

THE NEW GLOBAL CONTEXT FOR AGRICULTURAL RESEARCH -
IMPLICATIONS FOR POLICY

by
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Opening Remarks

I am grateful to the Chairman of the group and to the group itself for this opportunity to address you. You may recall, the External Program Review (EPR) for IFPRI made two recommendations that provide the basis for this address. First, it recommended that the Director of IFPRI should address the group biennially on a policy issue of relevance to the group. This will be the second occasion for me to do so. Second, the EPR urged that the Director of IFPRI make carefully considered extrapolations from the factual base of IFPRI research as well as that of others, to draw policy conclusions of immediate relevance to the complex food policy problems facing our society. The need for such extrapolation is particularly the case today -- events have outrun the global capacity for food policy research and hence we must extrapolate with particular vigor, care, and risk.

While through my Board, staff, and normal travels I have been exposed continuously to developing country views on the issues I will touch on this morning, I am particularly grateful to NOMISMA, Winrock Foundation, and the Ditchley Foundation for the opportunity to participate in recent meetings in Italy, the U.S.A., and the U.K. that brought home to me how important, difficult, and delicate the issues I will treat this morning are. I no longer find it surprising that the facts of the global food situation are as contentious as the extrapolations. Particularly on the latter, I hope I convey the genuine humility and concern that I feel.

My message is a simple one: of thanks, for the bounteous harvests in much of the world; of concern, that complacency will diminish that bounty; and of apprehension, that the extreme complexity of the task of using that bounty to banish hunger will turn us away from the policies for its sustainment and utilization.

* Address presented at International Centers Week, November 3-6, 1986, Washington, D.C. I am grateful to Tom Harrington and David Chesser for providing the data and tables, and Tom Harrington for assistance in preparing the text.

Introduction

The current appearance of food abundance is in sharp contrast to that of a decade ago when the CGIAR was in its apotheosis. Global cereal stocks in the mid-1980s have been more than twice as large as in the mid-1970s. Real, world cereal prices were down 30 percent in 1985 from 1981, compared to an almost twofold increase from 1972 to 1974. Real fertilizer prices have fallen to the lows of the late 1960s after having more than quadrupled in real terms from 1971 to 1974. Lack of natural gas feedstock is now a much less worrying problem than inadequate investment in fertilizer production. The focus of food shortage has switched from Asia to Africa.

Finally, many developing countries are diverted from long-term development efforts by overwhelming debt problems and the need for major adjustments in foreign exchange rates and their national budgets.¹ Reflecting these changing times, the budget of the CGIAR system in terms of 1986 dollars grew by \$17 million per year from 1973 to 1980 and by \$1.2 million per year from 1980 to 1986.²

Two years ago I discussed the importance and difficulty of transferring the concepts of agricultural success from Asia to Africa. That challenge in Africa and in all developing countries persists. Today, however, I focus my remarks on the dynamic global food supply/demand balance, an area currently of major concern that links the interests of developed and developing countries and has important implications for foreign assistance and agricultural research policy.

Underlying Trends

For the period 1961-80, developing countries' cereal production has grown at an annual rate of 2.9 percent per year; consumption has grown at the considerably faster rate of 3.2 percent per year.³ Hence, net annual cereal imports of the developing countries have increased more than fourfold in twenty years from about 15 million tons to 64 million tons.⁴

Cereal imports to developing countries grew slowly in the 1960s and then accelerated sharply after 1972, with that accelerated growth showing no sign of decline, at least to 1984.⁵ Developing countries have increased their share of total world imports of cereals from a 1961-63 average of 36 percent to a 1981-83 average of 43 percent - an absolute increase of 315 percent. The developing countries represent the only cereal market capable of rapid growth.

For the developed countries, from 1961 to 1980 cereal production grew 3.1 percent per year; consumption at a much slower 2.5 percent per year, with the difference representing the rapidly growing exportable surplus to the developing countries.⁶ Developed country imports and

exports dropped sharply from 1981 to 1984, with a substantial recovery in 1985.⁷

The Future: Projections to 2000

Projection of past trends for food supply and demand, though uncertain indicator of the future, have three features that recommend them: they smooth the effects of short-term influences, such as weather; they illuminate the effects of cumulative forces; and they show potential changes in a country's position from net importer to net exporter, and vice versa, arising from given supply and demand changes. Such projections are particularly revealing for food, for which underlying structural forces of supply and demand change only slowly.

A standard projection to 2000 for developing countries, assuming trends in output and income from the 1960's to 1980s continue, states an increase in staple food crops shortfall (or imports) from 1980 of 40 million tons. 1984 actual net imports were on the projected trend line.⁸

Growth in the demand for livestock product is an important source of growth in demand for basic food staples. While in developing countries waste and by-products initially sustain the bulk of livestock production, accelerated growth of livestock output quickly surpasses the inelastic supply of such feed. Further increments to production are made largely on concentrate feeds, particularly cereals. The above-cited projections assume constant feeding rates in livestock production.

