is the target rate advisedly chosen by the World Food Council, although it is a rate rarely achieved by any nation for a sustained period.

Investment Requirements

Increasing food production by 4 percent per annum will be extremely difficult and will require vast resources used with greatly increased efficiency. The forthcoming Research Report *Investment Requirements to Increase Food Production* estimates the investment required to close the gap between projected production and consumption by 1990 in 36 food deficit, low income nations that contain 33 percent of the world's population and 68 percent of the population of DME countries. The report also provides insights into where and under what circumstances the req-. uisite production increases can be best obtained. Originally commissioned by the Consultative Group on Food Production and Investment, the study was broadened at the request of the World Food Council and provides five salient findings.

First, more than $60 billion of additional capital investment will be required up to 1990 to close the gap solely for this set of food deficit, low income countries. In addition, a substantial increase in recurrent investment for inputs and services will be needed. Mobilizing such a volume of additional resources for food production will clearly require an expanded and redirected effort by the developing countries. The resource needs are so great, however, that they seem likely to require massive transfers from the developed countries as well. Moreover, the unprecedented expansion of human, scientific, technical and managerial skills needed in the Third World will also require greatly expanded technical assistance, if these augmented resources are to be used effectively.

Second, the irrigation expansion needed for just these 36 countries requires nearly $45 billion of additional investment between now and 1990. IFPRI's estimates necessarily involve many judgments, but results, at least for the major food deficit countries of Asia, are generally consistent with findings of a Japanese study team on behalf of the Trilateral Commission. The magnitude of the investment highlights not only the importance of irrigation to accelerating growth of food output, but also the need for high levels of efficiency in irrigation development and utilization. The latter consideration has led to a collaboration among IFPRI, the International Rice Research Institute (IRRI), the International Fertilizer Development Center (IFDC) and national institutions in the Association of Southeast Asian Nations (ASEAN) on a research project on irrigation investment and efficiency in Southeast Asia.

Third, massive spending on irrigation and ancillary investments in fertilizer production and use and technical change would provide no more than half the additional food needed to close the food gap estimated for 1990. The rest must come from rainfed agriculture—in the face of declining opportunities for expansion of the cultivated area. For example, although irrigation must eventually play a much larger role in Africa, increased output, from rainfed agriculture will continue to be the dominant element of that continent's food production growth for the next decade or so.

Fourth, if rainfed agriculture is to play its full role in helping growth reach 4 percent, yields per hectare must generally grow at rates of 2 percent or more. That requires unprecedented progress in applied research. New technology must be adapted to a myriad of local conditions, to raise yields directly and to increase profitability and hence use of purchased inputs in order to further increase production. Expanding the system of international research centers, supported by the Consultative Group on International Agricultural Research (CGIAR), in conjunction with rapidly developing national agricultural research systems, would appear to have a vital role in the process of technology adaptation.

Fifth, international development assistance expenditures are much better documented than national levels of expenditures on the agricultural sector. IFPRI is therefore augmenting its estimate of investment requirements by a trial effort to estimate levels and trends in national budgetary allocation to agricultural development.

Research Resource Allocations

In recognition of the importance of agricultural research in developing a base of technology that will permit a sustained increase in productivity, and of the need to increase the quantity and efficiency of research resources, IFPRI has given high priority to analysis of agricultural research allocations. The initial work, requested by the Technical Advisory Committee (TAC) Secretariat of the CGIAR, deals with the allocation of research funds within the CGIAR system.

The wealth of detail and careful qualification of findings reported in the forthcoming Research Report, *Allocation of Resources to Agricultural Research: International Research Priorities*, make it difficult to summarize. It is apparent, however, that imports of wheat into tropical countries are growing rapidly, which suggests a need for careful scrutiny of the potential for adapting high yielding wheat varieties to the intertropical agroclimatic zones. Results from maize, millet and sorghum research are still meager relative to the many countries in which these are major crops. The tropical root crops likewise loom far larger in value, tonnage and importance to the poor than they do in research allocations. Pulse production is heavily concentrated in South Asia whereas the distribution of international agricultural research funds to pulse research are widely dispersed geographically. The importance of rainfed agriculture and the fragile environments so common among rainfed areas indicate the need for relatively more research on water and soil management. Despite IRRI's having been the first International Center, current international research allocations do not match rice's importance in value, in tonnage, and as a source of human nutrients. Economic, political, even physical and biological consequences of new technology are receiving insufficient attention. Inadequate knowledge of the strengths, weaknesses and allocation of resources within and across national research and extension systems impedes the most effective allocation of international resources for research and scientific training. Moreover, it hampers the adoption of the research output of International Centers at the national and local levels.

As a follow-up to the work for the TAC and as an initial approach to analysis of national agricultural research systems, the Institute has examined Nigeria's research allocations. IFPRI found that in at least partial continuation of an historical relation, the ratio of research funds devoted to food crops relative to money allocated to export crops is much smaller than the ratio of food to export crops in value of production. In addition, changing the proportion of research resources given to various agricultural regions may substantially increase efficiency.

Replication of such research in other countries will pave the way for analysis of overall investment requirements in research and their allocation between national and international centers. Investment in agricultural research and scientific training between now and 1990 should probably be of the order of $3.5 billion for just the 36 low income, food deficit nations. IFPRI plans to study means of increasing efficiency in the use of these important investments as part of a substantial continuing effort on various aspects of research investment.

Increasing Food Consumption

The IFPRI research program reflects increasing concern about matching accelerated food production with commensurate growth in effective demand for food. It is clear that higher food production growth rates are not automatically accompanied by commensurate increases in purchasing power of low income people. This may be particularly true in the low income countries. These relationships are being explored by IFPRI staff in the framework of recent major changes on the food scene in India as a basis for understanding the basic relationships. A match between growth in production and in effective demand is necessary not only to meet humanitarian objectives but also to maintain the remunerative prices essential to rapid production growth. Research shows clearly that growth of effective demand for food is determined basically by the growth in the purchasing power of the poor. The poorest 20 percent of the population spend half or more of increments to their income on grain alone, while the upper income decile spends 10 percent or less of additional income on grain.

In the long run IFPRI's research program will analyze the growth linkages and market forces implicit in a rural-led growth strategy. Macro analysis showing the point at which disparity in wage rates triggers migration from rural to urban areas is helping define rural development patterns needed to provide remunerative employment in rural areas. (See the forthcoming, *Intersectoral Factor Mobility and Agricultural Growth.*)

In the short run, IFPRI's research on food consumption is concentrating on broad food subsidy schemes as a means of making larger quantities of food available for consumption by the poor. *Impact of Subsidized Rice Distribution on Food Consumption and Nutrition in Kerala* (in press) shows that two-price rationing systems can have a major positive effect on food intake, dietary balance, nutrient consumption and health (as measured by height and weight measures) of low income people. Based on data collected directly from low income households in the Indian state of Kerala, the study ranks income sources in the following order on efficiency in improving child health: broad food subsidies, production on the farm by its owner, and off-farm wages. Other variables are being examined and the analysis will be expanded to other and larger populations.

Meanwhile, other food consumption policy research is comparing costs of broad food subsidy programs in India, Sri Lanka, and Bangladesh and relating those costs to other policies. It is clear that widely admired food distribution programs such as Sri Lanka's are expensive, particularly with respect to public sector resources. Nevertheless, it appears that broad food subsidy programs are, despite the high costs, a promising means of improving the welfare of large numbers of poor people. In due course, the research aims to provide a basis for judging the efficacy of alternative policies to increase effective demand and food consumption of low income people apace with accelerating production. This future work will compare the costs and benefits of narrowly targeted programs with those of broad based distribution programs. It will also examine the role of price policy in influencing the composition of production and consumption and the implications of price induced change to nutritional status.

Food Aid

Accelerating food production growth rates requires, depending on the country, up to 20 years or more of major institution building, investment in physical facilities and consistent policy measures. Food aid, on the other hand, can reach the poor in the short run. Preliminary findings from a comprehensive IFPRI analysis of food aid are reported in *Programming United States Food Aid to Meet Humanitarian and Developmental Objectives,* drafted as a contribution to a Brookings Institution study of foreign assistance. IFPRI's results show that food aid of more than 70 million tons a year would be needed to close the calorie gap and to meet projected increases in effective demand in the DME countries. However, filling even 20 percent or so of that gap could be of great value. To be effective in a development context, the analysis notes, food aid should be combined with programs to increase effective demand and with domestic production programs which can facilitate an eventual phasing out of assistance. In this context, the importance of continuity and reliability of food aid to these objectives is clarified.

Food Security

If IFPRI has given a high priority to research on food security because it is essential to effective policy to increase food consumption by the poor. The Institute believes that the food security needs of poor people in low income countries have to be met separately from the larger problems of instability in world grain markets, which so often reflect the direct and indirect effects of demand for grain-fed livestock by high income consumers in developed countries.

Thus IFPRI has first considered measures to insure developing countries against the increase in foreign exchange requirements to replace domestic production lost due to the vagaries of weather. The analysis concentrated on international schemes, recognizing that nationally held stocks are prohibitively expensive and cannot average out variation in weather across large geographic areas.

Research Report 4, *Food Security: An Insurance Approach,* presents an insurance type food security scheme and a simulation model for analyzing its costs and operational qualities. Country-by-country data on costs indicate that the scheme although much cheaper than independent national systems, still requires a $4-6 billion fund in combination with a 20 million ton reserve of grain. The International Center for Wheat and Maize Improvement (CIMMYT) and IFPRI are cosponsoring a major conference in Mexico to compare four alternative approaches to food security: IFPRI's combined grain reserve and financing facility; a program run unilaterally by a major exporter such as the United States; unilateral efforts by developing countries; and a financing scheme along the lines of the existing compensatory facility of the International Monetary Fund. The operational problems of food security systems as exemplified by the ASEAN countries, East African countries, India, and Colombia will be analyzed. We expect that a clearer view of food security alternatives at a timely period for policy making will result.

Linkages of IFPRI Research to Policy

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

A Look Ahead

The next step in IFPRI's development must be to deal with policies and problems of particular developing countries. That dimension has been modestly present in the country specific aspects of the food distribution, food security, trade and food aid efforts, but its full development depends on establishing close collaborative arrangements with research institutes and policy makers in developing countries. The Institute is now taking the initial steps along that path.

Discussions are being initiated to expand the study of Nigerian research resource allocations. The person in charge of that effort has now returned to the University of Ibadan in Nigeria, providing the basis for a continuing institution-to-institution relationship that should assist the development of both institutions. The anticipated shift to IFPRI of another Nigerian from the same institution offers scope for broadening and consolidating the arrangement, with benefits in personnel development, research output and dissemination of research results.

A broad project on rice policy in the ASEAN countries is in an advanced stage of preparation and negotiation. IFPRI, IRRI and IFDC are collaborating with national institutions of the ASEAN countries in an integrated rice policy analysis. In the longer run the project will analyze the interaction among changes in food production growth rates, food consumption policy and trade. The first phase of the project covers three specific issues: domestic food policy and its short run reflection in trade and food security needs; the relation between irrigation investment and efficiency; and fertilizer policy. A new staff member arriving next summer, highly experienced in the Sahel and with enterprise combination questions, will explore collaboration on food policy problems of the Sahel with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the International Livestock Center for Africa (ILCA) and other organizations with operational interests in Africa. That effort is viewed as a broader consideration of enterprise combination problems in specific areas, problems that are of vital concern to the International Centers as well as to the national research systems. The research in the Sahel will complement IFPRI's ongoing application of the food security research to the region.

A joint World Bank-IFPRI analysis of food policy in Bangladesh has led to an invitation from the Government of Bangladesh to a senior IFPRI staff member to play a substantial role in implementing the study's recommendations. That effort is likely to lead to new collaborative research in Bangladesh. Similarly applied research in nutrition policy is leading to proposals for extensions in comparative field work in close association with national institutions in several developing countries.

The growing emphasis on individual countries and regions is leading not only to closer collaboration with International Centers and national institutions but also to staff interchanges that will increase national capacities to analyze food policy programs. It is from this thrust that IFPRI will develop as a focal point for a wide network of interaction among various national and international organizations. The nature of the research program and the progressive expansion of IFPRI's staff across functional and geographic areas give the Institute a unique potential to provide leadership in the growing community of researchers on food policy.

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Washington, D.C. 20036 U.S.A.

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documents

1979

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INSTITUTE

1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036 U.S.A.

IFPRI LOCATION STUDY

Daniel Ritchie

RESTRICTED

THE INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE (IFPRI)

Location Study

By C. Hart Schaaf, Consultant
Washington, D.C.

September 1979

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INTERNATIONAL
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7 September 1979

Mr. John W. Mellor, Director
International Food Policy Research Institute
1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036
USA

Dear Mr. Mellor:

I take pleasure in giving you herewith the IFPRI Location Study which I have prepared pursuant to your letter to me of 7 August 1979.

In these past weeks of work and reflection, I have had much help from your staff, notably Miss Mary Patricia Rafferty. I would like to record my grateful thanks to her and to them; and also to the many persons listed in Annex IV who have let me interview them.

I wish also to express my appreciation to James M. Mitchell, of the Brookings Institution, for his valuable counsel on methodology.

Because of the severe time constraint, my assessment is neither as broad nor as deep as I would have wished, and as the subject surely deserves. I nevertheless hope that it may be useful to you and the others concerned in dealing with the problem at hand.

Cordially,

C. Hart Schaaf

C. Hart Schaaf
Consultant

IFPRI LOCATION STUDY

By C. Hart Schaaf, Consultant

I. INTRODUCTION

A. Terms of Reference. These are stated in the letter to me from Mr. John W. Mellor, Director of the International Food Policy Research Institute (IFPRI), dated 7 August 1979, reproduced below as Annex I. They ask me:

1. to examine and weigh the advantages and disadvantages, the costs and benefits, and the consequences which in my view, and according to my findings, might accrue to IFPRI were the organization to move from Washington to some location in the developing world;
2. to examine relevant IFPRI and CGIAR documentation;
3. to pursue further avenues of enquiry deemed appropriate by me, including documentation and interviews; and
4. to bring to this study a fresh and independent approach.

B. Time Frame. Mr. Mellor's letter of 7 August 1979 (Annex I) notes that I would be (and I have been) involved with other continuing and time-consuming commitments during August and early September; but asks me--and I agreed to try--to prepare and submit my report, in a form ready for final typing, preferably by Friday 31 August and not later than Friday 7 September.

C. Documents Examined. These are given in Annex II. It will be noted that they fall into four categories:

1. CGIAR background documents.
2. CGIAR and TAC documents concerning IFPRI, including location.
3. IFPRI background documents, some containing references to location.
4. IFPRI research studies.

D. Persons with Whom Discussions Were Held are listed in Annex IV.

The persons interviewed were invited to speak as individuals and not necessarily as spokesmen for their institution or institutions of attachment.

The list of interviewees was nevertheless structured to include the principal institutions concerned with IFPRI: the CGIAR sponsors (the World Bank, FAO, and UNDP) and secretariat; and the IFPRI Board of Trustees, senior staff, and donors (IDRC of Canada, and the Ford and Rockerfeller Foundations). In addition, as noted in Annex IV, discussions were held with a few people not, or not currently, directly involved in CGIAR or IFPRI activity.

The interviewees are nationals of 12 countries, 8 of them developing, 4 of them industrialized. Of the individuals talked with, 13 are nationals of developing countries, 37 are nationals of industrialized countires.

Information and assessments were obtained from the IFPRI staff mostly during a group discussion, and from written material submitted following the discussion.

The other persons--the bulk of the list--were usually seen in their offices, though some of the interviews were by phone.

The average interview lasted about an hour. In every case the interviewee was invited (1) to give his or her considered frank views about IFPRI location; and (2) to comment on a provisional tabular statement giving (a) criteria which might govern IFPRI location, (b) possible weights within a total of 100 to be assigned to these criteria, and (c) provisional location ratings against these weighted criteria. In virtually every case the interviewee chose to focus the principal part of the discussion on this table. The table, in the form in which it emerged at the conclusion of the discussions, is given below on page 8.

E. Consultant's Background. Biographical data appear in Annex IV.

II. IFPRI

A. Purposes.

CGIAR in May 1979 requested a formal restatement of IFPRI's mandate and objectives. This is being drafted by the Director of the Institute, Mr. John Mellor, for consideration by the IFPRI Board of Trustees at their meeting scheduled for Friday 21 September 1979. The Board of Trustees plans to forward this statement, after they have reviewed and possibly amended it, for consideration by CGIAR at its meeting scheduled for November 1979.

Mr. Mellor agrees that for the convenience of readers I may quote here from his draft. Mr. Mellor states in part:

> "The International Food Policy Research Institute undertakes research on selected policy issues related to the production, consumption, availability and distribution of food in the world, with particular emphasis on the needs of the low-income countries and of the lower-income groups within those countries ...the Institutes's work is to provide knowledge of economic conditions and policy alternatives to facilitate improved nutri-

tion for that substantial proportion of the world's population which obtains inadequate food intake for an active and healthy life...Because technological change in agriculture is so fundamental to increased supplies of food and hence to the availability of food to low-income people, the institutes's research gives special emphasis to the policy implications of new technology, its conditions of application and the effects that derive from its application...The Institute intends that its research results improve policymaking of national and international bodies."

The CGIAR draft secretariat observations on IFPRI's proposed 1980 program and budget also contain much useful information which, although quite well known to the persons who will be reading my report, may nevertheless be quoted here for their convenience. The CGIAR secretariat notes that IFPRI is preparing a new formal statement of its mandate, and continues:

"4. Meanwhile, the broad mandate and objectives of the Institute can be considered as those set out in the International Development Research Centre (IDRC) grant letter of June 1975. This stated that IFPRI would undertake research on selected policy problems affecting the production, consumption, availability and equitable distribution of food in the world with particular emphasis on the needs of the low-income countries and especially the needs of vulnerable groups within those countries. Specifically, IFPRI would work:

"(a) to identify major opportunities for expanding world food production with particular emphasis on the development actions and policies best suited to remove present constraints to production and to establish the framework for the sustained use of the potential agricultural capacities existing in low income nations;

"(b) to determine and publicize those actions which could be undertaken, and those policies which could be adopted by governments, regional and international agencies, to effect a continued increase in the quantity and quality of food supplies available to all people through enhanced food production, wider trade; and

"(c) to provide information, and expanded base of knowledge and objective analysis of world food problems, and to indicate the opportunities and options open for their solution.

"5. With respect to training, not covered in the IDRC letter, the May 1975 prospectus of IFPRI states 'that IFPRI will have no formal training program. The training activities would consist largely of learning by participating in multidisciplinary policy research...of a world food policy institute.

"6. TAC, at its 21st Meeting, after consideration of the report of its Review Mission to IFPRI (January 1979), 'recommended that, from the point of view of CGIAR support, the mandate of the Institute should give its principal emphasis to the problems of developing countries and that the central tasks in its programme should be concerned with the linkages and inter-relationship between the micro-level problems of the adoption of new technologies and the wider economic and socio-economic aspects of agricultural development. Thus the work on trends analysis and international food trade should be considered only as supporting activities to the main research programme. The Committee also considered that more emphasis should be given to collaboration with national institutes in developing countries and to the possibilities of useful interaction with ISNAR.' (p. 1)

"7. In its response, the IFPRI Board has noted that the TAC view of the desired mandate is fully consistent with its own view and with the orientation and trend of the Institute's research programme. It is understood that the new draft of IFPRI's mandate to be submitted to the CGIAR in November will reflect this view."

Other useful material about IFPRI's objectives, well-known to the readers of this report, and amplifying but not significantly altering the information quoted above, is contained in many of the documents listed in Annex II below.

B. Resources

It is, I think, not too much of an oversimplification to state that IFPRI's resources are basically three:

1. Global knowledge and data, including the means to assemble, discuss, analyze, and disseminate this.
2. Personnel--staff--qualified to deal with all aspects of the knowledge and data resource, with such staff necessarily possessing not only high technical competence, but also widely diverse geographical backgrounds to ensure that many if not all of them are aware of the realities of the developing world, including food shortages and hunger.
3. The finance necessary to evoke and utilize resources 1 and 2.