If, however, we project the trend growth of feed use during the base period and further assume market relationships for livestock products at constant relative prices, the production shortfall in developing countries increases by another 40 million tons.⁹ It must be emphasized that this projection of feed use requires a return to the per capita income growth of the 1966-80 period. The debt crises and the structural adjustment crises must be met and passed beyond.

Developing countries have been expanding livestock product imports at a rapid pace. Since livestock production is generally labor intensive, it is logical for developing countries to displace the projected imports with domestic production. Success in such an effort would very conservatively add another 40 million tons to food crop imports.¹⁰

If we sum these favorable circumstances -- in essence developing countries improving their development strategy to return to the growth rates of the 1960s and 1970s -- one would encounter growth in developing country imports at a rate similar to or somewhat higher than in the past two decades.

Three caveats must be noted about use of such projections. First, one must take these numbers in aggregated form and not look at

individual countries. That is because so many of the unpredictable events in the world benefit some and not others - for example, in the 1970s growth in most of the oil producing countries surged ahead, it is said, at the expense of many oil importing developing countries; perhaps the reverse will happen in the 1990s. Countries differ in their natural resources bases -- Argentina and Thailand have very different ratios of people to agricultural production resources than Taiwan or Bangladesh. On all these matters, grouping countries helps us see central tendencies -- at times we do want to see the forest and not the trees.

Second, and very important, when we look at food gaps and trade figures we are looking at small residuals from large consumption and production estimates -- small differences in production and consumption data give relatively large differences in "trade". It is rash indeed to predict trade volumes and their effects on global prices.

Third, we are poorly placed to judge the future effects of pure science breakthroughs in biology on applications to agricultural production. Keep in mind that while such breakthroughs add to demand as well as supply in developing countries, they add only to supply in developed countries.

Theory

Before drawing conclusions, it is useful to briefly outline the theory that lies behind the trends and relationships just presented - it is that theory that gives substantial credibility to such projections. I abstract grossly for brevity.

In developed countries, the food demand is virtually satiated and hence does not increase with income. In contrast, growth in food output is institutionalized through research and various complementary institutions. Without export growth, the benefit of technological change can only be realized by undertaking the socially difficult task of rapidly withdrawing resources (land and people) from agriculture.

In sharp contrast, in developing countries, rising incomes of low income people, derived from employment growth, are converted by remarkably high demand elasticities to increased effective demand for food -- 60 to 80 percent of incremental incomes are so spent. Thus in developing countries increased food supplies and increased employment are two sides of the same coin, one cannot proceed long without the other.

Further, accelerated growth of food production has the potential for setting in motion powerful multiplier forces on income and, especially, employment growth in other sectors. That, coupled with added growth arising autonomously in the other sectors, results in the normal picture of fast growth in basic food staples production being accompanied by even faster growth in consumption.

It is these relationships that make reasonable the remarkable finding that from the late 1960s to the late 1970s, the 29 developing countries with the fastest growth rates in basic food staple production increased their imports of basic food staples by 360 percent in the same period.¹¹ It is this potential for developing countries to expand demand for food faster than even high rates of growth of food production that needs to be understood and nurtured and which offers such exciting prospects for the reduction of poverty and malnourishment.

Implications: Developed Countries

For developed countries, the much larger fluctuations in production reduce the credibility of projections compared to developing countries. However, a simple projection to 2000 of domestic use and production for the period 1961-80 shows an exportable surplus from developed countries more than double the largest projected level of developing country net imports.¹² These estimates assume no diminution of growth rates for livestock feed in the Soviet Bloc from the high levels of 1961-80. That confirms the need for substantial reduction in developed country agricultural production.

Such estimates are extraordinarily fragile. If, for example, with the production growth rate in developed countries were to drop to the level of 1972-83 and consumption growth rates were maintained, then the developed countries would actually become net importers.¹³ Unfortunately while prediction of developed country exports is highly uncertain, it matters immensely to the choice of development strategy in developing countries.

Since the production trends in developed countries are very much subject to policy, it is well to keep in mind the following points.

First, developing countries as a group will prosper more if they do not face rapidly rising food prices driven by their own demand. But, conversely, intermittent dumping on international markets and consequent unpredictable periods of sharply depressed prices are deleterious to developing countries.

Second, demand is much more responsive to price in developing countries than in developed countries; while supply is more responsive in developed countries than developing countries. Thus, to simplify, rising global food prices foster developed country surpluses and reduce demand in developing countries primarily through effects on the poor.

But, third, the pace at which export surpluses are generated in developed countries now appears to be rapid enough to severely depress international prices, suggesting a need for structural adjustments in developed countries despite the rapidly growing Third World market.

Fourth, given the social costs in developed countries of drastically reduced food production and the potentials to raise food demand in developing countries through food aid-based employment growth, it is logical to develop such programs on a much larger scale than at present.