C. Method of Operation

It will be useful to quote again from Mr. Mellor's draft statement referred to in I.A. Having noted that IFPRI "intends that its research results improve policymaking of national and international bodies," Mr. Mellor states that it seeks to facilitate this result "by 1) publishing research reports, 2) issuing policy oriented statements on key issues, 3) operating workshops and conferences which include researchers and policymakers, and 4) by individual contact with policy makers." Mr. Mellor emphasizes that "the Institute attempts to make its research relevant by choice of subjects and approaches to those subjects which are tuned to the actual policy needs of the relevant bodies."

D. Future Evaluations

CGIAR conducts a quinquennial review of each of the institutes in the CGIAR network. Such an evaluation of IFPRI will no doubt include an examination of the relevance and spread of the subjects IFPRI has chosen for research; the quality and persuasiveness of the resulting studies; the extent to which the recommendations in these studies appear to have been adopted or utilized by governments and international agencies; and the practical results which appear to have ensued. The relevance of evaluation five years from now to the present problem of location is that the choice of a location well-suited to IFPRI's work and the attainment of its objectives will no doubt, five years from now, be reflected in the evaluation of its performance.

E. Earlier Considerations of Location

The question of the location of IFPRI has been earnestly debated ever since the Institute was established in 1975, and even before.

The pertinent arguments are well-known to the persons who will read this report. References include paras 29, 30, 31, 32, 33, and 127 in the Draft Report of the TAC Mission to IFPRI (which took place 9-12 January 1979); para 1(iii) of the Draft TAC Conclusions and Recommendations on the Inclusion of IFPRI in the CGIAR System of TAC's 21st meeting (13-20 February 1979); the Response of the IFPRI Board of Trustees to the TAC Conclusions and Recommendations (the Response is attached to the Conclusions and Recommendations); paras 62-71 of the Informal Summary of Proceedings of the 16th meeting of CGIAR, May 3-4 1979; and para B on the "Main Points from the Summary" of these Proceedings. Differing location criteria advanced by TAC and its panel on IFPRI, and by the IFPRI Board of Trustees as reported in the Draft TAC Conclusions are reproduced in Annex III below.

The CGIAR secreteriat in its observations of July 18, 1979 on the IFPRI proposed 1980 Progran and Budget summarizes the position on the location question as follows:

> "26. Location. TAC recommended that IFPRI move to a developing country in due course. CGIAR members, in discussing the TAC report and the application of IFPRI to join the Group, did not reach a strong consensus in favor of such a move. Instead, the Group asked IFPRI to prepare an analysis of the advantages and disadvantages of moving, including the cost. It would be appropriate for the Group to confirm that any specific proposal to relocate IFPRI should be subject to its prior approval."

III. SOME POSSIBLE LOCATIONS IN THE DEVELOPING WORLD

The terms of reference given to me, as well as the discussions and documents on which they are based, refer only to the developing world, not to any particular location or locations within the developing world. Nine likely cities would appear to me to be, in alphabetical order: Abidjan, Bangkok, Cairo, Manila, Mexico City, Nairobi, New Delhi, Rio de Janeiro, and Singapore. My analysis has consisted of an attempt to compare Washington to each of these nine cities as a possible headquarters for IFPRI. This list is not intended to be definitive; other cities might well be added.

The Report of the Task Force on International Assistance for Strengthening National Agricultural Research, prepared for CGIAR in 1978, also examined, in its Chapter XII, the question of a headquarters location. The Task Force presented in its Annex H a list of profiles of 6 of the 10 cities which I am suggesting for consideration as headquarters for IFPRI: Abidjan, Cairo, Mexico City, New Delhi, Rio de Janeiro, and Washington. (The report also looked at 7 other locations, in addition to Washington, all of which except one are in the industrialized world, and hence outside the scope of my examination.)

In Annex VI below I reproduce the 6 city profiles including Washington, from the ISNAR report, plus the profiles, prepared in the same way, of the four other cities in my list; this material is updated by using latest UN Cost of Living indices, and latest airline schedules.

IV. CRITERIA FOR LOCATION

After studying the documents listed in Annex II and before commencing discussions, I prepared a provisional detailed list of criteria which it seemed to me might govern the choice of a location for IFPRI, provisional weights totaling 100 for these criteria, and provisional location ratings.

The provisional criteria and provisional weights I started with reflected my understanding, at that point based largely on the relevant documentation, of IFPRI's purposes, resources, method of operation, and forseen periodic evaluation. My provisional location ratings were based partly on the six city profiles presented in the ISNAR report; partly on the remaining four profiles prepared in the same manner; and partly on my own experience of working, for longer or shorter periods, in 7 of the 10 cities listed.

In my subsequent discussions with the persons listed in Annex IV I gave each an opportunity to comment on the table in whatever was then its current form. As already indicated, virtually everyone with whom I spoke chose to devote much of the discussion to the provisional criteria, criteria weights, and location ratings in the table. The table underwent considerable changes in the light of these discussions as they progressed.

The table as it finally emerged is given on page 8, as Table I: IFPRI--CRITERIA FOR LOCATION. In addition to many other factors, the table largely incorporates, now with weights, the differing location criteria suggested by TAC and the TAC panel, and by the IFPRI Board of Trustees, reproduced below in Annex III.

I would not claim that any one of the persons with whom discussions were held would give exactly the same appraisal as that represented in every one of the 143 figures which appear in Table I. Nor, perhaps, would any one of the interviewees word every criterion exactly as I now do. But I believe that Table I, as it now stands, fairly represents the approximate appraisal of most of the people with whom I spoke, and especially their appraisal of Washington compared with the other locations.

For the readers of this report most of the material in Table I will be self-explanatory. The comments thus are limited to minimal clarifications and amplifications. These comments in the following sections A through J, refer to similarly headed items and columns in the table.

Table 1 -- IFPRI -- SUGGESTED CRITERIA FOR LOCATION.

(1) CRITERIA	(2) WEIGHT IN 100	(3) ABIDJAN	(4) BANGKOK	(5) CAIRO	(6) MANILA	(7) MEXICO CITY	(8) NAIROBI	(9) NEW DELHI	(10) RIO DE JANEIRO	(11) SINGAPORE	(12) WASHINGTON
A. DATA AVAILABILITY AND RELATED CONSIDERATIONS (including opportunity to review & discuss data sources, compilation, and interpretation; access to libraries, institutes, and universities; opportunity for dialog with leaders in research methodology and conceptual frameworks; availability of highest level computer services; and interaction among all the foregoing)	25	6	10	5	10	7	7	10	7	8	24
B. STAFFING											
1. opportunity to attract and retain international professional staff	20	4	8	3	11	10	11	12	9	10	19
2. availability of local professional staff	5	1	2	3	4	3	2	4	3	4	5
C. OPPORTUNITY FOR DIALOG WITH POLICY MAKERS IN THE DEVELOPING WORLD	5	2	3	1	2	1	2	2	2	2	4
D. OPPORTUNITY FOR DIALOG WITH POLICY ANALYSTS IN INTERNATIONAL AGENCIES INCLUDING CGIAR INSTITUTES	4	1	2	1	2	1	1	1	1	1	3
E. OPPORTUNITY FOR DIALOG WITH DONORS (including dialog concerning impact of donor policies of assistance to agricultural production, consumption, and trade in the developing world)	4	1	2	1	3	1	1	2	1	2	4
F. COMMUNICATIONS AND TRAVEL	6	1	4	2	3	2	3	2	4	4	6
G. EXPOSURE OF STAFF TO REALITIES OF THE DEVELOPING WORLD (including food shortages and hunger)	9	6	6	8	6	6	6	8	5	6	1
H. GEOGRAPHICAL BALANCE WITHIN CGIAR NETWORK	4	4	4	4	2	2	2	2	4	4	2
I. IFPRI INDEPENDENCE AND PERCEPTION OF THIS BY OTHERS (including independence from a host government, donors, and international agencies)	8	6	6	6	6	6	6	6	6	6	3
J. EXPENSE											
1. capital (moving and installation)	2	0	0	0	0	0	0	0	0	0	2
2. operating (including cost of local professional and nonprofessional staff; office rent; international travel; supplies and services)	8	0	8	7	7	6	5	8	4	5	8
TOTAL	100	32	55	41	56	45	46	57	46	52	81

Item A. Column (1): Self-explanatory except possibly for computer services. These are highly important, if not indispensable, in IFPRI's work, and I thus give in Annex VII a statement about them prepared for this report by Miss Patricia Tillman, IFPRI's Coordinator of Statistical Services.
Column (2): The high weight of 25 is assigned to this criterion because of IFPRI's absolute dependence upon accurate, detailed, up-to-date, global agricultural information and the means rigorously to assess this, if IFPR is to carry out the food policy research which is its raison d'etre.

Columns (3),(4),(6),(11): The ratings take into account, but are not solely based upon, the presence of the African Development Bank in Abidjan, ESCAP in Bangkok, the FAO regional offices in Bangkok and Cairo, the Asian Development Bank in Manila, and the excellent computer services in Singapore.
Column (12): Washington is given a location rating of 24 because of the presence in Washington of the World Bank Group, the Inter-American Development Bank, CGIAR, the United States Department of Agriculture, outstanding computer services and libraries, and numerous research organizations such as the Brookings Institution; as well as easy access to many universities.
Item B1) Refers to both professional working environment; and family living environment, including schools.
Item C. The location ratings take into account but are not based solely upon the large number of government officials from developing countries throughout the world who visit Washington, inter alia on World Bank and Inter-American Development Bank business; and similarly, though to a lesser extent, the number of policy makers who visit Bangkok for ESCAP meetings, and Abidjan and Manila for discussions with the regional development banks.
Item D. Column (2). The weighting takes into account, but is not limited to, the view of CGIAR that IFPRI should increase the consideration it gives to the relationship and potential relationship of government policy to the micro-economic aspects of the findings of other CGIAR institutes.
Columns (3) through (10). The ratings take into account the location of the international agencies noted in Item A above, plus IRRI near Manila, CIMMYT near Mexico City, elements of two CGIAR institutes (ILCA and ILRAD) in the outskirts of Nairobi, ICRISAT in India, the FAO North American Regional Office in Washington, and the proximity of Washington to the headquarters in

New York City of the United Nations and many other organizations in the UN family.

Item E. The term "Donors" is meant to convey two functions. One of these, as stated parenthetically in Table 1, is the provision of assistance in agricultural production, consumption, and trade to the developing world; the other is the extension of support to the CGIAR network and to IFPRI.

Item F. Self-explanatory.

Item G. Columns (1) through (12). Much has been said in CGIAR and TAC about the importance of location in an environment where IFPRI staff could be exposed to the realities of the developing world, including food shortages and hunger. The presence of mal-nourished children may indeed be more motivational than cold statistics. A high weight has hence been accorded to this criterion, with high location ratings given to New Delhi and Cairo, and the lowest rating to Washington. Many of the persons interviewed, however, have pointed out, and my own observations confirm, that international officials, and many nationals of developing countires as well, are often quite isolated from the problems surrounding them. This does not in itself mean that such persons do not perform well in their work, but it tends to diminish the force of this criterion.

Item H. This criterion is intended to indicate that just from the point of view of geographical balance, the location of the network of all CGIAR institutes as a whole is perhaps more to be taken into account than the location of any one of them viewed in isolation. The location ratings are hence 4 for countries which do not have a CGIAR institute, and 2 for those having one institute. Washington is rated 2 because of the presence of the CGIAR secretariat.

With CGIAR and IFPRI in Washington, the geographical spread of the network entities is:

Africa	4
Latin America	3
Asia	2
Europe	2
North America	2
Middle East	1
	14

Item I. It is important to recall that the TAC panel found no evidence of interference with IFPRI's independence in its present location. The perception by others of IFPRI's independence is another matter, and surely important. Table I thus rates this criterion rather highly, at 8; and assigns the lowest rating, of 3, to Washington. I should like, however, to quote from an IFPRI senior researcher (and national of a developing country), who rates the locations differently: "Wherever IFPRI is located, I believe that it will be subjected to pressures either expressed or implied. IFPRI's activities cut across food commodities; its location in the developing countries may bring pressures to take on problems of specific commodities and of other problems of national or regional orientation. Thus, despite the seeming perception of IFPRI independence in some quarters at present, I have not given other places much of an edge on points over IFPRI's present location."

Item J.1) Columns (2) through (12). Annex VIII presents an estimate of the cost of moving IFPRI, including the cost of transfering Computer data, away from Washington. To the financial costs would be added the very serious disruption and loss of momentum of IFPRI work. Remaining in Washington would avoid the financial costs and the disruption; thus Washington is given the highest rating on this criterion, and a rating of 0 is assigned everywhere else. Table I assigns (Column (2)) only a very low weight, of 2, to this criterion, because the cost of moving and installation, including the computer costs and work disruption, would be for once only. If all other criteria indicated that great advantages in IFPRI's usefulness would accrue from a move, then such a move, in my view, would be in order.

Item J.2). Columns (3) through (12): Operating Expenses (including Salaries, Office Rent, International Travel, Supplies and Services.)
Annex IX gives estimated operating expenses in Washington as contained in the IFPRI approved budget for 1980; and comparable figures, with a similar manning table, at each of the nine alternative locations.

The estimates are based where applicable on UNDP experience. UNDP is used rather than other CGIAR institutes because, according to Phillip Thorson's 1979 Review of Staff Compensation, institute salaries are not standardized, or known.

UNDP operates offices in all the nine locations considered in this study.

Senior staff salary estimates in Annex IX use present actual IFPRI salaries (on which the recipient pays a US Income Tax), assume that the post would be graded at the same level by UNDP, and then treats the gross UNDP income figure as though it included the International Civil Service Commission post adjustment. Pursuant to this formula an IFPRI senior staff member would receive in Washington the same take-home pay he or she receives now; but if he or she were moved to one of the nine locations under consideration, the salary would be changed to reflect the ICSC post adjustment. The ICSC post adjustment system seeks to make a staff member's real salary the same wherever he is stationed, eliminating increases or decreases in income based upon location.

The Washington approved budget of $2,424,813 compared with estimates for the other locations indicate the following estimated annual differences:

Abidjan:	+ $679,331
Bangkok:	- $546,221
Cairo:	- $350,077
Manila:	- $354,271
Mexico City:	- $261,228
Nairobi:	- $88,982
New Delhi:	- $538,186
Rio de Janeiro:	+ $58,686
Singapore:	- $113,011

Having carried out the foregoing analysis, I asked the CGIAR secretariat if they would care to comment on this, especially the table in Annex IX. Mr. Daniel Ritchie, Deputy Executive Secretary of CGIAR, kindly agreed to let me have his views. Mr. Ritchie, who agreed to be quoted, stated that he finds the table clear; internally consistent; quite acceptable for what it purports to be, namely a cost comparison based mostly upon UNDP equivalents; and a useful ranking of the nine cities outside Washington.

Mr. Ritchie believes, however, in the light of CGIAR experience with the other network institutes, that my figures are too conservative. He feels that an attempt by IFPRI to operate at this cost level in any of the nine cities considered as alternatives to Washington would in practice prove to be difficult if not impossible. He points to three examples of why he believes this:

1. In practice it would be difficult, he believes, to persuade present staff, or most of them, to move from Washington to

other locations where their net income would be less than present salaries, no matter what explanations were advanced concerning the logic of post adjustments. He therefore believes that in practice it would be necessary to pay salaries equal to Washington salaries in the least expensive cities according to the table, and to move upward from this base, not downward from Washington.

2. If IFPRI were to establish an employee benefits package like that in most of the other CGIAR institutes, this would be of the order of 40 percent, rather than the present IFPRI 24 percent benefits package, which is the figure used in Table I. Such a benefits package (40 percent) would include higher and more visible housing allowances than those contained within International Civil Service Commission post adjustments. (Some of the CGIAR institutes have a benefits package of 50 percent.)
3. If IFPRI were to follow the home leave practice of some of the other CGIAR institutes, annual rather than biennial home leave would be provided.

Mr. Ritchie estimates that such increases would mean in practice that operating costs in the cities I find least expensive, Bangkok and New Delhi, would in practice turn out to be at about the Washington level, with the remaining 7 locations proportionately higher.

Columns (3) through (12). The location ratings in the Table are derived from Mr. Ritchie's comments.

K. A Preponderant Majority. Table I indicates a rating for Washington--81--a good deal higher than for anywhere else; with New Delhi (57), Manila (56) and Bangkok (55). This pre-eminence of Washington appeared in all earlier versions of the table, and thus has been considered by virtually all the persons with whom discussions have been held. A very few of the interviewees feel that this is the wrong conclusion, i.e., they believe that IFPRI should be located in a developing country. But a preponderant, very large majority, indicate agreement with this assessment of Washington as best for IFPRI.

L. An Important Excluded Criterion. Host Country Relationship. The analysis has not considered a further criterion, which is very important, and which must be kept in mind; but which would be difficult to deal with here.

This is the host country relationship, including such items as tax status of staff, and possible free provision of an office. But it would have been difficult to explore these with a possible host government, let alone nine of them, in the time available for this study. It may, however, be noted in Annex IX that free office space is provided to UNDP by the governments concerned in Abidjan, Manila, New Delhi, and Singapore. An impressive headquarters has also been built by the government of the Philippines for the Asian Development Bank.

V. VIEWS OF PRESENT IFPRI SENIOR RESEARCH STAFF

No one, I think, would feel that IFPRI should either remain in Washington or move to the developing world in order to please the present senior research staff, and the more so because most of the staff have been engaged on short term contracts of from one to five years. In other words the decision to remain in Washington or move to a developing country surely should be based on wider considerations, of the type set forth in Table I, than those elicited by a staff poll.

It nevertheless has seemed to me that the present senior research staff have a very important contribution to make to the question of IFPRI location. For the senior research staff are the laborers in the vineyard. More, perhaps, than anyone else, they have an understanding of what it means to carry out their type of work, and to live, in Washington.

Moreover since more than half of them are nationals of the developing countries, they have a highly valid basis for comparing research realities in Washington with those elsewhere.

For this reason I arranged to have a staff meeting with the senior research personnel then in Washington, and similar talks with two of the staff who returned several days after the meeting. I was able in this way to seek the views of the entire senior research staff present in Washington during the period of my study: 13 persons, including the Director of Information Services. At my suggestion the Director of IFPRI, Mr. Mellor, was not present at any of this discussion.

At the staff meeting, and following a general discussion in which there was lively participation, I gave to each person two sheets of paper. One contained a criteria table like that on page 9, with provisional criteria weights, but without location ratings. We discussed this at some length, with almost everyone expressing views about the provisional criteria and the provisional weights.

The second sheet of paper was a short questionnaire in which the recipient was invited to state whether, in the event IFPRI were to move from Washington to the developing world, he or she 1) would feel unable to accompany IFPRI, or 2) would be prepared to move anywhere with IFPRI conducive to the effective pursuit of his work, or 3) would be prepared to move but would prefer some named location or locations, or 4) would be prepared to move but only to some named location or locations.

The staff members were invited to take these two papers away with them, think about them, and get them back to me two days later completed to express their views, including 1) amendment of or addition to or elimination of any of the criteria, 2) alteration of the criteria weights, and 3) their ratings of cities familiar to them in the list of possible locations.

Of the 13 persons concerned, 11 replied. Of these 11, 8 are nationals of developing countries, 3 are nationals of industrialized countries.

The staff comments and suggestions concerning criteria and weights have been merged with the results of other interviews, with which they generally tend to agree, and are reflected in Table I as it now appears on page 8.

I found the staff answers to be very significant, and worth separate comment, for two reasons:

First, with only one exception (because of children's education), no one said that if IFPRI moved from Washington, he or she would be unwilling to accompany it. A few noted that the question was somewhat irrelevant because of the short remaining duration of their contracts; a small number of the others expressed a preference among possible locations; and a still smaller number limited their willingness to move to one or several of the alternative listed locations. But the fact with but a single exception, no one indicated an unwillingness to leave Washington seems to me to enhance the objectivity and hence the value of their ratings of Washington in relation to other possible locations.

And this leads me to what strikes me as the second point of major significance in the senior research staff replies, which is that every single one of them rates Washington, usually by a very wide margin, as a better place to carry out IFPRI's type of work than any of the 9 alternative locations listed.

VI. RECOMMENDATION

On the basis of the analysis herein presented, and in the light of views of the preponderant majority of the 40 persons with whom I have spoken, I recommend that IFPRI headquarters be retained in Washington.

C Hart Schaaf

C. Hart Schaaf
Consultant

Washington, D.C., USA
7 September 1979

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036 U.S.A.
(202) 862-5600
Cable: IFPRI

August 7, 1979

Mr. C. Hart Schaaf
3525 Twin Branches Drive
Silver Spring, Md 20906 USA

Dear Mr. Schaaf:

IFPRI Location Study

Confirming our discussion of this morning, your terms of reference in preparing the above study will be to examine and weigh the advantages and disadvantages, the costs and benefits, and the consequences which according to your findings might accrue to IFPRI were the organization to move from Washington to some location in the developing world.

In your study you will wish to examine the nature of the work of IFPRI and CGIAR, by studying the relevant documents, and by pursuing any other avenue of enquiry you believe may be useful. In particular you will wish to consider the discussions which have taken place on earlier occasions concerning the location of IFPRI, culminating in the statement of the Chairman of CGIAR at its May 3-4 1979 meeting (para 71 of the Informal Summary of Proceedings) wherein the Chairman noted his feeling that IFPRI should be asked "to prepare a study in some detail of the location question including cost of any such transfer.."

From our discussion I am fully aware of your other continuing commitments during these coming weeks. But you appreciate our requirement that the report be completed quickly, to be available for the meeting of the IFPRI Board of Trustees scheduled for Friday September 21. To enable us to distribute your statement to the Board for advance reading by them, we will hope to have it from you, preferably by Friday August 31, and at the latest by Friday September 7, in a form ready for final typing.

During your study the IFPRI staff, and especially Miss Mary Patricia Rafferty, will be happy to help you in any way they can, including assembling documents and information, arranging appointments, and assisting in the preparation of cost estimates.

Annex I, Continued

August 7, 1979

Mr. C. Hart Schaaf
Silver Spring, Md 20906

Good luck in your coming endeavor. We await with keenest interest the report and recommendations which you, with your long and varied international experience, and your fresh and independent approach to IFPRI's location problem, will be submitting to us.

Sincerely yours,

John W. Mellor

ANNEX II: DOCUMENTS EXAMINED

1. CGIAR Background Documents

CGIAR: Consultative Group on International Agricultural Research (1976, printed, 67 pp)

CGIAR Secreteriat: The Consultative Group and the International Research System - An Integrative Report (29 July 1977, mimeo, 34 pp plus annexes)

CGIAR Secreteriat: Same title (19 September 1978, mimeo, 31 pp)

CGIAR: Report of the Task Force on International Assistance for Strengthening National Agricultural Research (August 1978, mimeo, 40 pp and annexes)

CGIAR: List of Participants in Centers Week, November 6-10, 1978 (mimeo, 9 pp)

Phillip Thorson: Review of Staff Compensation in the International Agricultural Research Centers (June 1979, mimeo, 22 pp and annexes)

CGIAR Secreteriat: The Consultative Group on International Agricultural Research (1 August 1979, mimeo, 9 pp including annexes)

2. CGIAR and TAC Documents Concerning IFPRI, including Location

CGIAR Technical Advisory Committee: Draft TAC Conclusions and Recommendations on the Inclusion of the International Food Policy Research Institute (IFPRI) in the CGIAR System, including Draft Report of the TAC Mission to IFPRI (of 9-12 January 1979) (March 1979, mimeo, 3 pp plus 31 pp Report of TAC Mission to IFPRI plus annexes)

CGIAR: Consultative Group Meeting, 3-4 May 1979, Paris, Informal Summary of Proceedings (30 July 1979, mimeo, 27 pp plus 5 pp on Main Points, and annexes)

CGIAR: Draft Secreteriat Observations on IFPRI 1980 Program and Budget (18 July 1979, mimeo, 10 pp)

3. IFPRI Background Documents, Some of Which Contain Reference to Location

IFPRI: Report 1976-1978 (printed, 40 pp)

IFPRI: Research Highlights 1978 (printed, 8 pp)

IFPRI Board of Trustees: Response to the CGIAR TAC Conclusions and and Recommendations on the Inclusion of IFPRI in the CGIAR System (March 1979, included in the TAC Conclusions and Recommendations listed above, mimeo, 2 pp)

John W. Mellor: The International Food Policy Research Institute - Purpose, Program and Approach (Draft) (7 August 1979, mimeo, 15 pp)

4. IFPRI Research Reports, Occasional Papers and Other Publications

ANNEX III: DIFFERING LOCATION CRITERIA EARLIER SUGGESTED BY TAC AND PANEL ON IFPRI, AND BY THE IFPRI BOARD OF TRUSTEES

TAC AND TAC PANEL (para (1)(iii) in DRAFT TAC CONCLUSIONS AND RECOMMENDATIONS ON THE INCLUSION OF THE INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE (IFPRI) IN THE CGIAR SYSTEM (AGD/TAC:IAR/79/13 RESTRICTED March 1979):

TAC also discussed the question of the location of IFPRI Headquarters. The panel had recommended that IFPRI give serious attention to the need to move the site of the Institute to a developing country for four main reasons. The first one was that an LDC environment was considered more appropriate for a research staff working on the problems of food shortage and hunger. The second reason was the need for IFPRI not to be considered as having a privileged status in the CGIAR System because of its present location. The third point in favour of a location in an LDC was to protect the Institute from undue influences of donors and to avoid that its work be perceived by others as being subject to these influences. The need for the Institute to avoid being used as a policy advisory body of international institutions, such as the CGIAR and the World Bank, was seen by the panel as the fourth reason justifying a location in a developing country.

IFPRI BOARD OF TRUSTEES (Response of IFPRI Board of Trustees to TAC CONCLUSIONS AND RECOMMENDATIONS, attached at end of AGD/TAC:TAR/79/13 cited in preceding para):

The Board has considered carefully the TAC's recommendation that the headquarters of the Institute be moved to a developing country and the reasons advanced for this.

If the Consultative Group accepts the necessity of desirability of such a move, the Board is willing to transfer the headquarters of the Institute to a developing country.

The criteria that were paramount in the original decision to locate the headquarters in Washington were as follows:

(1) Excellent access to the wide range of data essential for policy analysis.

(2) The need to be able to attract high quality international staff, most of them drawn from developing countries.

(3) The need for excellent international communications, since IFPRI's research must deal with policy issues all over the world, and is not confined to the problems of a host country or even of the region where the host country might be located.

(4) The need for a strong resource base for an institute of IFPRI's character and mandate, including operational facilities (library, computer, secretarial services, etc.), office and housing facilities, and legal framework.

In the Board's opinion these criteria led to a wise choice in the Institute's initial location in Washington. The Board believes these criteria would be appropriate for use in a search for a new headquarters. At the same time, the Board would welcome suggestions from the Consultative Group for any desired modifications of these criteria.

Following a decision by the Consultative Group, the Board would be prepared to move expeditiously toward the selection of a new headquarters and the transfer of IFPRI's operations. The Board calls the Group's attention to the many practical issues which would necessarily be confronted and we would not wish to be bound to a short, predetermined time schedule.

ANNEX IV: PERSONS WITH WHOM DISCUSSIONS WERE HELD

Ojetunji Aboyade (Nigeria)
Vice Chancellor, University of Ife, Ife, Nigeria; Member, IFPRI Board of Trustees

Raisuddin Ahmed (Bangladesh)
Research Fellow, IFPRI; Chief of Agricultural Section in Bangladesh Planning Commission

Randolph Barker (USA)
Professor, Department of Agricultural Economics, Cornell University; Member of TAC Mission to IFPRI; former Head, Agricultural Economics Department, International Rice Research Institute

Nicolas Ardito Barletta (Panama)
Regional Vice President, Latin America and the Caribbean, the World Bank; and Member, IFPRI Board of Trustees

I.P.M. Cargill (UK)
Senior Vice President, World Bank

John K. Coulter (UK)
Scientific Adviser, CGIAR

Ralph Kirby Davidson (USA)
Deputy Director, Social Sciences Division, Rockefeller Foundation; and Vice Chairman, IFPRI Board of Trustees

Gunvant Desai (India)
Research Fellow, IFPRI

Graham Donaldson (Australia)
Chief, Economic Division, Agriculture and Rural Development Department, World Bank

Jorge Garcia (Colombia)
Consultant, IFPRI

James Gavan (UK)
Program Director, Distribution, IFPRI

Harold Graves (USA)
Consultant; formerly Executive Secretary, CGIAR

Lowell Hardin (USA)
Program Officer, Office of the Vice President, International Division, Ford Foundation

Dale E. Hathaway (USA)
Undersecretary for International Affairs and Commodity Programs, US Department of Agriculture; and first Director, IFPRI

Ivan Head (Canada)
President, International Development Research Centre; Member, Board of Trustees, IFPRI

David Hopper (Canada)
Regional Vice President, South Asia, World Bank

Barbara Huddleston (USA)
Research Fellow, IFPRI

Donald Kimmel (USA)
North American Representative, FAO

Robin Kinloch (UK)
Senior Project Officer, Division for Global and International Projects, UNDP

Nathan Koffsky (USA)
Consultant; formerly Interim Director, IFPRI

William T. Mashler (USA)
Senior Director, Division for Global and International Projects, UNDP

John McIntire (USA)
Consultant, IFPRI

Charles McVicker (USA)
Director of Communications, IFPRI

John W. Mellor (USA)
Director, IFPRI

Daniel Morrow (USA)
Fellowship Recipient, IFPRI

Dharm Narain (India)
Program Director, Production, IFPRI

C.V. Narasimhan (India)
Organizing Executive Secretary, Cotton Development International, UNDP; formerly Chef de Cabinet and Undersecretary General, United Nations; and formerly Deputy Administrator, UNDP

Jesus Ocampo (Phillippines)
Administrative Officer for Rates and Allowances, Personnel Division, UNDP

Peter A. Oram (UK)
Deputy Director, IFPRI

Leonardo Paulino (Philippines)
Program Director, Trends, and Statistics, IFPRI

Mary Patricia Rafferty (USA)
Director for Administration, IFPRI

Daniel Ritchie (USA)
Deputy Executive Secretary, CGIAR

J.S. Sarma (India)
Consultant, IFPRI

Samar Ranjan Sen (India)
Retired; President of International Association of Agricultural Economists (1970-76); Ambassador and Executive Director, World Bank (1970-78); Member, FAO Council (1966-70); Chairman, ECAFE (now ESCAP) Committee on Agricultural Planning (1962-64)

Ammar Siamwalla (Thailand)
Research Fellow, IFPRI; and former Lecturer in Economics, Thammasat University, Bangkok

Patricia Tillman (USA)
Coordinator of Statistical Services, IFPRI

Alberto Valdes (Chile)
Program Director, Trade, IFPRI

Toby Wagley (USA)
Program Administrator, Institute for International Education

Montague Yudelman (USA)
Director, Agriculture and Rural Development Department, World Bank

Ruth Zagorin (USA)
Associate Director, Office of International Cooperation and Development, USDA; former Member, IFPRI Board of Trustees

ANNEX V: CONSULTANT'S BACKGROUND

Biographical Data on C. Hart Schaaf

Of 31 years as a UN staff member, 25 years were spent in developing countries, mostly in Asia but with three years also in the Middle East. A recent brief UNDP consultancy in Nigeria, not listed below, afforded an introduction also to Africa.

Who's Who in the World (similar material in Who's Who in America):

SCHAAF, C(ARL) HART, ret. UN ofcl., cons.; b. Ft. Wayne Ind., January 14, 1912; s. Albert H. and Bertha May (Hart) S.; student U. Montpellier (France), 1930-31, U. Stockholm (Sweden), 1937-39; B.A., U. Mich., 1935, Ph.D., (Horace H. Rackham fellow), 1940; m. Barbara Joan Crook, Nov. 22, 1945; children-Albert H., Timothy H. Instr. polit. sci. Coll. City N.Y., summer 1940; asso. prof. pub. administrn., Richmond div. Coll. William and Mary, 1940-42; state rationing adminstr. for VA., U.S. OPA, 1942-43; asst. dep. dir. gen., also chief supply for Europe UNRRA, 1944-47; asso. prof. adminstrn. Sch. Bus. and Pub. Adminstrn. Cornell U., 1947-49; dep. exec. sec. UN Econ Commn. for Asia and Far East, 1949-54; mem. UN Tech. Assistance Bd. Survey Mission to Indonesia, 1950; spl. adviser to UN sec. gen. on relief and support civilian population Korea, 1950-51; resident rep. in Israel UN Tech Assistance Bd., 1954-57, resident rep. in Phillippines, 1957-1959; co-chmn. Seminar on Devel. and Adminstrn. Internat. River Basin U. B.C., 1961; exec. agt. Com. Coordination Investigations Lower Mekong Basin UN Econ. Commn. for Asia and Far East, Bangkok, Thailand, 1959-69; mem. Mekong Comm. Adv. Bd., 1969-72; resident rep. UN Devel. Program, Sri Lanka and Republic of Maldives. 1969-74; dep. exec. dir. UN Fund for Population Activities, 1974-77. Recipient (with Mekong Com.), Ramon Magsaysay award for internat. understanding, 1966, Outstanding achievement award U. Mich., 1966. Mem Am. Polit. Sci. Assn., Soc. Internat. Devel. Author: (play) Partition, 1948; (with Russell H. Fifield) The Lower Mekong: Challenge to Cooperation in Southeast Asia, 1963. Contbr. articles to tech. and acad. jours. Home: 3525 Twin Branches Dr., Silver Spring, MD 20906

ANNEX VI: PROFILES OF TEN CITIES
(Uses Latest Airline Schedules and UN Cost of Living Indices)

ABIDJAN

Population: 800,000.

Per capita product (national): $540.

Cost-of-living index: 120.

Telecommunications: Telephone instruments are scarce and local communications are fair to poor. International service, through Paris, is good.

International travel: Air connections to destinations in sub-Saharan Africa are plentiful. Direct flights to other regions are scarce: 35 a week to Europe, 3 to North Africa and the Near East, 3 to North America, none to Asia, Australia, South and Central America. Destinations in Asia, Australia and the Western Hemisphere are reached through Paris.

Climate: Hot and rainy. The average high temperature is 32 C (88 F), the average low temperature 24 C (74 F) or higher during five months of the year. Annual rainfall is about 200 cm (80 in), of which more than half occurs in May, June and July.

Health conditions: Poor. Malaria, typhoid, yellow fever and amebiasis are risks; upper respiratory infections are common. Insect pests are numerous. Drinking water must be boiled and filtered.

Medical care: Good doctors and dentists are available.

Schools: Good. Teaching in French and in English is available through Grade 12.

Housing: Scarce and expensive.

Goods and services: Fair. Food is good in quality and variety. General household supplies are available. Household equipment, toiletries and sundries are imported and expensive. Laundry, dry cleaning and shoe repair are satisfactory.

Local Staff availability: Fair in French, poor in English.

Recreational and cultural opportunities: Good.

Special factor: Abidjan is the site of the national university of the Ivory Coast; it has an agricultural faculty and conducts agricultural research in the vicinity.

BANGKOK

Population: 4.5 million.

Per capita GNP: $380 (Thailand).

Cost-of-living index: 78.

Telecommunications: Demand for phone service in Bangkok is growing faster than the telephone company can provide facilities. International service is good with 24-hour service available. Telegrams and cables can be sent from any post office and from most hotels.

International air travel: Excellent direct flights to Asia, India, Europe, North America and the Near East. There are no direct flights to Central and South America and service to Africa is nearly non-existant.

Climate: Warm and humid. The climate is monsoonal, marked by a pronounced rainy season lasting from July through November. November through February is cooler and drier. During this season, the temperature range is from the mid-60's to the mid-80's. March through June is hot and humid with the temperatures often reaching 100 F.

Health conditions: Prickly heat, fungal infections, colds and other respiratory infections are common as well as intestinal disorders. Water must be boiled before drinking and milk products are the sources of many infectuous diseases. Medical care is good.

Schools: Good. The International School of Bangkok provides English language schooling based on the American educational system through grade 12.

Housing: Good. There are many new modern apartment buildings. Individual houses are, however, usually older and require a considerable amount of upkeep.

Goods and services: Good sold in local markets is not usually refridgerated and there is no guarantee of its cleanliness or quality. Toiliteries and cosmetics purchased locally are very expensive. Tailors and shoe repairs are readily available.

Local staff availability: Good.

Recreational and cultural opportunities: Good.

CAIRO

Population: 8.5 million.

Per capita GNP: $260.

Cost of living index: 94

Telecommunications: Poor.

International travel: Air connections to Europe are plentiful (more than 150 direct flights a week); and there are direct flights to sub-Saharan Africa (about 40 a week), Asia (about 30) and North America (about 20). Latin America and Australia must be reached through connections in other cities.

Climate: Hot and extremely dry. During five months of the year, the average daily high temperature is 32 C (90 F) or more; and the average daily high temperature throughout the year is 28 C (82 F), the low temperature 16 C (60 F). Less than five days a year have any rainfall.

Health conditions: Poor. Intestinal, respiratory and fungal infections, hepatitis and fevers of unexplained origin are endemic. Constant dust is a hazard. Drinking water must be boiled; milk and milk products are considered unsafe. Good dcotors are available, and simple dental work can be done.

Schools: Good. Teaching in French, German and English is available through the 12th grade. There is an American University in Cairo.

Housing: Scarce and expensive.

Local staff availability: Good.

Recreational and cultural opportunities: Good.

Special factor: There is a university faculty of agriculture and an experiment station in the vicinity of Cairo.

MANILA

Population: 1,438,252

Per Capita GNP: $420 (*this is for the Philippines)

Cost-of-living index: 94.

Telecommunications: Good on balance -- local service is available, but far from reliable while long distance (international) service is excellent.

International Air travel: Direct flights to Europe, Middle East Asia, North Africa, North America and India. There are no direct flights to sub-Saharan Africa, Latin America or South America although connections do exist to these points.

Climate: Hot and humid. There are 3 seasons: the hot, dry season from March through May; the rainy season from June through November during which rain can be expected nearly every day; and the cool, dry season from November through February. Manila has an annual mean temperature of 80 F, with the average monthly maximum temperature ranging from 86 F to 93 F. The monthly minimum temperature ranges from 69 F to 76 F. Typhoons are common during the rainy season.

Health conditions: Fair. Fungus and ear infections, mainly due to swimming are common in the hot, humid climate. There is also the inevitable increase in the number of respiratory diseases as the rainy season closes and cooler weather begins. The health facilities in Manila are considered average. Occassional gastrointestinal upsets and colds seem to be almost unavoidable. While the city of Manila is maleria free, there is maleria in some of the rural underdeveloped areas. Drinking water must be boiled before drinking and local produce should be eaten only after peeling, scrubbing or cooking.

Schools: Good. The scope of private education is impressive and a high priority has been placed on education by the government. Schooling in English is available through the 12th grade and there has been established an American junior college in Manila.

Goods and services: For the most part, good.

Local staff availability: Good.

Recreational and cultural opportunities: Good.

Special factors: The International Rice Research Institute, which conducts research on rice and attracts scholars from throughout the world, is located in Los Banos.

MEXICO CITY

Population: 8.5 million.

Per Capita GNP: $1,050.

Cost-of-living index: 79.

Telecommunications: Good.

International travel: Mexico City has plentiful connections to major destinations throughout the Western Hemisphere, poor connections to other regions. There are about 20 direct flights a week to Europe, three to Asia, one to North Africa and the Near East, none to sub-Saharan Africa or Australia.

Climate: Moderate temperatures, and quite wet. Average daily high temperatures range from 19 C (66 F) to 26 C (78 F), lows from 6 C (42 F) to 12 C (54 F). About 170 days a year have some rain; from June to October there are two or three hours of rain virtually every day.