Implications: Developing Country Exporters

There are now few developing country net exporters of food. Two countries Argentina and Thailand, with their very favorable land to person ratios, accounted for 68 percent of total developing country cereal exports in 1979-83 and will be considerably larger exporters by 2000.¹⁴ There are probably one or two other developing countries with similar land resources and export potentials but with unfavorable policies that hold back their agricultural potentials. These few countries are severely injured by food dumping by high income countries.

Poor, high population pressure countries are another story. In projections to 2000, countries with per capita incomes below \$500 strikingly provide 83 percent of developing country net major staple food exports other than those of Thailand and Argentina. In particular, four countries -- China, India, Indonesia, and Pakistan -- account for 71 percent of projected developing country net exports, excluding Argentina and Thailand.¹⁵

Exports of food clearly represent a failure in employment generation and poverty alleviations for countries with per capita incomes below \$500. They have half or more of their population deficient in food intake. The countries in the low income group projected to become exporters tend to be large and populous, to have a high percentage of total GDP in nonagricultural sectors, but a large percentage of total labor force in agriculture -- the former typically twice the latter.¹⁶ Their low per capita GNPs are, in general, increasing slowly. These characteristics suggest that they have capital-intensive investment policies causing low growth in employment, to the particular deprivation of their low income people. A change in investment strategy would foster faster and more equitable growth, accelerated the food production growth rate and change these countries from food exporters to food importers.

Implications: Developing Country Importers

It is notable that virtually without exception developing countries with per capita incomes over \$500 are able to generate demand for food more rapidly than domestic production growth. Developing country importers with per capita incomes less than \$500 also manage to increase employment and hence effective demand more rapidly than production. Of course the least developed countries with the lowest incomes simply have

low growth rates in food production. They are able to use foreign assistance and food aid to keep consumption somewhat higher than would otherwise be possible.

The number one policy need for net food importing countries is an international environment in which food supplies are reliable. If they are to expand employment more rapidly than food production, they must believe, first, that the shortfalls generated by these divergent trends can be met without steadily rising prices. That means there must be a reliable international market. Second, and perhaps even more important, they need to be protected from radical fluctuations in domestic and international supplies. For the latter, one needs a source of international finance such as a well-operating International Monetary Fund cereal facility. Whether enlarged stocks are needed as well is a moot point.

In order for employment growth to increase demand for food more rapidly than domestic supply requires wide participation in the development process is required. This, in turn, requires a rural infrastructure that brings the bulk of the people into close contact with the improved markets and technology necessary for the modernization of agriculture. There also is a need for the development of employment linkages between agriculture and the rest of the economy so that growing agricultural incomes will result in expenditure patterns and responses to those patterns favorable to the growth of rural industry and employment. Agricultural growth through cost decreasing technological change, a product of the CGIAR system, is the basic engine for such growth.

A Note on Foreign Assistance Policy

Foreign assistance policies which support an agricultural production and employment oriented strategies of growth are concurrently favorable to growth and poverty alleviation in developing countries and to increased markets for food exporters. What are the broad policy outlines of such strategies?

First and foremost is investment in agricultural research and its support services to start the engine of growth.

Second is assistance to growth of infrastructure. That is to ensure breadth of participation in growth. In a world of food surpluses, hungry people, and inadequate rural employment infrastructure investment offers immense potential for effective use of food aid, particularly in the low-income countries. It is puzzling that hunger, lack of labor and food resources for building infrastructure, and huge food surpluses can coexist.

Third is increasing food security nationally and internationally. That is needed because a strategy relying on food and employment growth

is terribly vulnerable to the effects of normal fluctuation in food production. Behind all these processes is rapid expansion of trained people -- a high employment strategy of growth is accompanied by extraordinarily rapid growth in demand for educated people at all levels. Foreign assistance has its greatest comparative advantage in helping meet that demand.

Agricultural Research Policy

The new environment of apparent global abundance of food brings somewhat differing requirements for food production research.

First, there must be an even greater emphasis than in the past on reducing costs of production. In Asia, that reductions continue by raising yields per acre. In Africa, the problem is more complex. Labor productivity is the greatest limitation to production in Africa. We can already substantiate that in general the appropriate way to raise labor productivity in Africa is through yield-increasing technology with a particular concern for the effect of such technology on labor productivity.

In Asia, since IRRI's pioneering work generated IR8, we have not seen a major increase in rice yield potential or in the cost of producing rice. In fact real cost of production has been slowly rising over the past decade. Recent efforts have been dedicated largely to maintaining yields at IR8 levels and the benefits of such varieties by increasing its adaptability and improving its resistance to diseases and pests. In this context, one can truly talk about saturation of the rice area with these high yielding varieties. How will growth rates of the recent past be maintained into the next decade or so under these circumstances? That is a serious problem in Asia. All our impression of food abundance will disappear within a decade or two without another breakthrough.

Second, with a more bountiful food supply in the world, we have the opportunity to take more meaningful steps towards sustaining growth in agriculture. On the one hand, we must increasingly shift higher-yielding, more productive farming systems into environments whose ecosystems can sustain such increased intensity. That should allow gradual increase in the proportion of population in more sustainable areas, while concurrently reducing population pressures in areas that cannot sustain arable agriculture. We must ask ourselves what are the implications of this to two related research questions. One is: under what circumstances and by what mechanisms can we use the increased abundance of food in the world to reduce population pressures more rapidly in the areas that cannot support arable agriculture? The other is: should that then push our research resources more towards the perennial grasses and tree crops that can be sustained in such areas?

Third, when the abundance of food is increasing, we must increase the emphasis on maximizing the linkages between agricultural growth and employment growth in nonagricultural sectors. That too requires research. Increasingly, lack of effective demand for food is proving to be a constraint for developing countries with per capita incomes under \$500, in spite of progress in agricultural production. We have done a good job of documenting the existence of linkages between agricultural growth and employment in other sectors, but we have not gone far in diagnosing the policy prescriptions for maximizing the size of those linkages.

Fourth, where food is more abundant, we can turn more vigorously to increasing employment by developing smallholder livestock production. Here we face elastic demand for the product and hence a substantial increase in demand from a small decline in prices. There are, however, clear technical problems, not only in production but also in marketing. Because of the inelasticity of waste and by-product feed supplies, research must have a twofold emphasis on increasing the productivity of grasslands and improving our knowledge about the productive use of concentrate feeds. Any enhancement of livestock production will also help to solve the difficult problem of inferior grains, such as millets and sorghums, and even maize. These which are well-suited to large areas and good possibilities for increasing yields, and yet the demand for them is highly inelastic except for livestock feed.

Fifth, with an increasing abundance of food, we need to focus our attention more on the problems of the poorest countries and the poorest people within those countries. However, these two sets of problems call for somewhat different treatment.

With respect to the poorest countries, there undoubtedly needs to be an emphasis on the better areas within those countries in order to increase the returns to investment in agriculture and to generate the funds for tackling the much more difficult problems of the more backward areas.

With respect to the poorest people in the poorest regions, we need to be much more innovative in developing types of research. We must differentiate clearly between short-term needs to mitigate the problems of the very poor, and longer-term adjustments that can be made as population densities are gradually reduced through more intensive and sustainable development in other areas.

Conclusion

Let us hope that the present abundance of food is not an illusion or a quickly passing aberration. Let us then recognize abundance for the blessing it is, by raising incomes in developing countries with new, cost-effective food production technology, by using food surpluses to support labor-intensive investment in the infrastructure which so

broadens participation in growth, by providing food security measures that reduce the risks to governments of caring about poverty and acting on those cares, and by learning now how to bring the lower income countries to the stage of development where effective demand for food outruns effective agricultural development policies. Thank you for your attention.

Footnotes

1. As cited in "Commentary: The Changing Global Food Scene - Opportunities for Development and Poverty Alleviation," International Food Policy Research Institute, IFPRI Report, Volume 8, Number 3 (October 1986).
2. CGIAR Secretariat
3. Food and Agriculture Organization of the United Nations (FAO), "Production Yearbook Tape, 1984," and "Agricultural Supply Utilization Accounts Tape, 1984" (Rome, 1985).
4. Food and Agriculture Organization of the United Nations (FAO), "Agricultural Supply Utilization Accounts Tape, 1984" (Rome, 1985). Developing countries includes China, the twenty year period referring to 1961-65 to 1979-83 averages of net annual cereal imports.
5. FAO, "Agricultural Supply Utilization Accounts Tape, 1984" (Rome, 1985). The annual growth rate of cereal imports to developing countries changed from 3.0% (1961-72) to 8.1% (1972-83).
6. FAO, "Production Yearbook Tape, 1984," and "Agricultural Supply Utilization Accounts Tape, 1984" (Rome, 1985).
7. FAO, "Agricultural Supply Utilization Accounts Tape, 1984" (Rome, 1985).
8. As cited in Paulino, L. A., Food in the Third World: Past Trends and Projections to 2000, Research Report 52, International Food Policy Research Institute (1986), Table 12, p.42. The projection excludes China, and assumes trend growth in production (1961-80) and consumption (based on per capita income growth trends 1966-80 and FAO elasticities for food and meat consumption).

Major staple food crops consist of cereals, roots and tubers, pulses, groundnuts, bananas and plantains.

9. Paulino, L. A., Table 15, p. 62.
10. Based on discussion and notes from Dr. Sarma.
11. 29 rapid agricultural growth developing countries increased their food imports from 2.37 (1966-70) to 8.57 (1976-80) million metric tons, an increase of almost fourfold.
12. Projections for developed countries were prepared by David Chesser and reviewed by Dr. Paulino. Projections were done for

developed countries as a group and compared production and total domestic use similar but simpler than methodology of Research Report 52--i.e., not based on income elasticities of demand but trend consumption patterns. Feed was projected on a trend; food was projected to remain constant at 1966-80 per capita consumption levels times the expected increased population.