Health conditions: Fair to poor. Tap water must be boiled before drinking. Intestinal infections are a hazard, respiratory infections are frequent. The combined effects of Mexico City's high altitude (2300 meters, 7500 feet) and severe air pollution present a special risk to persons with a tendancy to respiratory illnesses. Medical facilities are good.

Schools: Good. There are international schools teaching in French, German and English through 12th grade.

Housing: Poor. Housing is in extremely short supply; apartments often need to be re-equipped.

Goods and services: Fair. Food is in good supply at reasonable prices. There are water shortages; electric supply is uncertain during some seasons.

Local staff availability: Good.

Recreational and cultural opportunities: Good.

Special factor: The national agricultural university, at Chapingo, and CIMMYT, at El Batan, are within 30 miles or so of Mexico City.

NAIROBI

Population: 800,000.

Per capita GNP: $250 (*This is for Kenya).

Cost-of-living index: 99.

Telecommunications: Nairobi telephone service is adequate. Excellent service is available via satellite to the United States. Telepgraphic service to all parts of the world is fair.

International air travel: Nairobi is an international air center. There are frequent flights to any place in the world. Excellent air connections within Africa as well as to Europe and North America. Somewhat limited direct flights elsewhere.

Climate: Nairobi has four distinct seasons, but the overall temperature changes are moderate:

mid-December-March: mainly sunny and warm by day and cool at night. Generally dry.

April and May: the main rainy season with lower daytime temperatures.

June-September: mainly dry, but often cloudy and cool. Very cool nights.

October-November: short rainy season. Long sunny periods with warm days and cool nights.

The average temperature range is 51 F to 79 F year-round. The average rainfall is about 34 inches, although it varies widely from year to year.

Health conditions: The pleasant climate and modern public health facilities within the city reduce the risk of contracting the tropical diseases which are commonly found elsewhere in Africa. The boiling of drinking water and elaborate cleansing of fresh vegetables is not necessary within Nairobi. Local hospitals are acceptable for the treatment and diagnosis of most illnesses. There are some limitations in providing complete medical care. Most medications and drugs are available.

Housing: Good. Nairobi is noted for its residential areas of beautiful housing and gardens. Houses and apartments have standard amenities.

Goods and services: All basic services are available. Some goods are more expensive than in the United States and others are less expensive.

Local staff availability: Good.

Schools: The Kenyan education system follows the British curriculum. The standard American curriculum is offered by the International School of Kenya through the 12th grade.

Recreational and cultural opportunities: Good. Nairobi offers a good range of cultural institutions and activities.

NEW DELHI

Population: 4 million (with Delhi).

Per capita GNP: $140

Cost-of-living index: 82.

International air travel: There are moderately good air connections from Delhi to other cities of Asia, to Europe (about 60 direct flights a week) and to North Africa and the Near East (about 25 flights). There are only 12 direct flights a week to North America, two to sub-Saharan Africa, and none to Latin America and Australia.

Climate: Hot and dry. The average daily high temperature throughout the year is 32 C (89 F); during seven months of the year, the daily high temperature is over 32 C (90 F), and during two of these the average high is more than 38 C (100 F). Average daily low temperatures during the year is 18 C (65 F). Rain falls on only about 35 days a year.

Health conditions: Poor. Intestinal disorders are common, and malaria is endemic. Hepatitis, typhoid and other water-borne diseases are common. Tap water must be boiled before drinking. Good doctors are available in New Delhi. Dental care is less good, hospital facilities are poor, and drugs are of uncertain quality, since adulteration is common.

Schools: Fair. International schools are available through the eighth grade; schools offering teaching through the 12th grade exist within easy travel.

Housing: Fair. Household equipment is scarce and expensive.

Goods and services: Poor. Food is plentiful and inexpensive. Household goods are in short supply. Water pressire is low, and electric voltage fluctuates, causing problems with automatic equipment.

Local staff availability: Good.

Recreational and cultural opportunities: Fair.

Special factor: The graduate school of agriculture administered by the Agricultural Research Council is in greater New Delhi and engages in agricultural research there.

RIO DE JANEIRO

Population: 5.5 million.

Per capita GNP: $1,030.

Cost-of-living index: 105.

Telecommunications: Fair. Telephones are scarce and service is mediocre. International and domestic telegraph service is good.

International air travel: Frequent direct flights connect Rio to destinations in Europe (about 80) and North America (about 50), but service to other regions is poor or non-existant: there are about 15 direct flights a week to sub-Saharan Africa, only three to Asia and none to North Africa and the Near East.

Climate: Temperate and pleasant. The annual average of daily high temperatures is 23 C (73 F), of lows 21 C (69 F); four months a year (December through April) have average daily highs between 27 C (80 F) and 29 C (85 F). Rain falls on about 125 days a year.

Health conditions: Fair. All water for consumption must be boiled. Parasitic intestinal infections and viral hepatitis are risks. Hospital and medical facilities are satisfactory. Medical and dental care are good; pharmaceutical drugs are in good supply.

Housing: Fair to poor. Few detached houses are available; moderately priced apartments are in poor locations.

Goods and services: Good. Food and consumer goods are plentiful.

Local staff availability: Fair.

Recreational and cultural opportunities: Good.

Special factor: There are a university agricultural faculty and an experiment station in the vicinity of Rio.

SINGAPORE

Population: 2.3 million.

Per Capita GNP: $2,580.

Cost-of-living index: 99.

Telecommunications: Telephones work better than in any other major Southeast Asian city. Only short waits for installation of new phones. International connections are usually excellent and rates relatively inexpensive. Plans are being completed in the near future for direct dialing to the United States. Commercial telegram service is available and reliable.

International air travel: Singapore is a hub of air and sea transport. It is served by over 29 airlines with good direct flights to U.S., Asia and Europe.

Climate: Seasons in Singapore are nonexistant. The mean high temperature is 82 F and the mean low is 77 F. The humidity level is high (it averages 70%) and the annual rainfall is 96 inches.

Health conditions: The tropical climate seems to foster diseases; germs and viruses thrive here. But malaria is not a problem. Singapore is probably one of the cleanest cities in Asia. Water is potable and is in good supply. Locally purchase food causes no ill effects.

Medical care: Facilities in Singapore are adequate for most health problems. Competent specialists in almost every field can be found in the city and excellent dental care is also available.

Schools: Singapore has 2 universities, both of which teach in the English language. The Singapore American School provides schooling through the 12th grade. Teaching is also available in Chinese and French.

Housing: Good, although more and more detached houses are being condemned and the property being rezoned to allow the construction of multistory apartment houses. Therefore, this type of housing is becoming scarce.

Goods and services: Good. Almost anything is available in Singapore. Toiletries and costmetics are available, but more expensive than in the U.S.. There is someone somewhere in Singapore who can fix almost anything. Craftsmanship is at a much higher level and at a much lower cost than in the U.S..

Local staff availability: Good.

Recreational and cultural opportunities: Good. Singapore arts are as varied as its cultural heritage. Sports opportunities are also readily available.

Special factor: Singapore Science Center is devoted to the promotion of interest in science and offers exhibitions, research facilities and public lectures as well as a venue for science and other conferences. Singapore is a member of the Association of Southeast Asian Nations (ASEAN).

WASHINGTON

Population: 3.1 million (metropolitan area).

Per capita GNP: $7,120.

Cost-of-living index: 94.

Telecommunications: Good.

International air travel: Washington has many direct flights to destinations throughout America and is well connected to Europe (more than 70 direct flights a week) and Latin America (about 35 flights), but direct connections are poor or lacking to sub-Saharan Africa (no direct flights, Asia (14 direct flights) and Australia (no direct flights).

Climate: Hot and humid summers, cold winters. Average daily high temperature in the summer months (June-August) are around 30 C (86 F), and temperatures in the winter months (December-February) are below freezing. Rain or snow falls on about 125 days a year.

Health conditions: Good.

Schools: Good. Instruction in major European languages is available through 12th grade, and middle schools are well equipped to prepare students for entrance to superior American and European universities.

Housing: Good. Houses and apartments are in good supply, and the housing market is well organized.

Goods and services: Good.

Local staff availability: Good.

Recreational and cultural opportunities: Good.

Special factors: Proximity to the headquarters of the World Bank Group and of the Inter-American Development Bank, the Secretariat of the CGIAR, the U.S. Department of Agriculture, and the Brookings Institution.

The University of Maryland, with a large agricultural facility, and the big U.S. agricultural experiment station at Beltsville, Maryland are both on the outskirts of Washington.

ANNEX VI, continued

CITY	U.N. COST OF LIVING INDEX	WEEKLY DIRECT INT'L FLIGHTS	TELE-COMMUNICATIONS	HEALTH CONDITIONS	SCHOOLS	HOUSING	GOODS & SERVICES	LOCAL GEN. SERV. STAFF	RECREATION
ABIDJAN	120	40	Fair	Poor	Good	Poor	Fair	Fair	Good
BANGKOK	78	80	Fair	Poor	Good	Good	Fair	Good	Good
CAIRO	94	245	Poor	Poor	Good	Poor	Poor	Good	Good
MANILA	94	120	Good	Fair	Good	Good	Good	Good	Good
MEXICO CITY	79	75	Good	Fair	Good	Poor	Fair	Good	Good
NAIROBI	99	100	Fair	Good	Good	Good	Good	Good	Good
NEW DELHI	82	100	Poor	Poor	Poor	Fair	Poor	Good	Fair
SINGAPORE	99	175	Good	Good	Good	Good	Good	Good	Good
RIO DE JANEIRO	105	150	Fair	Fair	Good	Fair	Good	Fair	Good
WASHINGTON	94	130	Good	Good	Good	Good	Good	Good	Good

ANNEX VII: COMPUTER SERVICES

By Patricia Tillman
Coordinator of Statistical Services, IFPRI

The vast majority of research papers produced at IFPRI have made use of either computer-produced reports on agricultural data or statistical packages and computer models to obtain the needed research results. Because IFPRI has been able to build its own computerized data and program library as well as using the standard statistical packages common to many computer installations, the research work at IFPRI is somewhat dependent upon access to proper computing facilities. The availability, in either computerized or non-computerized form, of data from many different sources, worldwide, is not so much a problem in relocating IFPRI as is the availability of a high level of facilities of prepare and manipulate the data.

IFPRI presently makes use, on a time-sharing basis, of a DEC-10 system at the Brookings Institution. It consists of a PDP-10 central processing unit, 3 magnetic tape drives, 4 disk drives, 2 line printers, a remote hook-up modem, a card puncher and reader and a plotter. IFPRI leases its own remote job entry terminals. The system, in fiscal year 1978/79, was used on an average of 150.3 hours per month, for an average of 15.3 jobs per working day. These figures reflect both the interactive nature and the ready accessibility which characterize IFPRI research work vis a vis computer usage, and a preliminary study was therefore undertaken to determine the possibility of access to facilities of the same sort should IFPRI relocate.

The principle effects which relocating the Institute might have on the computer side of research work would probably be to increase the amount of time a job would take and to limit, in some cases, the kind of work which could be done should a different system have to be used. The survey was only designed to give a basic idea of which kinds of equipment and programs were available in each of the nine cities and is, by no means, a completely comprehensive report. It does, however, give some indication as to the relative ease with which IFPRI could continue to do the same kind of work in each of the cities chosen.

It will be noted that the overall ratings (final column) indicate that computer facilities are distinctly better in Washington than in the other 9 cities under consideration. Washington, rated at 99, is followed by Rio de Janeiro at 89.5, Singapore at 60.8, and the other locations follow this.

City	Computer[a.] Availability Factor	Service Factor [b.]	Access Rating [c.]	Cost Factor [d.]	Total [e.] (Basis of 100)
Abidjan	12	4	4	7.8	14
Bangkok	16	2	2	12.0	16
Cairo	9	2	3	10.0	12
Manila	23	6	6	10.0	22.5
Mexico City	61	12	14	11.9	49.5
Nairobi	9	2	2	9.5	11.3
New Dehli	45	8	9	11.5	36.8
Rio de Janeiro	134	18	18	8.9	89.5
Singapore	77	18	17	9.5	60.8
Washington, D.C.	150	20	18	10.0	99

a. Computer availability factor- sums of the numbers and kinds of computers times a weight for the types of installations already in the city: DEC= 5 IBM= 3 UNIVAC= 2; Service Bureau= 3 Research Institute or University= 2 Government= 1.

b. Service factor- 2 points for each field service office or branch office in the area.

c. Access rating- Sums of points for types of facilities ranked as to their willingness to sell time and ability to provide computing services.

d. Cost factor- Cost of living factor applied to probable rates in the area with Washington, D.C. as base.

e. Sum of columns a,b,c,d/2.

*Sources of information: Conversations with appropriate personnel at Digital Equipment Corporation, IBM, and Univac, as well as consultants at the Brookings Institution, and Mr. George Sadowski, Technical Advisor in Computer Methods for Developing Countries at the United Nations in New York.

ANNEX VIII: ESTIMATED COSTS OF MOVING FROM WASHINGTON, INCLUDING COMPUTER DATA TRANSFER

Four items concern the cost elements which would be involved in moving the Institute from its current location in Washington.

1. Cost of physical move (office and staff) (See Table II on page 41.)

2. Cost of installation. No estimate is given, as the funds required would vary greatly according to a host country's contribution or lack of contribution.

3. Cost of computer conversion. The computer currently used by IFPRI is a DEC-10 located at Brookings Institute. In order to move IFPRI to another location, it would be necessary to convert current programs, even where a DEC-10 computer is available (this is due to the nature of the programs and the existance of certain software packages). For maximum control over the conversion process, Washington would be the most likely location for the conversion. A DEC-10 computer (most compatable) is available in Mexico City, New Delhi, Rio de Janeiro and Singapore. IBM computers (next compatable) are located in Abidjan, Bangkok, Cairo, Manila and Nairobi. It has been estimated that it would take one person approximately 3 months (full-time) to convert to another DEC computer and approximately 6 months (full time) to an IBM. The cost would be as follows (estimate):

DEC -- $ 9,500 to $12,000

IBM -- $16,500 to $19,500

4. Severance arragements. It is the current policy of IFPRI to pay the following when an employee is terminated (pay may be substituted for notice when it is in the best interests of the Institute):

i) Professional staff recruited from outside the U.S. -- 2 months.

ii) Professional staff recruited from within the U.S. -- 1 month.

iii) Non-professional staff -- 2 weeks.

While this is the current policy, it should be noted that it would depend upon the Board of Trustees to determine what procedures would be followed in the case that the Institute were to move from Washington.

TABLE II. ESTIMATED COST OF PHYSICAL MOVE: STAFF AND OFFICE[1]

CITY	LOW (30 PERSONS)[2]	HIGH (45 PERSONS)[2]
ABIDJAN	$501,910	$715,615
BANGKOK	$575,410	$820,465
CAIRO	$634,500	$903,750
MANILA	$470,600	$670,400
MEXICO CITY	$286,500	$408,750
NAIROBI	$701,900	$1,000,850
NEW DELHI	$630,110	$897,365
RIO DE JANEIRO	$491,760	$701,565
SINGAPORE	$362,900	$514,850

[1] Cost figures submitted as rough estimates by Security Storage of Washington. These are estimates of the physical move based on staff configurations indicated with an average of 7,000 lbs. per person and a total of 40,000 lbs. for IFPRI office contents. Figures also include cost to move 1 car per person and 4 cars for IFPRI use.

[2] These figures represent a range of possible costs involved in a move. It is impossssible at this time to ascertain with any amount of certainty exactly which IFPRI employees would be moved, therefore a range is presented.

ANNEX IX: ESTIMATED OPERATING COSTS OF IFPRI IN WASHINGTON AND 9 OTHER CITIES

	ABIDJAN	BANGKOK	CAIRO	MANILA	MEXICO CITY	NAIROBI	NEW DELHI	RIO DE JANEIRO	SINGAPORE	WASHINGTON
SALARIES[1]										
Senior Staff[7]	1,245,533	643,864	797,005	797,005	682,143	845,290	682,143	893,590	872,892	797,005
Scientific and Supervisory Staff[8]	276,825	86,895	85,995	89,685	153,465	184,995	91,005	217,200	148,545	247,000
Support Staff[9]	174,192	72,448	60,720	53,648	130,816	97,536	43,360	115,152	92,352	186,080
TOTAL SALARIES	1,696,550	803,207	943,720	940,338	966,424	1,127,821	816,508	1,225,942	1,113,784	1,230,705
CONSULTANTS	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
EMPLOYEE BENEFITS[2] (@24% of salary)	299,525	229,523	226,492	225,680	259,508	259,088	223,528	271,045	249,096	295,069
HOME LEAVE AND RECRUITMENT	135,000	135,000	135,000	135,000	135,000	135,000	135,000	135,000	135,000	135,000
STAFF TRAVEL	153,375	153,375	153,375	153,375	153,375	153,375	153,375	153,375	153,375	102,250
COMPUTER[3]	95,745	62,205	75,000	75,000	63,030	78,990	65,423	83,775	78,990	75,000
WORKSHOPS, LIBRARY[3] AND PUBLICATIONS	261,753	170,141	205,039	205,039	172,315	215,947	178,856	229,029	215,947	205,039
BOARD	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000
PROFESSIONAL FEES	21,600	21,600	21,600	21,600	21,600	21,600	21,600	21,600	21,600	21,600
RENT[4] (9920 sq.ft.)	(120,000)	30,752	23,510	(23,510)	119,040	47,318	(15,000)	60,214	(47,318)	109,150
COMMUNICATIONS[3]	37,021	24,064	29,000	29,000	24,372	30,543	25,297	32,393	30,543	29,000
SUPPLIES[3]	33,192	21,575	26,000	26,000	21,850	27,383	22,680	29,042	27,383	26,000
MISCELLANEOUS[3,11]	78,383	55,150	64,000	64,000	55,701	66,766	57,360	70,084	66,766	52,000
CAPITAL EXPENDITURES[10]	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	30,000
TOTAL BUDGET[5]	3,104,144	1,878,592	2,074,736	2,070,542	2,163,585	2,335,831	1,886,627	2,483,499	2,311,802	2,424,813[6]

[1] Salaries are based on present gross pay. Where more than one person employed in a similar position, current salaries are averaged. Salaries reflect International Civil Service Commission post adjustments for each city ("Consolidated List of Post Adjustments," U.N., June 1, 1979). For secretarial positions, United Nations' policy of hiring locally is followed -- salaries are derived from U.N. documents listing local employees' compensation.

[2] Employee benefits are based on gross pay before post adjustment in accordance with U.N. policy; 24% is actual present IFPRI benefit package.

[3] These categories reflect cost-of-living adjustments, with Washington as a base. Cost-of-living figures are derived from "Monthly Bulletin of Statistics," U.N., March 1979, Vol. 33, #3. They are as follows: Abidjan -- 120, Bangkok -- 78, Cairo -- 94, Manila -- 94, Mexico City -- 79, Nairobi -- 99, New Delhi -- 82, Singapore -- 99, Rio de Janeiro -- 105, Washington -- 94.

[4] With the exception of those figures in brackets, the rents listed are those paid by UNDP in each city for a comparable amount of space as currently occupied by IFPRI. Figures in brackets are estimates based on the cost-of-living indeces and are not necessarily reflective of rent in those cities (UNDP receives office space free-of-charge from the host government in these cities).

[5] Based on proposed budget for 1980 and with staff configuration expected during 1980.

[6] IFPRI approved budget for 1980 as presented to the CGIAR.

[7] Presumably all internationally recruited staff.

[8,9] Presumably all locally recruited staff. Salaries based on UNDP figures for local employees' compensation.

[10] Includes purchase price of 4 cars for use of IFPRI staff on official business in locations other than Washington.

[11] Includes operating cost for 4 cars for IFPRI official business in locations other than Washington.

G.14.

INTERNATIONAL
FOOD
POLICY
RESEARCH
INSTITUTE

1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036 U.S.A.

Annex B

IFPRI LOCATION STUDY

RESTRICTED

THE INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE (IFPRI)

Location Study

By C. Hart Schaaf, Consultant
Washington, D.C.

September 1979

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TABLES

CONTENTS, continued

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ANNEXES

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7 September 1979

Mr. John W. Mellor, Director
International Food Policy Research Institute
1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036
USA

Dear Mr. Mellor:

I take pleasure in giving you herewith the IFPRI Location Study which I have prepared pursuant to your letter to me of 7 August 1979.

In these past weeks of work and reflection, I have had much help from your staff, notably Miss Mary Patricia Rafferty. I would like to record my grateful thanks to her and to them; and also to the many persons listed in Annex IV who have let me interview them.

I wish also to express my appreciation to James M. Mitchell, of the Brookings Institution, for his valuable counsel on methodology.

Because of the severe time constraint, my assessment is neither as broad nor as deep as I would have wished, and as the subject surely deserves. I nevertheless hope that it may be useful to you and the others concerned in dealing with the problem at hand.

Cordially,

C. Hart Schaaf

C. Hart Schaaf
Consultant

IFPRI LOCATION STUDY

By C. Hart Schaaf, Consultant

I. INTRODUCTION

A. Terms of Reference. These are stated in the letter to me from Mr. John W. Mellor, Director of the International Food Policy Research Institute (IFPRI), dated 7 August 1979, reproduced below as Annex I. They ask me:

1. to examine and weigh the advantages and disadvantages, the costs and benefits, and the consequences which in my view, and according to my findings, might accrue to IFPRI were the organization to move from Washington to some location in the developing world;
2. to examine relevant IFPRI and CGIAR documentation;
3. to pursue further avenues of enquiry deemed appropriate by me, including documentation and interviews; and
4. to bring to this study a fresh and independent approach.

B. Time Frame. Mr. Mellor's letter of 7 August 1979 (Annex I) notes that I would be (and I have been) involved with other continuing and time-consuming commitments during August and early September; but asks me--and I agreed to try--to prepare and submit my report, in a form ready for final typing, preferably by Friday 31 August and not later than Friday 7 September.

C. Documents Examined. These are given in Annex II. It will be noted that they fall into four categories:

1. CGIAR background documents.
2. CGIAR and TAC documents concerning IFPRI, including location.
3. IFPRI background documents, some containing references to location.
4. IFPRI research studies.

D. Persons with Whom Discussions Were Held are listed in Annex IV.

The persons interviewed were invited to speak as individuals and not necessarily as spokesmen for their institution or institutions of attachment.

The list of interviewees was nevertheless structured to include the principal institutions concerned with IFPRI: the CGIAR sponsors (the World Bank, FAO, and UNDP) and secretariat; and the IFPRI Board of Trustees, senior staff, and donors (IDRC of Canada, and the Ford and Rockerfeller Foundations). In addition, as noted in Annex IV, discussions were held with a few people not, or not currently, directly involved in CGIAR or IFPRI activity.

The interviewees are nationals of 12 countries, 8 of them developing, 4 of them industrialized. Of the individuals talked with, 13 are nationals of developing countries, 37 are nationals of industrialized countires.

Information and assessments were obtained from the IFPRI staff mostly during a group discussion, and from written material submitted following the discussion.

The other persons--the bulk of the list--were usually seen in their offices, though some of the interviews were by phone.

The average interview lasted about an hour. In every case the interviewee was invited (1) to give his or her considered frank views about IFPRI location; and (2) to comment on a provisional tabular statement giving (a) criteria which might govern IFPRI location, (b) possible weights within a total of 100 to be assigned to these criteria, and (c) provisional location ratings against these weighted criteria. In virtually every case the interviewee chose to focus the principal part of the discussion on this table. The table, in the form in which it emerged at the conclusion of the discussions, is given below on page 8.

E. Consultant's Background. Biographical data appear in Annex IV.

II. IFPRI

A. Purposes.

CGIAR in May 1979 requested a formal restatement of IFPRI's mandate and objectives. This is being drafted by the Director of the Institute, Mr. John Mellor, for consideration by the IFPRI Board of Trustees at their meeting scheduled for Friday 21 September 1979. The Board of Trustees plans to forward this statement, after they have reviewed and possibly amended it, for consideration by CGIAR at its meeting scheduled for November 1979.

Mr. Mellor agrees that for the convenience of readers I may quote here from his draft. Mr. Mellor states in part:

> "The International Food Policy Research Institute undertakes research on selected policy issues related to the production, consumption, availability and distribution of food in the world, with particular emphasis on the needs of the low-income countries and of the lower-income groups within those countries ...the Institutes's work is to provide knowledge of economic conditions and policy alternatives to facilitate improved nutri-

tion for that substantial proportion of the world's population which obtains inadequate food intake for an active and healthy life...Because technological change in agriculture is so fundamental to increased supplies of food and hence to the availability of food to low-income people, the institutes's research gives special emphasis to the policy implications of new technology, its conditions of application and the effects that derive from its application...The Institute intends that its research results improve policymaking of national and international bodies."

The CGIAR draft secretariat observations on IFPRI's proposed 1980 program and budget also contain much useful information which, although quite well known to the persons who will be reading my report, may nevertheless be quoted here for their convenience. The CGIAR secretariat notes that IFPRI is preparing a new formal statement of its mandate, and continues:

"4. Meanwhile, the broad mandate and objectives of the Institute can be considered as those set out in the International Development Research Centre (IDRC) grant letter of June 1975. This stated that IFPRI would undertake research on selected policy problems affecting the production, consumption, availability and equitable distribution of food in the world with particular emphasis on the needs of the low-income countries and especially the needs of vulnerable groups within those countries. Specifically, IFPRI would work:

"(a) to identify major opportunities for expanding world food production with particular emphasis on the development actions and policies best suited to remove present constraints to production and to establish the framework for the sustained use of the potential agricultural capacities existing in low income nations;

"(b) to determine and publicize those actions which could be undertaken, and those policies which could be adopted by governments, regional and international agencies, to effect a continued increase in the quantity and quality of food supplies available to all people through enhanced food production, wider trade; and

"(c) to provide information, and expanded base of knowledge and objective analysis of world food problems, and to indicate the opportunities and options open for their solution.

"5. With respect to training, not covered in the IDRC letter, the May 1975 prospectus of IFPRI states 'that IFPRI will have no formal training program. The training activities would consist largely of learning by participating in multidisciplinary policy research...of a world food policy institute.

"6. TAC, at its 21st Meeting, after consideration of the report of its Review Mission to IFPRI (January 1979), 'recommended that, from the point of view of CGIAR support, the mandate of the Institute should give its principal emphasis to the problems of developing countries and that the central tasks in its programme should be concerned with the linkages and inter-relationship between the micro-level problems of the adoption of new technologies and the wider economic and socio-economic aspects of agricultural development. Thus the work on trends analysis and international food trade should be considered only as supporting activities to the main research programme. The Committee also considered that more emphasis should be given to collaboration with national institutes in developing countries and to the possibilities of useful interaction with ISNAR.' (p. 1)

"7. In its response, the IFPRI Board has noted that the TAC view of the desired mandate is fully consistent with its own view and with the orientation and trend of the Institute's research programme. It is understood that the new draft of IFPRI's mandate to be submitted to the CGIAR in November will reflect this view."

Other useful material about IFPRI's objectives, well-known to the readers of this report, and amplifying but not significantly altering the information quoted above, is contained in many of the documents listed in Annex II below.

B. Resources

It is, I think, not too much of an oversimplification to state that IFPRI's resources are basically three:

1. Global knowledge and data, including the means to assemble, discuss, analyze, and disseminate this.
2. Personnel--staff--qualified to deal with all aspects of the knowledge and data resource, with such staff necessarily possessing not only high technical competence, but also widely diverse geographical backgrounds to ensure that many if not all of them are aware of the realities of the developing world, including food shortages and hunger.
3. The finance necessary to evoke and utilize resources 1 and 2.

C. Method of Operation

It will be useful to quote again from Mr. Mellor's draft statement referred to in I.A. Having noted that IFPRI "intends that its research results improve policymaking of national and international bodies," Mr. Mellor states that it seeks to facilitate this result "by 1) publishing research reports, 2) issuing policy oriented statements on key issues, 3) operating workshops and conferences which include researchers and policymakers, and 4) by individual contact with policy makers." Mr. Mellor emphasizes that "the Institute attempts to make its research relevant by choice of subjects and approaches to those subjects which are tuned to the actual policy needs of the relevant bodies."

D. Future Evaluations

CGIAR conducts a quinquennial review of each of the institutes in the CGIAR network. Such an evaluation of IFPRI will no doubt include an examination of the relevance and spread of the subjects IFPRI has chosen for research; the quality and persuasiveness of the resulting studies; the extent to which the recommendations in these studies appear to have been adopted or utilized by governments and international agencies; and the practical results which appear to have ensued. The relevance of evaluation five years from now to the present problem of location is that the choice of a location well-suited to IFPRI's work and the attainment of its objectives will no doubt, five years from now, be reflected in the evaluation of its performance.

E. Earlier Considerations of Location

The question of the location of IFPRI has been earnestly debated ever since the Institute was established in 1975, and even before.

The pertinent arguments are well-known to the persons who will read this report. References include paras 29, 30, 31, 32, 33, and 127 in the Draft Report of the TAC Mission to IFPRI (which took place 9-12 January 1979); para 1(iii) of the Draft TAC Conclusions and Recommendations on the Inclusion of IFPRI in the CGIAR System of TAC's 21st meeting (13-20 February 1979); the Response of the IFPRI Board of Trustees to the TAC Conclusions and Recommendations (the Response is attached to the Conclusions and Recommendations); paras 62-71 of the Informal Summary of Proceedings of the 16th meeting of CGIAR, May 3-4 1979; and para B on the "Main Points from the Summary" of these Proceedings. Differing location criteria advanced by TAC and its panel on IFPRI, and by the IFPRI Board of Trustees as reported in the Draft TAC Conclusions are reproduced in Annex III below.

The CGIAR secreteriat in its observations of July 18, 1979 on the IFPRI proposed 1980 Progran and Budget summarizes the position on the location question as follows:

> "26. Location. TAC recommended that IFPRI move to a developing country in due course. CGIAR members, in discussing the TAC report and the application of IFPRI to join the Group, did not reach a strong consensus in favor of such a move. Instead, the Group asked IFPRI to prepare an analysis of the advantages and disadvantages of moving, including the cost. It would be appropriate for the Group to confirm that any specific proposal to relocate IFPRI should be subject to its prior approval."

III. SOME POSSIBLE LOCATIONS IN THE DEVELOPING WORLD

The terms of reference given to me, as well as the discussions and documents on which they are based, refer only to the developing world, not to any particular location or locations within the developing world. Nine likely cities would appear to me to be, in alphabetical order: Abidjan, Bangkok, Cairo, Manila, Mexico City, Nairobi, New Delhi, Rio de Janeiro, and Singapore. My analysis has consisted of an attempt to compare Washington to each of these nine cities as a possible headquarters for IFPRI. This list is not intended to be definitive; other cities might well be added.

The Report of the Task Force on International Assistance for Strengthening National Agricultural Research, prepared for CGIAR in 1978, also examined, in its Chapter XII, the question of a headquarters location. The Task Force presented in its Annex H a list of profiles of 6 of the 10 cities which I am suggesting for consideration as headquarters for IFPRI: Abidjan, Cairo, Mexico City, New Delhi, Rio de Janeiro, and Washington. (The report also looked at 7 other locations, in addition to Washington, all of which except one are in the industrialized world, and hence outside the scope of my examination.)

In Annex VI below I reproduce the 6 city profiles including Washington, from the ISNAR report, plus the profiles, prepared in the same way, of the four other cities in my list; this material is updated by using latest UN Cost of Living indices, and latest airline schedules.

IV. CRITERIA FOR LOCATION

After studying the documents listed in Annex II and before commencing discussions, I prepared a provisional detailed list of criteria which it seemed to me might govern the choice of a location for IFPRI, provisional weights totaling 100 for these criteria, and provisional location ratings.

The provisional criteria and provisional weights I started with reflected my understanding, at that point based largely on the relevant documentation, of IFPRI's purposes, resources, method of operation, and forseen periodic evaluation. My provisional location ratings were based partly on the six city profiles presented in the ISNAR report; partly on the remaining four profiles prepared in the same manner; and partly on my own experience of working, for longer or shorter periods, in 7 of the 10 cities listed.

In my subsequent discussions with the persons listed in Annex IV I gave each an opportunity to comment on the table in whatever was then its current form. As already indicated, virtually everyone with whom I spoke chose to devote much of the discussion to the provisional criteria, criteria weights, and location ratings in the table. The table underwent considerable changes in the light of these discussions as they progressed.

The table as it finally emerged is given on page 8, as Table I: IFPRI--CRITERIA FOR LOCATION. In addition to many other factors, the table largely incorporates, now with weights, the differing location criteria suggested by TAC and the TAC panel, and by the IFPRI Board of Trustees, reproduced below in Annex III.

I would not claim that any one of the persons with whom discussions were held would give exactly the same appraisal as that represented in every one of the 143 figures which appear in Table I. Nor, perhaps, would any one of the interviewees word every criterion exactly as I now do. But I believe that Table I, as it now stands, fairly represents the approximate appraisal of most of the people with whom I spoke, and especially their appraisal of Washington compared with the other locations.

For the readers of this report most of the material in Table I will be self-explanatory. The comments thus are limited to minimal clarifications and amplifications. These comments in the following sections A through J, refer to similarly headed items and columns in the table.

Table 1 -- IFPRI -- SUGGESTED CRITERIA FOR LOCATION.

(1) CRITERIA	(2) WEIGHT IN 100	(3) ABIDJAN	(4) BANGKOK	(5) CAIRO	(6) MANILA	(7) MEXICO CITY	(8) NAIROBI	(9) NEW DELHI	(10) RIO DE JANEIRO	(11) SINGAPORE	(12) WASHINGTON
A. DATA AVAILABILITY AND RELATED CONSIDERATIONS (including opportunity to review & discuss data sources, compilation, and interpretation; access to libraries, institutes, and universities; opportunity for dialog with leaders in research methodology and conceptual frameworks; availability of highest level computer services; and interaction among all the foregoing)	25	6	10	5	10	7	7	10	7	8	24
B. STAFFING											
1. opportunity to attract and retain international professional staff	20	4	8	3	11	10	11	12	9	10	19
2. availability of local professional staff	5	1	2	3	4	3	2	4	3	4	5
C. OPPORTUNITY FOR DIALOG WITH POLICY MAKERS IN THE DEVELOPING WORLD	5	2	3	1	2	1	2	2	2	2	4
D. OPPORTUNITY FOR DIALOG WITH POLICY ANALYSTS IN INTERNATIONAL AGENCIES INCLUDING CGIAR INSTITUTES	4	1	2	1	2	1	1	1	1	1	3
E. OPPORTUNITY FOR DIALOG WITH DONORS (including dialog concerning impact of donor policies of assistance to agricultural production, consumption, and trade in the developing world)	4	1	2	1	3	1	1	2	1	2	4
F. COMMUNICATIONS AND TRAVEL	6	1	4	2	3	2	3	2	4	4	6
G. EXPOSURE OF STAFF TO REALITIES OF THE DEVELOPING WORLD (including food shortages and hunger)	9	6	6	8	6	6	6	8	5	6	1
H. GEOGRAPHICAL BALANCE WITHIN CGIAR NETWORK	4	4	4	4	2	2	2	2	4	4	2
I. IFPRI INDEPENDENCE AND PERCEPTION OF THIS BY OTHERS (including independence from a host government, donors, and international agencies)	8	6	6	6	6	6	6	6	6	6	3
J. EXPENSE											
1. capital (moving and installation)	2	0	0	0	0	0	0	0	0	0	2
2. operating (including cost of local professional and nonprofessional staff; office rent; international travel; supplies and services)	8	0	8	7	7	6	5	8	4	5	8
TOTAL	100	32	55	41	56	45	46	57	46	52	81

Item A. Column (1): Self-explanatory except possibly for computer services. These are highly important, if not indispensable, in IFPRI's work, and I thus give in Annex VII a statement about them prepared for this report by Miss Patricia Tillman, IFPRI's Coordinator of Statistical Services. Column (2): The high weight of 25 is assigned to this criterion because of IFPRI's absolute dependence upon accurate, detailed, up-to-date, global agricultural information and the means rigorously to assess this, if IFPR is to carry out the food policy research which is its raison d'etre.

Columns (3),(4),(6),(11): The ratings take into account, but are not solely based upon, the presence of the African Development Bank in Abidjan, ESCAP in Bangkok, the FAO regional offices in Bangkok and Cairo, the Asian Development Bank in Manila, and the excellent computer services in Singapore.

Column (12): Washington is given a location rating of 24 because of the presence in Washington of the World Bank Group, the Inter-American Development Bank, CGIAR, the United States Department of Agriculture, outstanding computer services and libraries, and numerous research organizations such as the Brookings Institution; as well as easy access to many universities.

Item B1) Refers to both professional working environment; and family living environment, including schools.

Item C. The location ratings take into account but are not based solely upon the large number of government officials from developing countries throughout the world who visit Washington, inter alia on World Bank and Inter-American Development Bank business; and similarly, though to a lesser extent, the number of policy makers who visit Bangkok for ESCAP meetings, and Abidjan and Manila for discussions with the regional development banks.

Item D. Column (2). The weighting takes into account, but is not limited to, the view of CGIAR that IFPRI should increase the consideration it gives to the relationship and potential relationship of government policy to the micro-economic aspects of the findings of other CGIAR institutes.

Columns (3) through (10). The ratings take into account the location of the international agencies noted in Item A above, plus IRRI near Manila, CIMMYT near Mexico City, elements of two CGIAR institutes (ILCA and ILRAD) in the outskirts of Nairobi, ICRISAT in India, the FAO North American Regional Office in Washington, and the proximity of Washington to the headquarters in

New York City of the United Nations and many other organizations in the UN family.

Item E. The term "Donors" is meant to convey two functions. One of these, as stated parenthetically in Table 1, is the provision of assistance in agricultural production, consumption, and trade to the developing world; the other is the extension of support to the CGIAR network and to IFPRI.

Item F. Self-explanatory.

Item G. Columns (1) through (12). Much has been said in CGIAR and TAC about the importance of location in an environment where IFPRI staff could be exposed to the realities of the developing world, including food shortages and hunger. The presence of mal-nourished children may indeed be more motivational than cold statistics. A high weight has hence been accorded to this criterion, with high location ratings given to New Delhi and Cairo, and the lowest rating to Washington. Many of the persons interviewed, however, have pointed out, and my own observations confirm, that international officials, and many nationals of developing countires as well, are often quite isolated from the problems surrounding them. This does not in itself mean that such persons do not perform well in their work, but it tends to diminish the force of this criterion.

Item H. This criterion is intended to indicate that just from the point of view of geographical balance, the location of the network of all CGIAR institutes as a whole is perhaps more to be taken into account than the location of any one of them viewed in isolation. The location ratings are hence 4 for countries which do not have a CGIAR institute, and 2 for those having one institute. Washington is rated 2 because of the presence of the CGIAR secretariat.

With CGIAR and IFPRI in Washington, the geographical spread of the network entities is:

Africa	4
Latin America	3
Asia	2
Europe	2
North America	2
Middle East	1
	14

Item I. It is important to recall that the TAC panel found no evidence of interference with IFPRI's independence in its present location. The perception by others of IFPRI's independence is another matter, and surely important. Table I thus rates this criterion rather highly, at 8; and assigns the lowest rating, of 3, to Washington. I should like, however, to quote from an IFPRI senior researcher (and national of a developing country), who rates the locations differently: "Wherever IFPRI is located, I believe that it will be subjected to pressures either expressed or implied. IFPRI's activities cut across food commodities; its location in the developing countries may bring pressures to take on problems of specific commodities and of other problems of national or regional orientation. Thus, despite the seeming perception of IFPRI independence in some quarters at present, I have not given other places much of an edge on points over IFPRI's present location."