Different base years chosen for production yielded varied outcomes, ranging from a high net surplus of production of 400 million metric tons (1961-80) production trend to a low net deficit of production of 57 million metric tons (1972-83) production trend. When developed countries were projected by regional groupings, the net surplus was 136 million metric tons, reflecting a high rate of feed consumption in Eastern European countries.

13. See footnote 12.
14. Food and Agriculture Organization of the United Nations (FAO), "Production Yearbook Tape, 1984," and "Agricultural Supply Utilization Accounts Tape, 1984" (Rome, 1985), and projections in Paulino, Research Report 52. Argentina is a net exporter of 17 million metric tons and Thailand of 6 million metric tons (1979-83 averages), and they are projected to have net surpluses of 26 and 30 million metric tons respectively, in 2000, or 50% of the total projected net surplus.
15. From data set on individual countries used in preparing Research Report 52. Assumptions of projections are the same as described in footnote 8.
16. Data from World Bank, World Tables, Volumes 1 and 2, (1983).

Figure 1. Trends of Latin American Exports for Developing Countries, 1961-73 and 1973-85.
(1984 & 1985 calculated using USDA data as base)

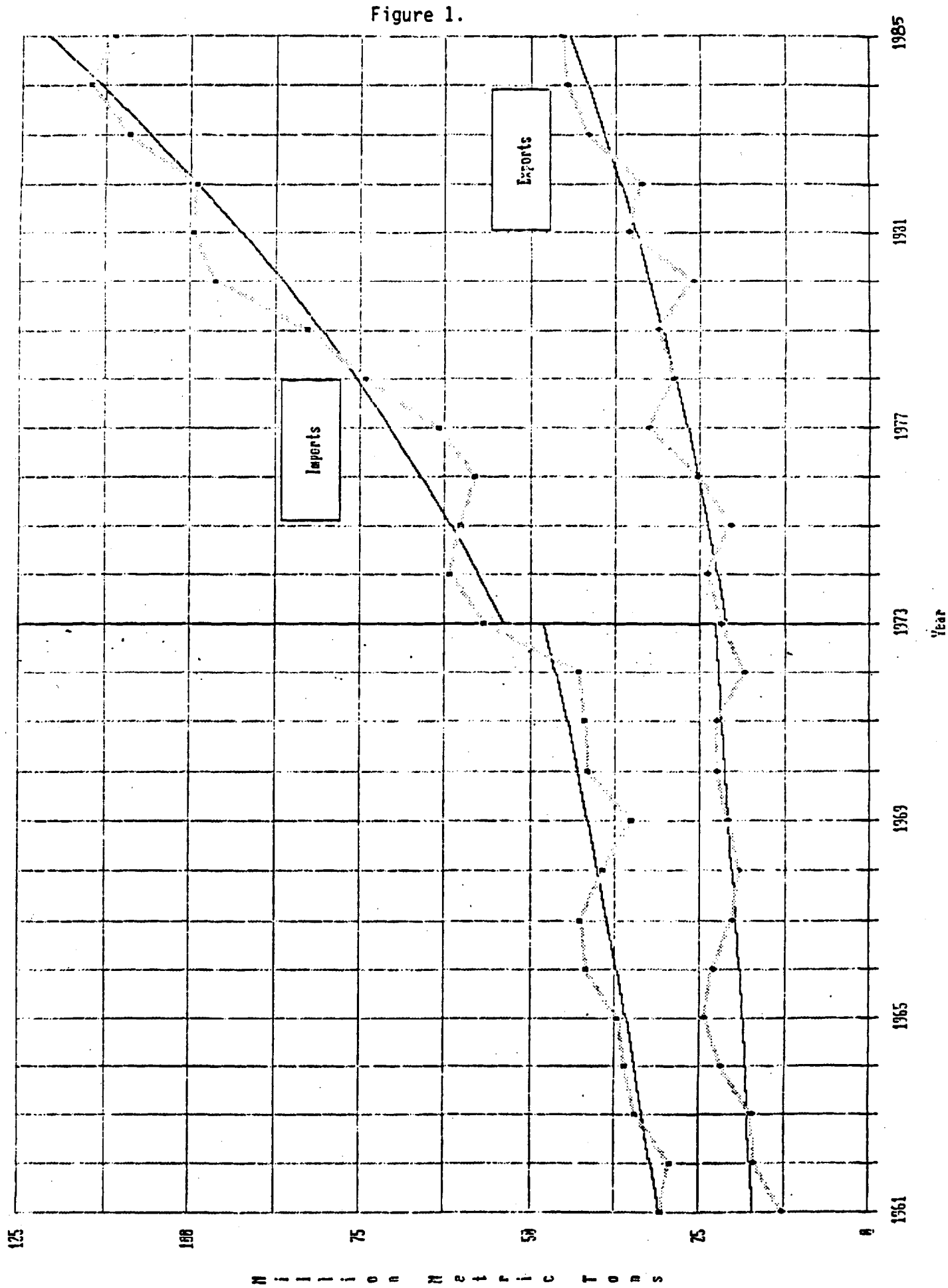


Figure 2. Trends of Capital Exports and Imports for Developed Countries, 1961-73 and 1973-85.
(1984 & 1985 data calculated using USDA data as base)