Item J.1) Columns (2) through (12). Annex VIII presents an estimate of the cost of moving IFPRI, including the cost of transfering Computer data, away from Washington. To the financial costs would be added the very serious disruption and loss of momentum of IFPRI work. Remaining in Washington would avoid the financial costs and the disruption; thus Washington is given the highest rating on this criterion, and a rating of 0 is assigned everywhere else. Table I assigns (Column (2)) only a very low weight, of 2, to this criterion, because the cost of moving and installation, including the computer costs and work disruption, would be for once only. If all other criteria indicated that great advantages in IFPRI's usefulness would accrue from a move, then such a move, in my view, would be in order.

Item J.2). Columns (3) through (12): Operating Expenses (including Salaries, Office Rent, International Travel, Supplies and Services.) Annex IX gives estimated operating expenses in Washington as contained in the IFPRI approved budget for 1980; and comparable figures, with a similar manning table, at each of the nine alternative locations.

The estimates are based where applicable on UNDP experience. UNDP is used rather than other CGIAR institutes because, according to Phillip Thorson's 1979 Review of Staff Compensation, institute salaries are not standardized, or known.

UNDP operates offices in all the nine locations considered in this study.

Senior staff salary estimates in Annex IX use present actual IFPRI salaries (on which the recipient pays a US Income Tax), assume that the post would be graded at the same level by UNDP, and then treats the gross UNDP income figure as though it included the International Civil Service Commission post adjustment. Pursuant to this formula an IFPRI senior staff member would receive in Washington the same take-home pay he or she receives now; but if he or she were moved to one of the nine locations under consideration, the salary would be changed to reflect the ICSC post adjustment. The ICSC post adjustment system seeks to make a staff member's real salary the same wherever he is stationed, eliminating increases or decreases in income based upon location.

The Washington approved budget of $2,424,813 compared with estimates for the other locations indicate the following estimated annual differences:

Abidjan:	+ $679,331
Bangkok:	- $546,221
Cairo:	- $350,077
Manila:	- $354,271
Mexico City:	- $261,228
Nairobi:	- $88,982
New Delhi:	- $538,186
Rio de Janeiro:	+ $58,686
Singapore:	- $113,011

Having carried out the foregoing analysis, I asked the CGIAR secretariat if they would care to comment on this, especially the table in Annex IX. Mr. Daniel Ritchie, Deputy Executive Secretary of CGIAR, kindly agreed to let me have his views. Mr. Ritchie, who agreed to be quoted, stated that he finds the table clear; internally consistent; quite acceptable for what it purports to be, namely a cost comparison based mostly upon UNDP equivalents; and a useful ranking of the nine cities outside Washington.

Mr. Ritchie believes, however, in the light of CGIAR experience with the other network institutes, that my figures are too conservative. He feels that an attempt by IFPRI to operate at this cost level in any of the nine cities considered as alternatives to Washington would in practice prove to be difficult if not impossible. He points to three examples of why he believes this:

1. In practice it would be difficult, he believes, to persuade present staff, or most of them, to move from Washington to

other locations where their net income would be less than present salaries, no matter what explanations were advanced concerning the logic of post adjustments. He therefore believes that in practice it would be necessary to pay salaries equal to Washington salaries in the least expensive cities according to the table, and to move upward from this base, not downward from Washington.

2. If IFPRI were to establish an employee benefits package like that in most of the other CGIAR institutes, this would be of the order of 40 percent, rather than the present IFPRI 24 percent benefits package, which is the figure used in Table I. Such a benefits package (40 percent) would include higher and more visible housing allowances than those contained within International Civil Service Commission post adjustments. (Some of the CGIAR institutes have a benefits package of 50 percent.)
3. If IFPRI were to follow the home leave practice of some of the other CGIAR institutes, annual rather than biennial home leave would be provided.

Mr. Ritchie estimates that such increases would mean in practice that operating costs in the cities I find least expensive, Bangkok and New Delhi, would in practice turn out to be at about the Washington level, with the remaining 7 locations proportionately higher.

Columns (3) through (12). The location ratings in the Table are derived from Mr. Ritchie's comments.

K. A Preponderant Majority. Table I indicates a rating for Washington--81--a good deal higher than for anywhere else; with New Delhi (57), Manila (56) and Bangkok (55). This pre-eminence of Washington appeared in all earlier versions of the table, and thus has been considered by virtually all the persons with whom discussions have been held. A very few of the interviewees feel that this is the wrong conclusion, i.e., they believe that IFPRI should be located in a developing country. But a preponderant, very large majority, indicate agreement with this assessment of Washington as best for IFPRI.

L. An Important Excluded Criterion. Host Country Relationship. The analysis has not considered a further criterion, which is very important, and which must be kept in mind; but which would be difficult to deal with here.

This is the host country relationship, including such items as tax status of staff, and possible free provision of an office. But it would have been difficult to explore these with a possible host government, let alone nine of them, in the time available for this study. It may, however, be noted in Annex IX that free office space is provided to UNDP by the governments concerned in Abidjan, Manila, New Delhi, and Singapore. An impressive headquarters has also been built by the government of the Philippines for the Asian Development Bank.

V. VIEWS OF PRESENT IFPRI SENIOR RESEARCH STAFF

No one, I think, would feel that IFPRI should either remain in Washington or move to the developing world in order to please the present senior research staff, and the more so because most of the staff have been engaged on short term contracts of from one to five years. In other words the decision to remain in Washington or move to a developing country surely should be based on wider considerations, of the type set forth in Table I, than those elicited by a staff poll.

It nevertheless has seemed to me that the present senior research staff have a very important contribution to make to the question of IFPRI location. For the senior research staff are the laborers in the vineyard. More, perhaps, than anyone else, they have an understanding of what it means to carry out their type of work, and to live, in Washington.

Moreover since more than half of them are nationals of the developing countries, they have a highly valid basis for comparing research realities in Washington with those elsewhere.

For this reason I arranged to have a staff meeting with the senior research personnel then in Washington, and similar talks with two of the staff who returned several days after the meeting. I was able in this way to seek the views of the entire senior research staff present in Washington during the period of my study: 13 persons, including the Director of Information Services. At my suggestion the Director of IFPRI, Mr. Mellor, was not present at any of this discussion.

At the staff meeting, and following a general discussion in which there was lively participation, I gave to each person two sheets of paper. One contained a criteria table like that on page 9, with provisional criteria weights, but without location ratings. We discussed this at some length, with almost everyone expressing views about the provisional criteria and the provisional weights.

The second sheet of paper was a short questionnaire in which the recipient was invited to state whether, in the event IFPRI were to move from Washington to the developing world, he or she 1) would feel unable to accompany IFPRI, or 2) would be prepared to move anywhere with IFPRI conducive to the effective pursuit of his work, or 3) would be prepared to move but would prefer some named location or locations, or 4) would be prepared to move but only to some named location or locations.

The staff members were invited to take these two papers away with them, think about them, and get them back to me two days later completed to express their views, including 1) amendment of or addition to or elimination of any of the criteria, 2) alteration of the criteria weights, and 3) their ratings of cities familiar to them in the list of possible locations.

Of the 13 persons concerned, 11 replied. Of these 11, 8 are nationals of developing countries, 3 are nationals of industrialized countries.

The staff comments and suggestions concerning criteria and weights have been merged with the results of other interviews, with which they generally tend to agree, and are reflected in Table I as it now appears on page 8.

I found the staff answers to be very significant, and worth separate comment, for two reasons:

First, with only one exception (because of children's education), no one said that if IFPRI moved from Washington, he or she would be unwilling to accompany it. A few noted that the question was somewhat irrelevant because of the short remaining duration of their contracts; a small number of the others expressed a preference among possible locations; and a still smaller number limited their willingness to move to one or several of the alternative listed locations. But the fact with but a single exception, no one indicated an unwillingness to leave Washington seems to me to enhance the objectivity and hence the value of their ratings of Washington in relation to other possible locations.

And this leads me to what strikes me as the second point of major significance in the senior research staff replies, which is that every single one of them rates Washington, usually by a very wide margin, as a better place to carry out IFPRI's type of work than any of the 9 alternative locations listed.

VI. RECOMMENDATION

On the basis of the analysis herein presented, and in the light of views of the preponderant majority of the 40 persons with whom I have spoken, I recommend that IFPRI headquarters be retained in Washington.

C Hart Schaaf

C. Hart Schaaf
Consultant

Washington, D.C., USA
7 September 1979

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036 U.S.A.
(202) 862-5600
Cable: IFPRI

August 7, 1979

Mr. C. Hart Schaaf
3525 Twin Branches Drive
Silver Spring, Md 20906 USA

Dear Mr. Schaaf:

IFPRI Location Study

Confirming our discussion of this morning, your terms of reference in preparing the above study will be to examine and weigh the advantages and disadvantages, the costs and benefits, and the consequences which according to your findings might accrue to IFPRI were the organization to move from Washington to some location in the developing world.

In your study you will wish to examine the nature of the work of IFPRI and CGIAR, by studying the relevant documents, and by pursuing any other avenue of enquiry you believe may be useful. In particular you will wish to consider the discussions which have taken place on earlier occasions concerning the location of IFPRI, culminating in the statement of the Chairman of CGIAR at its May 3-4 1979 meeting (para 71 of the Informal Summary of Proceedings) wherein the Chairman noted his feeling that IFPRI should be asked "to prepare a study in some detail of the location question including cost of any such transfer.."

From our discussion I am fully aware of your other continuing commitments during these coming weeks. But you appreciate our requirement that the report be completed quickly, to be available for the meeting of the IFPRI Board of Trustees scheduled for Friday September 21. To enable us to distribute your statement to the Board for advance reading by them, we will hope to have it from you, preferably by Friday August 31, and at the latest by Friday September 7, in a form ready for final typing.

During your study the IFPRI staff, and especially Miss Mary Patricia Rafferty, will be happy to help you in any way they can, including assembling documents and information, arranging appointments, and assisting in the preparation of cost estimates.

Annex I, Continued

August 7, 1979

Mr. C. Hart Schaaf
Silver Spring, Md 20906

Good luck in your coming endeavor. We await with keenest interest the report and recommendations which you, with your long and varied international experience, and your fresh and independent approach to IFPRI's location problem, will be submitting to us.

Sincerely yours,

John W. Mellor

ANNEX II: DOCUMENTS EXAMINED

1. CGIAR Background Documents

CGIAR: Consultative Group on International Agricultural Research (1976, printed, 67 pp)

CGIAR Secreteriat: The Consultative Group and the International Research System - An Integrative Report (29 July 1977, mimeo, 34 pp plus annexes)

CGIAR Secreteriat: Same title (19 September 1978, mimeo, 31 pp)

CGIAR: Report of the Task Force on International Assistance for Strengthening National Agricultural Research (August 1978, mimeo, 40 pp and annexes)

CGIAR: List of Participants in Centers Week, November 6-10, 1978 (mimeo, 9 pp)

Phillip Thorson: Review of Staff Compensation in the International Agricultural Research Centers (June 1979, mimeo, 22 pp and annexes)

CGIAR Secreteriat: The Consultative Group on International Agricultural Research (1 August 1979, mimeo, 9 pp including annexes)

2. CGIAR and TAC Documents Concerning IFPRI, including Location

CGIAR Technical Advisory Committee: Draft TAC Conclusions and Recommendations on the Inclusion of the International Food Policy Research Institute (IFPRI) in the CGIAR System, including Draft Report of the TAC Mission to IFPRI (of 9-12 January 1979) (March 1979, mimeo, 3 pp plus 31 pp Report of TAC Mission to IFPRI plus annexes)

CGIAR: Consultative Group Meeting, 3-4 May 1979, Paris, Informal Summary of Proceedings (30 July 1979, mimeo, 27 pp plus 5 pp on Main Points, and annexes)

CGIAR: Draft Secreteriat Observations on IFPRI 1980 Program and Budget (18 July 1979, mimeo, 10 pp)

3. IFPRI Background Documents, Some of Which Contain Reference to Location

IFPRI: Report 1976-1978 (printed, 40 pp)

IFPRI: Research Highlights 1978 (printed, 8 pp)

IFPRI Board of Trustees: Response to the CGIAR TAC Conclusions and and Recommendations on the Inclusion of IFPRI in the CGIAR System (March 1979, included in the TAC Conclusions and Recommendations listed above, mimeo, 2 pp)

John W. Mellor: The International Food Policy Research Institute - Purpose, Program and Approach (Draft) (7 August 1979, mimeo, 15 pp)

4. IFPRI Research Reports, Occasional Papers and Other Publications

ANNEX III: DIFFERING LOCATION CRITERIA EARLIER SUGGESTED BY TAC AND PANEL ON IFPRI, AND BY THE IFPRI BOARD OF TRUSTEES

TAC AND TAC PANEL (para (1)(iii) in DRAFT TAC CONCLUSIONS AND RECOMMENDATIONS ON THE INCLUSION OF THE INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE (IFPRI) IN THE CGIAR SYSTEM (AGD/TAC:IAR/79/13 RESTRICTED March 1979):

> TAC also discussed the question of the location of IFPRI Headquarters. The panel had recommended that IFPRI give serious attention to the need to move the site of the Institute to a developing country for four main reasons. The first one was that an LDC environment was considered more appropriate for a research staff working on the problems of food shortage and hunger. The second reason was the need for IFPRI not to be considered as having a privileged status in the CGIAR System because of its present location. The third point in favour of a location in an LDC was to protect the Institute from undue influences of donors and to avoid that its work be perceived by others as being subject to these influences. The need for the Institute to avoid being used as a policy advisory body of international institutions, such as the CGIAR and the World Bank, was seen by the panel as the fourth reason justifying a location in a developing country.

IFPRI BOARD OF TRUSTEES (Response of IFPRI Board of Trustees to TAC CONCLUSIONS AND RECOMMENDATIONS, attached at end of AGD/TAC:TAR/79/13 cited in preceding para):

> The Board has considered carefully the TAC's recommendation that the headquarters of the Institute be moved to a developing country and the reasons advanced for this.
>
> If the Consultative Group accepts the necessity of desirability of such a move, the Board is willing to transfer the headquarters of the Institute to a developing country.
>
> The criteria that were paramount in the original decision to locate the headquarters in Washington were as follows:
>
> (1) Excellent access to the wide range of data essential for policy analysis.
>
> (2) The need to be able to attract high quality international staff, most of them drawn from developing countries.
>
> (3) The need for excellent international communications, since IFPRI's research must deal with policy issues all over the world, and is not confined to the problems of a host country or even of the region where the host country might be located.
>
> (4) The need for a strong resource base for an institute of IFPRI's character and mandate, including operational facilities (library, computer, secretarial services, etc.), office and housing facilities, and legal framework.

In the Board's opinion these criteria led to a wise choice in the Institute's initial location in Washington. The Board believes these criteria would be appropriate for use in a search for a new headquarters. At the same time, the Board would welcome suggestions from the Consultative Group for any desired modifications of these criteria.

Following a decision by the Consultative Group, the Board would be prepared to move expeditiously toward the selection of a new headquarters and the transfer of IFPRI's operations. The Board calls the Group's attention to the many practical issues which would necessarily be confronted and we would not wish to be bound to a short, predetermined time schedule.

ANNEX IV: PERSONS WITH WHOM DISCUSSIONS WERE HELD

Ojetunji Aboyade (Nigeria)
Vice Chancellor, University of Ife, Ife, Nigeria; Member, IFPRI Board of Trustees

Raisuddin Ahmed (Bangladesh)
Research Fellow, IFPRI; Chief of Agricultural Section in Bangladesh Planning Commission

Randolph Barker (USA)
Professor, Department of Agricultural Economics, Cornell University; Member of TAC Mission to IFPRI; former Head, Agricultural Economics Department, International Rice Research Institute

Nicolas Ardito Barletta (Panama)
Regional Vice President, Latin America and the Caribbean, the World Bank; and Member, IFPRI Board of Trustees

I.P.M. Cargill (UK)
Senior Vice President, World Bank

John K. Coulter (UK)
Scientific Adviser, CGIAR

Ralph Kirby Davidson (USA)
Deputy Director, Social Sciences Division, Rockefeller Foundation; and Vice Chairman, IFPRI Board of Trustees

Gunvant Desai (India)
Research Fellow, IFPRI

Graham Donaldson (Australia)
Chief, Economic Division, Agriculture and Rural Development Department, World Bank

Jorge Garcia (Colombia)
Consultant, IFPRI

James Gavan (UK)
Program Director, Distribution, IFPRI

Harold Graves (USA)
Consultant; formerly Executive Secretary, CGIAR

Lowell Hardin (USA)
Program Officer, Office of the Vice President, International Division, Ford Foundation

Dale E. Hathaway (USA)
Undersecretary for International Affairs and Commodity Programs, US Department of Agriculture; and first Director, IFPRI

Ivan Head (Canada)
President, International Development Research Centre; Member, Board of Trustees, IFPRI

David Hopper (Canada)
Regional Vice President, South Asia, World Bank

Barbara Huddleston (USA)
Research Fellow, IFPRI

Donald Kimmel (USA)
North American Representative, FAO

Robin Kinloch (UK)
Senior Project Officer, Division for Global and International Projects, UNDP

Nathan Koffsky (USA)
Consultant; formerly Interim Director, IFPRI

William T. Mashler (USA)
Senior Director, Division for Global and International Projects, UNDP

John McIntire (USA)
Consultant, IFPRI

Charles McVicker (USA)
Director of Communications, IFPRI

John W. Mellor (USA)
Director, IFPRI

Daniel Morrow (USA)
Fellowship Recipient, IFPRI

Dharm Narain (India)
Program Director, Production, IFPRI

C.V. Narasimhan (India)
Organizing Executive Secretary, Cotton Development International, UNDP; formerly Chef de Cabinet and Undersecretary General, United Nations; and formerly Deputy Administrator, UNDP

Jesus Ocampo (Phillippines)
Administrative Officer for Rates and Allowances, Personnel Division, UNDP

Peter A. Oram (UK)
Deputy Director, IFPRI

Leonardo Paulino (Philippines)
Program Director, Trends, and Statistics, IFPRI

Mary Patricia Rafferty (USA)
Director for Administration, IFPRI

Daniel Ritchie (USA)
Deputy Executive Secretary, CGIAR

J.S. Sarma (India)
Consultant, IFPRI

Samar Ranjan Sen (India)
Retired; President of International Association of Agricultural Economists (1970-76); Ambassador and Executive Director, World Bank (1970-78); Member, FAO Council (1966-70); Chairman, ECAFE (now ESCAP) Committee on Agricultural Planning (1962-64)

Ammar Siamwalla (Thailand)
Research Fellow, IFPRI; and former Lecturer in Economics, Thammasat University, Bangkok

Patricia Tillman (USA)
Coordinator of Statistical Services, IFPRI

Alberto Valdes (Chile)
Program Director, Trade, IFPRI

Toby Wagley (USA)
Program Administrator, Institute for International Education

Montague Yudelman (USA)
Director, Agriculture and Rural Development Department, World Bank

Ruth Zagorin (USA)
Associate Director, Office of International Cooperation and Development, USDA; former Member, IFPRI Board of Trustees

ANNEX V: CONSULTANT'S BACKGROUND

Biographical Data on C. Hart Schaaf

Of 31 years as a UN staff member, 25 years were spent in developing countries, mostly in Asia but with three years also in the Middle East. A recent brief UNDP consultancy in Nigeria, not listed below, afforded an introduction also to Africa.