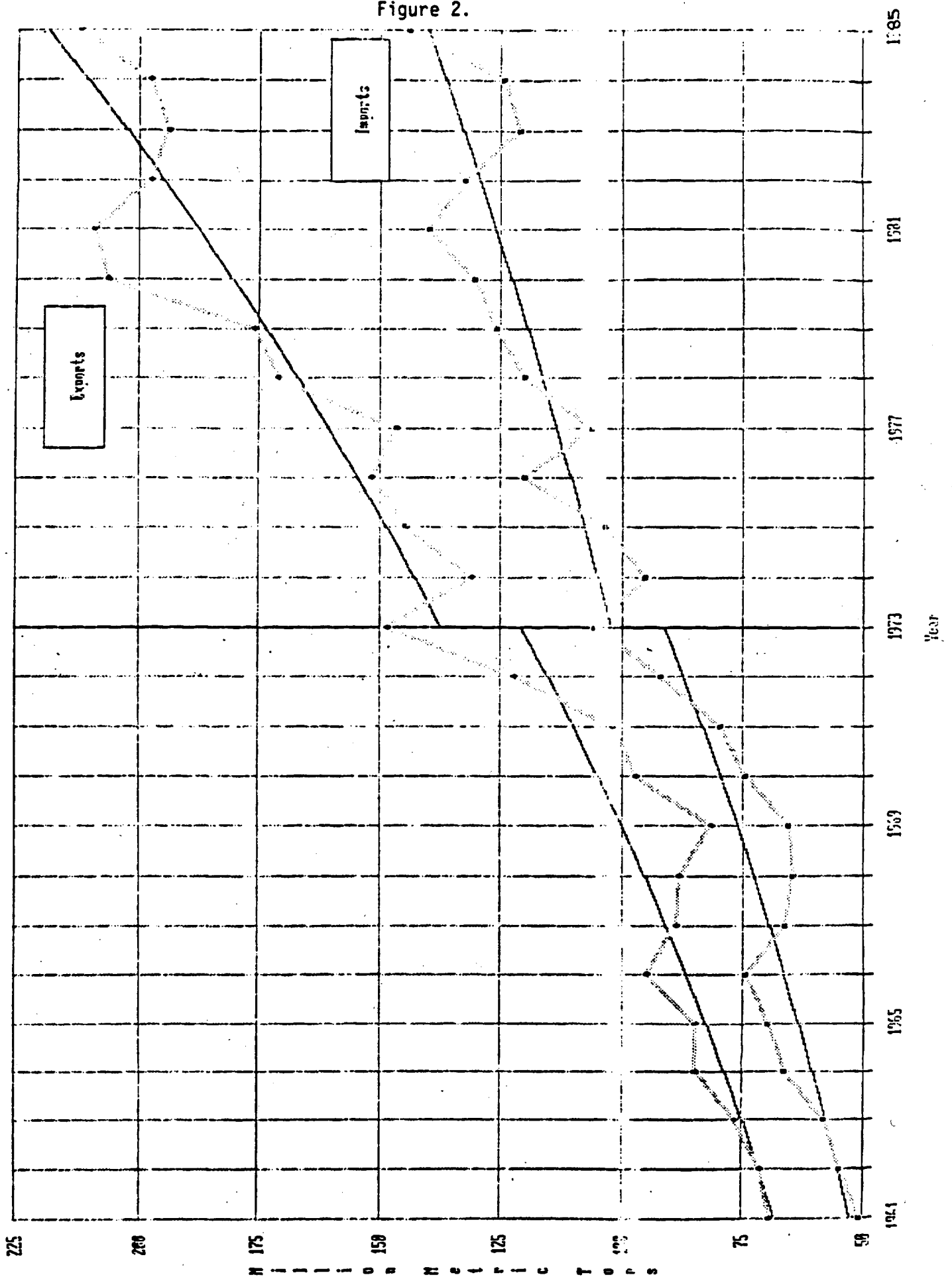


Figure 3.