Who's Who in the World (similar material in Who's Who in America):

SCHAAF, C(ARL) HART, ret. UN ofcl., cons.; b. Ft. Wayne Ind., January 14, 1912; s. Albert H. and Bertha May (Hart) S.; student U. Montpellier (France), 1930-31, U. Stockholm (Sweden), 1937-39; B.A., U. Mich., 1935, Ph.D., (Horace H. Rackham fellow), 1940; m. Barbara Joan Crook, Nov. 22, 1945; children-Albert H., Timothy H. Instr. polit. sci. Coll. City N.Y., summer 1940; asso. prof. pub. administrn., Richmond div. Coll. William and Mary, 1940-42; state rationing adminstr. for VA., U.S. OPA, 1942-43; asst. dep. dir. gen., also chief supply for Europe UNRRA, 1944-47; asso. prof. adminstrn. Sch. Bus. and Pub. Adminstrn. Cornell U., 1947-49; dep. exec. sec. UN Econ Commn. for Asia and Far East, 1949-54; mem. UN Tech. Assistance Bd. Survey Mission to Indonesia, 1950; spl. adviser to UN sec. gen. on relief and support civilian population Korea, 1950-51; resident rep. in Israel UN Tech Assistance Bd., 1954-57, resident rep. in Phillippines, 1957-1959; co-chmn. Seminar on Devel. and Adminstrn. Internat. River Basin U. B.C., 1961; exec. agt. Com. Coordination Investigations Lower Mekong Basin UN Econ. Commn. for Asia and Far East, Bangkok, Thailand, 1959-69; mem. Mekong Comm. Adv. Bd., 1969-72; resident rep. UN Devel. Program, Sri Lanka and Republic of Maldives. 1969-74; dep. exec. dir. UN Fund for Population Activities, 1974-77. Recipient (with Mekong Com.), Ramon Magsaysay award for internat. understanding, 1966, Outstanding achievement award U. Mich., 1966. Mem Am. Polit. Sci. Assn., Soc. Internat. Devel. Author: (play) Partition, 1948; (with Russell H. Fifield) The Lower Mekong: Challenge to Cooperation in Southeast Asia, 1963. Contbr. articles to tech. and acad. jours. Home: 3525 Twin Branches Dr., Silver Spring, MD 20906

ANNEX VI: PROFILES OF TEN CITIES
(Uses Latest Airline Schedules and UN Cost of Living Indices)

ABIDJAN

Population: 800,000.

Per capita product (national): $540.

Cost-of-living index: 120.

Telecommunications: Telephone instruments are scarce and local communications are fair to poor. International service, through Paris, is good.

International travel: Air connections to destinations in sub-Saharan Africa are plentiful. Direct flights to other regions are scarce: 35 a week to Europe, 3 to North Africa and the Near East, 3 to North America, none to Asia, Australia, South and Central America. Destinations in Asia, Australia and the Western Hemisphere are reached through Paris.

Climate: Hot and rainy. The average high temperature is 32 C (88 F), the average low temperature 24 C (74 F) or higher during five months of the year. Annual rainfall is about 200 cm (80 in), of which more than half occurs in May, June and July.

Health conditions: Poor. Malaria, typhoid, yellow fever and amebiasis are risks; upper respiratory infections are common. Insect pests are numerous. Drinking water must be boiled and filtered.

Medical care: Good doctors and dentists are available.

Schools: Good. Teaching in French and in English is available through Grade 12.

Housing: Scarce and expensive.

Goods and services: Fair. Food is good in quality and variety. General household supplies are available. Household equipment, toiletries and sundries are imported and expensive. Laundry, dry cleaning and shoe repair are satisfactory.

Local Staff availability: Fair in French, poor in English.

Recreational and cultural opportunities: Good.

Special factor: Abidjan is the site of the national university of the Ivory Coast; it has an agricultural faculty and conducts agricultural research in the vicinity.

BANGKOK

Population: 4.5 million.

Per capita GNP: $380 (Thailand).

Cost-of-living index: 78.

Telecommunications: Demand for phone service in Bangkok is growing faster than the telephone company can provide facilities. International service is good with 24-hour service available. Telegrams and cables can be sent from any post office and from most hotels.

International air travel: Excellent direct flights to Asia, India, Europe, North America and the Near East. There are no direct flights to Central and South America and service to Africa is nearly non-existant.

Climate: Warm and humid. The climate is monsoonal, marked by a pronounced rainy season lasting from July through November. November through February is cooler and drier. During this season, the temperature range is from the mid-60's to the mid-80's. March through June is hot and humid with the temperatures often reaching 100 F.

Health conditions: Prickly heat, fungal infections, colds and other respiratory infections are common as well as intestinal disorders. Water must be boiled before drinking and milk products are the sources of many infectuous diseases. Medical care is good.

Schools: Good. The International School of Bangkok provides English language schooling based on the American educational system through grade 12.

Housing: Good. There are many new modern apartment buildings. Individual houses are, however, usually older and require a considerable amount of upkeep.

Goods and services: Good sold in local markets is not usually refridgerated and there is no guarantee of its cleanliness or quality. Toiliteries and cosmetics purchased locally are very expensive. Tailors and shoe repairs are readily available.

Local staff availability: Good.

Recreational and cultural opportunities: Good.

CAIRO

Population: 8.5 million.

Per capita GNP: $260.

Cost of living index: 94

Telecommunications: Poor.

International travel: Air connections to Europe are plentiful (more than 150 direct flights a week); and there are direct flights to sub-Saharan Africa (about 40 a week), Asia (about 30) and North America (about 20). Latin America and Australia must be reached through connections in other cities.

Climate: Hot and extremely dry. During five months of the year, the average daily high temperature is 32 C (90 F) or more; and the average daily high temperature throughout the year is 28 C (82 F), the low temperature 16 C (60 F). Less than five days a year have any rainfall.

Health conditions: Poor. Intestinal, respiratory and fungal infections, hepatitis and fevers of unexplained origin are endemic. Constant dust is a hazard. Drinking water must be boiled; milk and milk products are considered unsafe. Good dcotors are available, and simple dental work can be done.

Schools: Good. Teaching in French, German and English is available through the 12th grade. There is an American University in Cairo.

Housing: Scarce and expensive.

Local staff availability: Good.

Recreational and cultural opportunities: Good.

Special factor: There is a university faculty of agriculture and an experiment station in the vicinity of Cairo.

MANILA

Population: 1,438,252

Per Capita GNP: $420 (*this is for the Philippines)

Cost-of-living index: 94.

Telecommunications: Good on balance -- local service is available, but far from reliable while long distance (international) service is excellent.

International Air travel: Direct flights to Europe, Middle East Asia, North Africa, North America and India. There are no direct flights to sub-Saharan Africa, Latin America or South America although connections do exist to these points.

Climate: Hot and humid. There are 3 seasons: the hot, dry season from March through May; the rainy season from June through November during which rain can be expected nearly every day; and the cool, dry season from November through February. Manila has an annual mean temperature of 80 F, with the average monthly maximum temperature ranging from 86 F to 93 F. The monthly minimum temperature ranges from 69 F to 76 F. Typhoons are common during the rainy season.

Health conditions: Fair. Fungus and ear infections, mainly due to swimming are common in the hot, humid climate. There is also the inevitable increase in the number of respiratory diseases as the rainy season closes and cooler weather begins. The health facilities in Manila are considered average. Occassional gastrointestinal upsets and colds seem to be almost unavoidable. While the city of Manila is maleria free, there is maleria in some of the rural underdeveloped areas. Drinking water must be boiled before drinking and local produce should be eaten only after peeling, scrubbing or cooking.

Schools: Good. The scope of private education is impressive and a high priority has been placed on education by the government. Schooling in English is available through the 12th grade and there has been established an American junior college in Manila.

Goods and services: For the most part, good.

Local staff availability: Good.

Recreational and cultural opportunities: Good.

Special factors: The International Rice Research Institute, which conducts research on rice and attracts scholars from throughout the world, is located in Los Banos.

MEXICO CITY

Population: 8.5 million.

Per Capita GNP: $1,050.

Cost-of-living index: 79.

Telecommunications: Good.

International travel: Mexico City has plentiful connections to major destinations throughout the Western Hemisphere, poor connections to other regions. There are about 20 direct flights a week to Europe, three to Asia, one to North Africa and the Near East, none to sub-Saharan Africa or Australia.

Climate: Moderate temperatures, and quite wet. Average daily high temperatures range from 19 C (66 F) to 26 C (78 F), lows from 6 C (42 F) to 12 C (54 F). About 170 days a year have some rain; from June to October there are two or three hours of rain virtually every day.

Health conditions: Fair to poor. Tap water must be boiled before drinking. Intestinal infections are a hazard, respiratory infections are frequent. The combined effects of Mexico City's high altitude (2300 meters, 7500 feet) and severe air pollution present a special risk to persons with a tendancy to respiratory illnesses. Medical facilities are good.

Schools: Good. There are international schools teaching in French, German and English through 12th grade.

Housing: Poor. Housing is in extremely short supply; apartments often need to be re-equipped.

Goods and services: Fair. Food is in good supply at reasonable prices. There are water shortages; electric supply is uncertain during some seasons.

Local staff availability: Good.

Recreational and cultural opportunities: Good.

Special factor: The national agricultural university, at Chapingo, and CIMMYT, at El Batan, are within 30 miles or so of Mexico City.

NAIROBI

Population: 800,000.

Per capita GNP: $250 (*This is for Kenya).

Cost-of-living index: 99.

Telecommunications: Nairobi telephone service is adequate. Excellent service is available via satellite to the United States. Telepgraphic service to all parts of the world is fair.

International air travel: Nairobi is an international air center. There are frequent flights to any place in the world. Excellent air connections within Africa as well as to Europe and North America. Somewhat limited direct flights elsewhere.

Climate: Nairobi has four distinct seasons, but the overall temperature changes are moderate:

mid-December-March: mainly sunny and warm by day and cool at night. Generally dry.

April and May: the main rainy season with lower daytime temperatures.

June-September: mainly dry, but often cloudy and cool. Very cc l nights.

October-November: short rainy season. Long sunny periods with warm days and cool nights.

The average temperature range is 51 F to 79 F year-round. The average rainfall is about 34 inches, although it varies widely from year to year.

Health conditions: The pleasant climate and modern public health facilitie within the city reduce the risk of contracting the tropical diseases which are commonly found elsewhere in Africa. The boiling of drinking water and elaborate cleansing of fresh vegetables is not necessary within Nairobi. Local hospitals are acceptable for the treatment and diagnosis of most illnesses. There are some limitations in providing complete medical care. Most medications and drugs are available.

Housing: Good. Nairobi is noted for its residential areas of beautiful housing and gardens. Houses and apartments have standard amenities.

Goods and services: All basic services are available. Some goods are more expensive than in the United States and others are less expensive.

Local staff availability: Good.

Schools: The Kenyan education system follows the British curriculum. The standard American curriculum is offered by the International School of Kenya through the 12th grade.

Recreational and cultural opportunities: Good. Nairobi offers a good rang of cultural institutions and activities.

NEW DELHI

Population: 4 million (with Delhi).

Per capita GNP: $140

Cost-of-living index: 82.

International air travel: There are moderately good air connections from Delhi to other cities of Asia, to Europe (about 60 direct flights a week) and to North Africa and the Near East (about 25 flights). There are only 12 direct flights a week to North America, two to sub-Saharan Africa, and none to Latin America and Australia.

Climate: Hot and dry. The average daily high temperature throughout the year is 32 C (89 F); during seven months of the year, the daily high temperature is over 32 C (90 F), and during two of these the average high is more than 38 C (100 F). Average daily low temperatures during the year is 18 C (65 F). Rain falls on only about 35 days a year.

Health conditions: Poor. Intestinal disorders are common, and malaria is endemic. Hepatitis, typhoid and other water-borne diseases are common. Tap water must be boiled before drinking. Good doctors are available in New Delhi. Dental care is less good, hospital facilities are poor, and drugs are of uncertain quality, since adulteration is common.

Schools: Fair. International schools are available through the eighth grade; schools offering teaching through the 12th grade exist within easy travel.

Housing: Fair. Household equipment is scarce and expensive.

Goods and services: Poor. Food is plentiful and inexpensive. Household goods are in short supply. Water pressire is low, and electric voltage fluctuates, causing problems with automatic equipment.

Local staff availability: Good.

Recreational and cultural opportunities: Fair.

Special factor: The graduate school of agriculture administered by the Agricultural Research Council is in greater New Delhi and engages in agricultural research there.

RIO DE JANEIRO

Population: 5.5 million.

Per capita GNP: $1,030.

Cost-of-living index: 105.

Telecommunications: Fair. Telephones are scarce and service is mediocre. International and domestic telegraph service is good.

International air travel: Frequent direct flights connect Rio to destinations in Europe (about 80) and North America (about 50), but service to other regions is poor or non-existant: there are about 15 direct flights a week to sub-Saharan Africa, only three to Asia and none to North Africa and the Near East.

Climate: Temperate and pleasant. The annual average of daily high temperatures is 23 C (73 F), of lows 21 C (69 F); four months a year (December through April) have average daily highs between 27 C (80 F) and 29 C (85 F). Rain falls on about 125 days a year.

Health conditions: Fair. All water for consumption must be boiled. Parasitic intestinal infections and viral hepatitis are risks. Hospital and medical facilities are satisfactory. Medical and dental care are good; pharmaceutical drugs are in good supply.

Housing: Fair to poor. Few detached houses are available; moderately priced apartments are in poor locations.

Goods and services: Good. Food and consumer goods are plentiful.

Local staff availability: Fair.

Recreational and cultural opportunities: Good.

Special factor: There are a university agricultural faculty and an experiment station in the vicinity of Rio.

SINGAPORE

Population: 2.3 million.

Per Capita GNP: $2,580.

Cost-of-living index: 99.

Telecommunications: Telephones work better than in any other major Southeast Asian city. Only short waits for installation of new phones. International connections are usually excellent and rates relatively inexpensive. Plans are being completed in the near future for direct dialing to the United States. Commercial telegram service is available and reliable.

International air travel: Singapore is a hub of air and sea transport. It is served by over 29 airlines with good direct flights to U.S., Asia and Europe.

Climate: Seasons in Singapore are nonexistant. The mean high temperature is 82 F and the mean low is 77 F. The humidity level is high (it averages 70%) and the annual rainfall is 96 inches.

Health conditions: The tropical climate seems to foster diseases; germs and viruses thrive here. But malaria is not a problem. Singapore is probably one of the cleanest cities in Asia. Water is potable and is in good supply. Locally purchase food causes no ill effects.

Medical care: Facilities in Singapore are adequate for most health problems. Competent specialists in almost every field can be found in the city and excellent dental care is also available.

Schools: Singapore has 2 universities, both of which teach in the English language. The Singapore American School provides schooling through the 12th grade. Teaching is also available in Chinese and French.

Housing: Good, although more and more detached houses are being condemned and the property being rezoned to allow the construction of multistory apartment houses. Therefore, this type of housing is becoming scarce.

Goods and services: Good. Almost anything is available in Singapore. Toiletries and costmetics are available, but more expensive than in the U.S.. There is someone somewhere in Singapore who can fix almost anything. Craftsmanship is at a much higher level and at a much lower cost than in the U.S..

Local staff availability: Good.

Recreational and cultural opportunities: Good. Singapore arts are as varied as its cultural heritage. Sports opportunities are also readily available.

Special factor: Singapore Science Center is devoted to the promotion of interest in science and offers exhibitions, research facilities and public lectures as well as a venue for science and other conferences. Singapore is a member of the Association of Southeast Asian Nations (ASEAN).

WASHINGTON

Population: 3.1 million (metropolitan area).

Per capita GNP: $7,120.

Cost-of-living index: 94.

Telecommunications: Good.

International air travel: Washington has many direct flights to destinations throughout America and is well connected to Europe (more than 70 direct flights a week) and Latin America (about 35 flights), but direct connections are poor or lacking to sub-Saharan Africa (no direct flights, Asia (14 direct flights) and Australia (no direct flights).

Climate: Hot and humid summers, cold winters. Average daily high temperature in the summer months (June-August) are around 30 C (86 F), and temperatures in the winter months (December-February) are below freezing. Rain or snow falls on about 125 days a year.

Health conditions: Good.

Schools: Good. Instruction in major European languages is available through 12th grade, and middle schools are well equipped to prepare students for entrance to superior American and European universities.

Housing: Good. Houses and apartments are in good supply, and the housing market is well organized.

Goods and services: Good.

Local staff availability: Good.

Recreational and cultural opportunities: Good.

Special factors: Proximity to the headquarters of the World Bank Group and of the Inter-American Development Bank, the Secretariat of the CGIAR, the U.S. Department of Agriculture, and the Brookings Institution.

The University of Maryland, with a large agricultural facility, and the big U.S. agricultural experiment station at Beltsville, Maryland are both on the outskirts of Washington.

ANNEX VI, continued

CITY	U.N. COST OF LIVING INDEX	WEEKLY DIRECT INT'L FLIGHTS	TELE-COMMUNICATIONS	HEALTH CONDITIONS	SCHOOLS	HOUSING	GOODS & SERVICES	LOCAL GEN. SERV. STAFF	RECREATION
ABIDJAN	120	40	Fair	Poor	Good	Poor	Fair	Fair	Good
BANGKOK	78	80	Fair	Poor	Good	Good	Fair	Good	Good
CAIRO	94	245	Poor	Poor	Good	Poor	Poor	Good	Good
MANILA	94	120	Good	Fair	Good	Good	Good	Good	Good
MEXICO CITY	79	75	Good	Fair	Good	Poor	Fair	Good	Good
NAIROBI	99	100	Fair	Good	Good	Good	Good	Good	Good
NEW DELHI	82	100	Poor	Poor	Poor	Fair	Poor	Good	Fair
SINGAPORE	99	175	Good	Good	Good	Good	Good	Good	Good
RIO DE JANEIRO	105	150	Fair	Fair	Good	Fair	Good	Fair	Good
WASHINGTON	94	130	Good	Good	Good	Good	Good	Good	Good

ANNEX VII: COMPUTER SERVICES

By Patricia Tillman
Coordinator of Statistical Services, IFPRI

The vast majority of research papers produced at IFPRI have made use of either computer-produced reports on agricultural data or statistical packages and computer models to obtain the needed research results. Because IFPRI has been able to build its own computerized data and program library as well as using the standard statistical packages common to many computer installations, the research work at IFPRI is somewhat dependent upon access to proper computing facilities. The availability, in either computerized or non-computerized form, of data from many different sources, worldwide, is not so much a problem in relocating IFPRI as is the availability of a high level of facilities of prepare and manipulate the data.

IFPRI presently makes use, on a time-sharing basis, of a DEC-10 system at the Brookings Institution. It consists of a PDP-10 central processing unit, 3 magnetic tape drives, 4 disk drives, 2 line printers, a remote hook-up modem, a card puncher and reader and a plotter. IFPRI leases its own remote job entry terminals. The system, in fiscal year 1978/79, was used on an average of 150.3 hours per month, for an average of 15.3 jobs per working day. These figures reflect both the interactive nature and the ready accessibility which characterize IFPRI research work vis a vis computer usage, and a preliminary study was therefore undertaken to determine the possibility of access to facilities of the same sort should IFPRI relocate.

The principle effects which relocating the Institute might have on the computer side of research work would probably be to increase the amount of time a job would take and to limit, in some cases, the kind of work which could be done should a different system have to be used. The survey was only designed to give a basic idea of which kinds of equipment and programs were available in each of the nine cities and is, by no means, a completely comprehensive report. It does, however, give some indication as to the relative ease with which IFPRI could continue to do the same kind of work in each of the cities chosen.

It will be noted that the overall ratings (final column) indicate that computer facilities are distinctly better in Washington than in the other 9 cities under consideration. Washington, rated at 99, is followed by Rio de Janeiro at 89.5, Singapore at 60.8, and the other locations follow this.

City	Computer[a.] Availability Factor	Service Factor [b.]	Access Rating [c.]	Cost Factor [d.]	Total [e.] (Basis of 100)
Abidjan	12	4	4	7.8	14
Bangkok	16	2	2	12.0	16
Cairo	9	2	3	10.0	12
Manila	23	6	6	10.0	22.5
Mexico City	61	12	14	11.9	49.5
Nairobi	9	2	2	9.5	11.3
New Dehli	45	8	9	11.5	36.8
Rio de Janeiro	134	18	18	8.9	89.5
Singapore	77	18	17	9.5	60.8
Washington, D.C.	150	20	18	10.0	99

a. Computer availability factor- sums of the numbers and kinds of computers times a weight for the types of installations already in the city: DEC= 5 IBM= 3 UNIVAC= 2; Service Bureau= 3 Research Institute or University= 2 Government= 1.

b. Service factor- 2 points for each field service office or branch office in the area.

c. Access rating- Sums of points for types of facilities ranked as to their willingness to sell time and ability to provide computing services.

d. Cost factor- Cost of living factor applied to probable rates in the area with Washington, D.C. as base.

e. Sum of columns a,b,c,d/2.