Net Cereal Imports of Developing Countries, 1961 to 1984

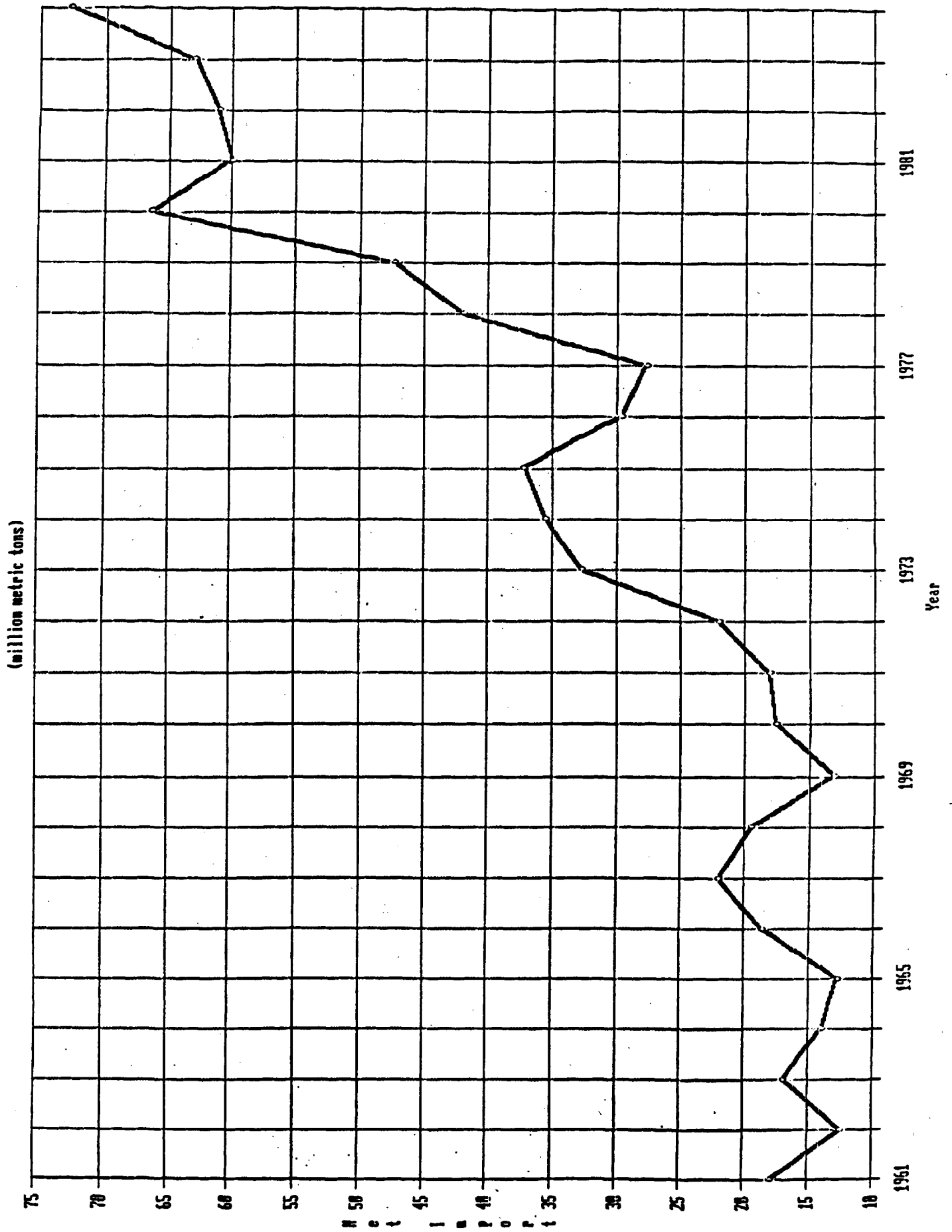
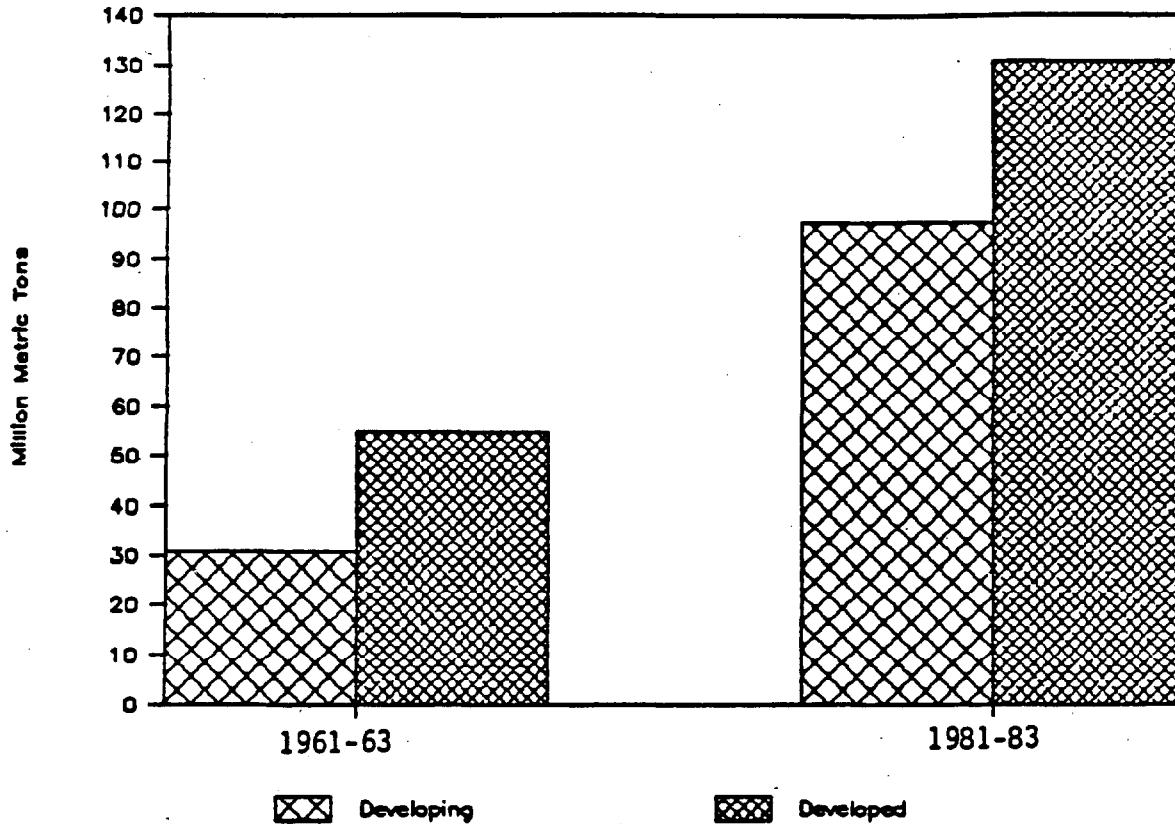