*Sources of information: Conversations with appropriate personnel at Digital Equipment Corporation, IBM, and Univac, as well as consultants at the Brookings Institution, and Mr. George Sadowski, Technical Advisor in Computer Methods for Developing Countries at the United Nations in New York.

ANNEX VIII: ESTIMATED COSTS OF MOVING FROM WASHINGTON, INCLUDING COMPUTER DATA TRANSFER

Four items concern the cost elements which would be involved in moving the Institute from its current location in Washington.

1. Cost of physical move (office and staff) (See Table II on page 41.)

2. Cost of installation. No estimate is given, as the funds required would vary greatly according to a host country's contribution or lack of contribution.

3. Cost of computer conversion. The computer currently used by IFPRI is a DEC-10 located at Brookings Institute. In order to move IFPRI to another location, it would be necessary to convert current programs, even where a DEC-10 computer is available (this is due to the nature of the programs and the existance of certain software packages). For maximum control over the conversion process, Washington would be the most likely location for the conversion. A DEC-10 computer (most compatable) is available in Mexico City, New Delhi, Rio de Janeiro and Singapore. IBM computers (next compatable) are located in Abidjan, Bangkok, Cairo, Manila and Nairobi. It has been estimated that it would take one person approximately 3 months (full-time) to convert to another DEC computer and approximately 6 months (full time) to an IBM. The cost would be as follows (estimate):

DEC -- \$ 9,500 to \$12,000

IBM -- \$16,500 to \$19,500

4. Severance arragements. It is the current policy of IFPRI to pay the following when an employee is terminated (pay may be substituted for notice when it is in the best interests of the Institute):

i) Professional staff recruited from outside the U.S. -- 2 months.

ii) Professional staff recruited from within the U.S. -- 1 month.

iii) Non-professional staff -- 2 weeks.

While this is the current policy, it should be noted that it would depend upon the Board of Trustees to determine what procedures would be followed in the case that the Institute were to move from Washington.

TABLE II. ESTIMATED COST OF PHYSICAL MOVE: STAFF AND OFFICE[1]

CITY	LOW (30 PERSONS)[2]	HIGH (45 PERSONS)[2]
ABIDJAN	$501,910	$715,615
BANGKOK	$575,410	$820,465
CAIRO	$634,500	$903,750
MANILA	$470,600	$670,400
MEXICO CITY	$286,500	$408,750
NAIROBI	$701,900	$1,000,850
NEW DELHI	$630,110	$897,365
RIO DE JANEIRO	$491,760	$701,565
SINGAPORE	$362,900	$514,850

[1] Cost figures submitted as rough estimates by Security Storage of Washington. These are estimates of the physical move based on staff configurations indicated with an average of 7,000 lbs. per person and a total of 40,000 lbs. for IFPRI office contents. Figures also include cost to move 1 car per person and 4 cars for IFPRI use.

[2] These figures represent a range of possible costs involved in a move. It is impossssible at this time to ascertain with any amount of certainty exactly which IFPRI employees would be moved, therefore a range is presented.

ANNEX IX: ESTIMATED OPERATING COSTS OF IFPRI IN WASHINGTON AND 9 OTHER CITIES

	ABIDJAN	BANGKOK	CAIRO	MANILA	MEXICO CITY	NAIROBI	NEW DELHI	RIO DE JANEIRO	SINGAPORE	WASHINGTON
SALARIES[1]										
Senior Staff[7]	1,245,533	643,864	797,005	797,005	682,143	845,290	682,143	893,590	872,892	797,005
Scientific and Supervisory Staff[8]	276,825	86,895	85,995	89,685	153,465	184,995	91,005	217,200	148,545	247,000
Support Staff[9]	174,192	72,448	60,720	53,648	130,816	97,536	43,360	115,152	92,352	186,080
TOTAL SALARIES	1,696,550	803,207	943,720	940,338	966,424	1,127,821	816,508	1,225,942	1,113,784	1,230,705
CONSULTANTS	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
EMPLOYEE BENEFITS[2] (@24% of salary)	299,525	229,523	226,492	225,680	259,508	259,038	223,528	271,045	249,096	295,069
HOME LEAVE AND RECRUITMENT	135,000	135,000	135,000	135,000	135,000	135,000	135,000	135,000	135,000	135,000
STAFF TRAVEL	153,375	153,375	153,375	153,375	153,375	153,375	153,375	153,375	153,375	102,250
COMPUTER[3]	95,745	62,205	75,000	75,000	63,030	78,990	65,423	83,775	78,990	75,000
WORKSHOPS, LIBRARY[3] AND PUBLICATIONS	261,753	170,141	205,039	205,039	172,315	215,947	178,856	229,029	215,947	205,039
BOARD	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000
PROFESSIONAL FEES	21,600	21,600	21,600	21,600	21,600	21,600	21,600	21,600	21,600	21,600
RENT[4] (9920 sq.ft.)	(120,000)	30,752	23,510	(23,510)	119,040	47,318	(15,000)	60,214	(47,318)	109,150
COMMUNICATIONS[3]	37,021	24,064	29,000	29,000	24,372	30,543	25,297	32,393	30,543	29,000
SUPPLIES[3]	33,192	21,575	26,000	26,000	21,850	27,383	22,680	29,042	27,383	26,000
MISCELLANEOUS[3,11]	78,383	55,150	64,000	64,000	55,701	66,766	57,360	70,084	66,766	52,000
CAPITAL EXPENDITURES[10]	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	30,000
TOTAL BUDGET[5]	3,104,144	1,878,592	2,074,736	2,070,542	2,163,585	2,335,831	1,886,627	2,483,499	2,311,802	2,424,813[6]

[1]Salaries are based on present gross pay. Where more than one person employed in a similar position, current salaries are averaged. Salaries reflect International Civil Service Commission post adjustments for each city ("Consolidated List of Post Adjustments," U.N., June 1, 1979). For secretarial positions, United Nations' policy of hiring locally is followed -- salaries are derived from U.N. documents listing local employees' compensation.

[2]Employee benefits are based on gross pay before post adjustment in accordance with U.N. policy; 24% is actual present IFPRI benefit package.

[3]These categories reflect cost-of-living adjustments, with Washington as a base. Cost-of-living figures are derived from "Monthly Bulletin of Statistics," U.N., March 1979, Vol. 33, #3. They are as follows: Abidjan -- 120, Bangkok -- 78, Cairo -- 94, Manila -- 94, Mexico City -- 79, Nairobi -- 99, New Delhi -- 82, Singapore -- 99, Rio de Janeiro -- 105, Washington -- 94.

[4]With the exception of those figures in brackets, the rents listed are those paid by UNDP in each city for a comparable amount of space as currently occupied by IFPRI. Figures in brackets are estimates based on the cost-of-living indeces and are not necessarily reflective of rent in those cities (UNDP receives office space free-of-charge from the host government in these cities).

[5]Based on proposed budget for 1980 and with staff configuration expected during 1980.

[6]IFPRI approved budget for 1980 as presented to the CGIAR.

[7]Presumably all internationally recruited staff.

[8,9]Presumably all locally recruited staff. Salaries based on UNDP figures for local employees' compensation.

[10]Includes purchase price of 4 cars for use of IFPRI staff on official business in locations other than Washington.

[11]Includes operating cost for 4 cars for IFPRI official business in locations other than Washington.

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THE INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE (IFPRI) AND ITS RELATIONSHIP TO JAPAN

J. Mellor, Director

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The International Food Policy Research Institute (IFPRI) is a new institute in the CGIAR system from which research results are only just beginning to flow. IFPRI was established to identify and analyze alternative national and international strategies and policies for meeting food needs in the world, with primary emphasis on low-income countries and on the poorer groups in those countries.

IFPRI's policy oriented research stresses alternative development strategies from the viewpoint of their implications for food production and consumption; food production processes, particularly the role of technological change in agriculture; food consumption issues, particularly as they relate to lower-income groups; and international food trade, aid, and food security. Although its 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.

In the pursuit of its task IFPRI works closely with other institutions of the CGIAR system, given the central role of improved technology in achieving food production goals, the need for careful study of the possible social and economic consequences of new technology, and the crucial importance of identifying linkages and interrelationships between the actions of farmers in its adoption and effective use and national and international policies which either constrain or encourage successful innovation. As much as possible, IFPRI's research is carried out in collaboration with national research organizations pursuing similar lines of inquiry.

Consistent with its mandate, IFPRI's Board of Trustees is half from developing countries and half from developed countries. Close to two-thirds of the senior research staff is from developing countries. The Institute is located in Washington, D.C. to facilitate access to data and data processing (particularly from the World Bank and IMF), to facilitate interaction with the broad range of Third World policymakers and researchers who visit the international institutions, as well as IFPRI, and to attract top level staff particularly from developing countries.

IFPRI has a major interest in expanding the capacity of developing country personnel to conduct policy research. It pursues this objective through collaborative research projects which provide intensive interaction at all stages of research with senior IFPRI researchers. Our largest such effort is in the Asian countries, with Indonesia forming the largest component. The topic of this research is Rice Policy and includes work on trade, buffer stocking, irrigation, fertilizer and consumption policies. The output from this research will provide a comprehensive policy package. IFPRI collaborates with IRRI and IFDC, facilitating particular emphasis on the role of new rice technologies. The work on Southeast Asia of Professor Yujiro Hayami, Dr. S. Hirashima and other Japanese scientists provides a major portion of the current base upon which this research is built. The large complex network of researchers in Asian countries being built by the Rice Policy Project, offers a useful point of contrast for Japanese researchers in related fields.

IFPRI's research output is integrated into four policy thrusts. Our work on national and international food imbalances diagnoses the need for other programs. IFPRI works very closely with FAO in this work. Because of the particular deficiency in production and consumption data for the People's Republic of China, IFPRI has made a comprehensive analysis of the food situation in China and is now completing a compendium of statistics. Work is continuing on China's agricultural price policy. IFPRI's senior researcher on China has worked very closely with Professor Ishikawa and is heavily indebted to him for his insights on China. IFPRI's overall work on trends portrays an exceedingly tight world food situation over the next few decades deriving particularly from the growing importance of fast growth developing countries.

IFPRI's production policy thrust emphasizes inputs, particularly irrigation and fertilizer. The irrigation effort is concentrated in Southeast Asia and will provide intensive back up knowledge complementary to the seminal Trilateral Commission report for which Japanese scientists have provided the major insights and efforts. The fertilizer work relates to the rapidly changing global fertilizer supply situation and addresses questions as to how developing countries and the international research system should respond to rapidly changing quantities and sources of fertilizer supply. Japan, of course, remains a significant element in this highly dynamic situation. The production policy effort is also expected to undertake analysis of the best allocation of agricultural research resources.

IFPRI has a major research effort on development strategy to ascertain how best to integrate a technologically dynamic agriculture into achieving broad societal objectives. The first published work in this program won the prize for distinguished research from the American Agricultural Economics Association. That research developed and applied a complex model to the economy of Japan -- facilitating the learning of developing countries from the Japanese case which is generally recognized as the best example of a dynamic agriculture playing a major effective role in overall development. Of course, the foundation work of Professor Ohkawa and other Japanese scientists entered heavily into this effort.

One of the most critical issues facing the world is how the increased production from new agricultural technology can be converted into stable adequate food supplies for the vast numbers of greatly deprived people in developing countries. IFPRI's research on development strategy; on trade; on international food security schemes; on nutrition; and on food consumption policies; as well as critical elements of the production policy work all focus on this question. Several projects in Bangladesh bear on the nutritional impact of a wide range of programs including food for work programs.

IFPRI's research output flow is just beginning and is now leading to programs for interaction with policymakers in developing countries so a to play a direct role in improving policy as well as to keep our research fully abreast of policy issues. IFPRI expects increasing calls for such interaction as exemplified by the requests and continuing contact with the Presidential Office, Government of Mexico. Developing relations in the Philippines, Thailand, and Indonesia point to a close interaction as soon as IFPRI's research results have progressed sufficiently to provide assurance of direct value.

IFPRI's most immediate financial needs are to increase support to existing staff to efficient levels, calling for an increase of 10 percent in budget, and, bringing the research staff to the optimal size of 25 persons, reflecting a further 20 percent increase. That will bring IFPRI to its mature phase. The additions to staff will allow development of an energy component to the research; research on research resource allocations; and, broader coverage of consumption policy. In addition, IFPRI requires support for collaborative research in developing countries with the dual objective of generating new knowledge and training researchers. The rice policy project with Asian countries particularly needs such support. The effectiveness of the work of Japanese researchers is particularly apparent in our work in Southeast Asia, and the People's Republic of China, and we look forward to growing interaction in these and other areas.

国際食糧政策研究所

Control No. C-37/81

国際食糧政策研究所（IFPRI）はCGIAR（国際農業研究協議グループ）の制度の下に新設された研究機関で、その研究成果は漸く発表されるようになったばかりである。IFPRI創設の趣旨は世界の食糧の必要を満たすための種々の国家的、国際的な戦略、ないし政策を検討、分析すること、特に所得水準の低い国々、それ等国々の貧困者層に重点をおいてそれを行なうことである。

IFPRIの研究は政策志向であり、開発戦略の諸代案を特に食糧生産と消費の観点からみて、それがどのような意義を持つかに重点をおいてなされているが、特に農業における技術の変化、食糧消費問題、とりわけ低所得者層に関連した消費の問題、国際食糧品貿易、援助、食糧の確保、がその対象となっている。研究努力は飢餓と営養不良の解消という明確な目標の達成に向けられているけれども、関連する要素は多岐にわたるものがあり、基本をなす種々の加工法の分析が必要とされ、その範囲は狭義に定義される食糧の分野を超えるものである。

その課題を達成するにあたってIFPRIはCGIAR制度の中にある他の諸機関と密接に提携しており、食糧生産目標達成のための改良技術、また新技術が社会、経済的にもたらす影響を慎重に研究する必要性、農家が新技術を採用して効果的にそれを使用した場合、その作用と国の政策、国際関係政策との結び付き、相互関係が

革新を阻害させるか、あるいは成功裡にそれを促進させるかのいづれになるかを見きわめる決定的な重要性に中心的な役割を与えられている。できる限りIFPRIの研究は似かよったテーマの研究をしている国立研究機関と協力態勢をとって行なわれている。

その規則に従って、IFPRIの評議会はその半数が開発途上国から、残りの半数が開発国からの代表で構成されている。上級研究職員の3分の2近くは開発途上国の出身である。研究所の所在地はワシントンDCであるが、それはデータ、データ処理(特に世界銀行とIMFより出るもの)を容易に利用できるよう、また国際機関を訪れる広汎な分野の第三世界の政策決定者や研究者との交流、接渉に便利なためであり、また特に開発途上国からの最高レベルのスタッフを招くためである。

IFPRIは開発途上国関係者の政策研究の能力開発に主要な関心を持っている。この目標をIFPRIはそのあらゆる研究段階において上級研究者との強力な相互作業を要する協力研究プロジェクトを通して追求している。このような努力のうち最も大きなものはアジア諸国を対象としているが、中でもインドネシアがその最大の要素となっている。この研究のテーマは稲作政策(Rice Policy)で、これは貿易、非常用手持ち在庫、灌漑、肥料、ならびに消費政策に関する研究を含むものである。この研究の成果は広汎な内容の政策手段の包括案となるものである。IFPRIはIRRIおよびIFDCと協

力しており、新しい米の栽培技術の果す役割を特に強調することを容易ならしめている。

東南アジアについてのハヤミ・ユージロウ教授、S・ヒラシマ博士、その他の日本人科学者の研究が現在行なわれているこの研究の基礎の主要な部分を占めている。稲作政策プロジェクト(Rice Policy Project)により現在アジア諸国の研究者から成る大がかりなネットワークが形成されつつあるが、これは日本の研究者にとってはそれぞれ関連の分野における有用な比較対象の接点となっている。

iFPRiの研究成果は4つの政策推進力として統合されている。われわれの国家レベル、および国際レベルの食糧のアンバランスに関する研究の成果は他の研究プログラムの必要性を診断する上に役立っている。この研究についてはiFPRiはFAO(国連食糧農業機構)と緊密に提携している。中国の食糧生産と消費のデータは特に不足しているので、iFPRiでは中国の食糧事情を巾広く分析した。現在その統計の大要をまとめつつある。中国の農業価格政策についての研究は目下続行中である。iFPRiの中国担当の上級研究者達は石川教授と非常に緊密に共同作業を行ない、教授の中国に対する洞察力にはきわめて感謝している。iFPRiの総合的な傾向の研究は今後二、三十年先の将来の極めて逼迫した食糧事情、特に急速に発展しつつある国々の持つ重要性が益々高まることに起因する事情を指し示している。

IFPRIの生産政策についての関心は投入，特に灌漑と肥料のそれに強調点を置いている。灌漑の努力は東南アジアに集中して注がれており，日本の学者が主としてその洞察力と努力を貢献している基本的な三国委員会報告書（Trilateral Commission report）に更に補完的な知識を豊富に提供することになろう。肥料に関する研究活動は世界的に急速に変化しつつある肥料の供給事情と関連しており，開発途上国や国際研究システムが肥料供給の急速に変る量と供給源にどのように対応すべきかという問題を取り上げている。もち論日本はこの高度に流動的な情勢においては今後とも重要な要素としてその役割を果すことになろう。生産政策に関する研究努力は農業研究資源の最善の配分を分析することにも傾注されることになっている。

IFPRIでは技術的に流動的な農業を統合して広汎な社会的目標を達成するために，それをどのように統合するのが最適であるかを確かめるための開発戦略を対象として主要な研究努力をしている。この研究プログラムで最初に発表された報告書はその卓越した研究を認められて，アメリカ農業経済協会より賞を与えられた。その研究は日本経済の複雑なモデルを作り，応用したもので，一般的に流動的な農業の全般的な開発の上に大きな効果的な役割をなしている最好例として認められている日本のケースが発展途上国が学びやすいようにしたものである。もち論，この研究には大川教授はじめ他の日本の科学者の基礎研究の成果が取り入れられている。

世界が直面している急務の問題の一つは新しい技術が生み出す生産の増加分をいかに発展途上国の多数の貧窮者のための安定した充分な食糧供給に振り向けるかということである。IFPRIの研究は、それが開発戦略、あるいは貿易、国際食糧確保計画、営養、食糧消費政策、または生産政策の重要な側面に関するものであれ、すべてこの問題に焦点が当てられている。バングラディッシュで行なわれている特別プロジェクトは、作業プログラムを含む広範囲のプログラムに及ぼす営養の影響に関するものである。

IFPRIの研究結果の発表がなされ始め、今や発展途上国の政策決定者との相互連系プログラムに結び付きを持って、政策の改善に直接の役割をなすと同時に、われわれの研究を政策に後れを取らない、それに適合したものにしている。IFPRIは、例えばメキシコ政府の大統領府から要請と、その後も継続して接触を得ているが、このような相互連系、作用を求める需要が益々増大してくることを期待している。フィリッピン、タイ、インドネシアとの連系関係が深まっているが、これはIFPRI研究成果が充分に発達して直接に役に立つ価値のあることが認められ、それに基づいて緊密な相互連系が行なわれていることを指し示している。

IFPRIの現在の財政的必要は現存の職員への援助を充分なレベルに高めることである。このためには予算を10パーセント増やし、研究スタッフを更に20パーセント増

員して総勢を最適規模である25名にすることが必要である。これを達成することによりIFPRIを成熟した段階に育て上げることができる。研究職員を増員することは研究にエネルギー面、研究資源配分の研究、そして消費政策を広汎にカバーするという側面を追加して研究所を充実させることになる。加えてIFPRIは、新しい知識を生み出すことと研究者を訓練するという二重の目的をもって発展途上国で行なわれている協力的研究に対する支援を要請するものである。アジア諸国と協力して行なっている稲作政策プロジェクトは特にそのような援助を必要としている。日本の研究者の研究が効果的であることは特に東南アジア、中国におけるわれわれの研究に顕著に認められ、われわれはこれらの地域はじめ他の地域においてもこの種の相互連系が益々増えることを願うものである。