Figure 4.

Total World Cereal Imports: The Changing Relative Positions
of Developed and Developing Countries, 1961-3 and 1981-3
(Million Metric Tons)



Total World Cereal Imports: The Changing Relative Positions
of Developed and Developing Countries, 1961-3 and 1981-3
(Percent)

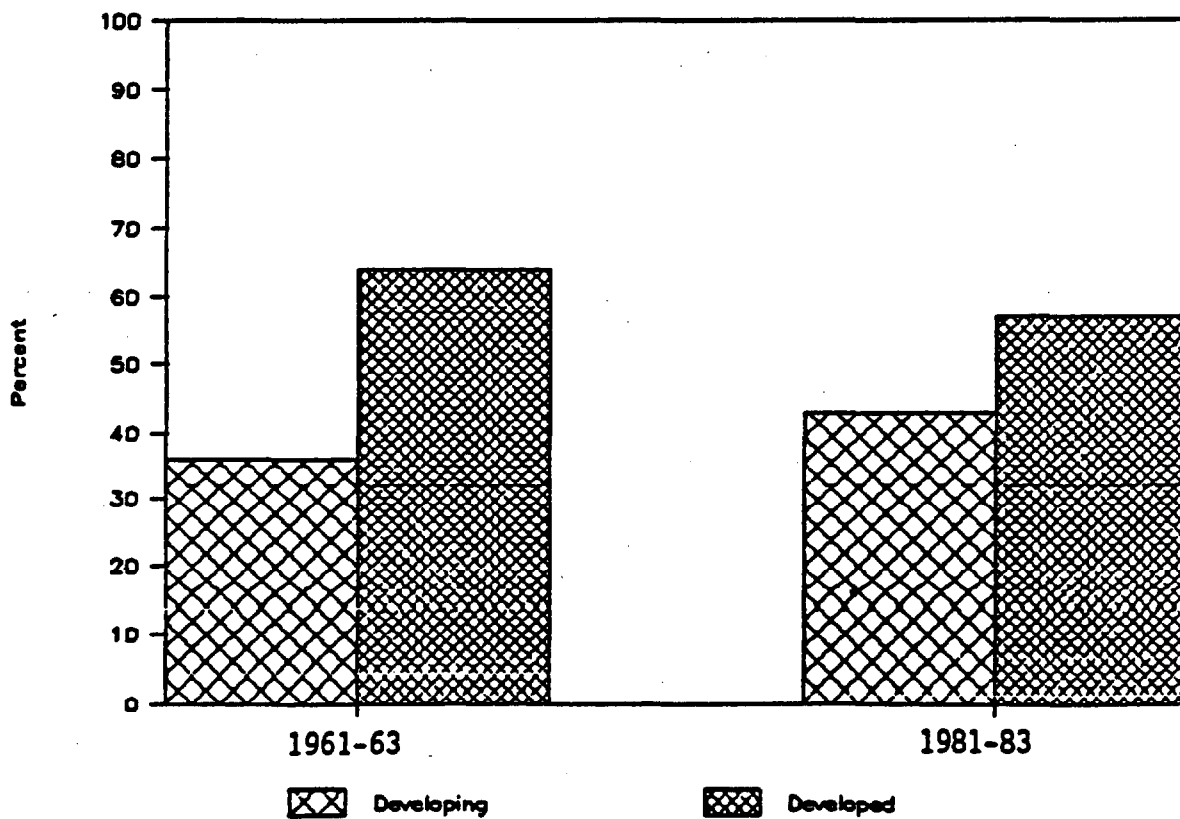


Figure 5: Percentage of Total Developing Countries' Cereal Exports of Selected Developing Countries, 1979-83

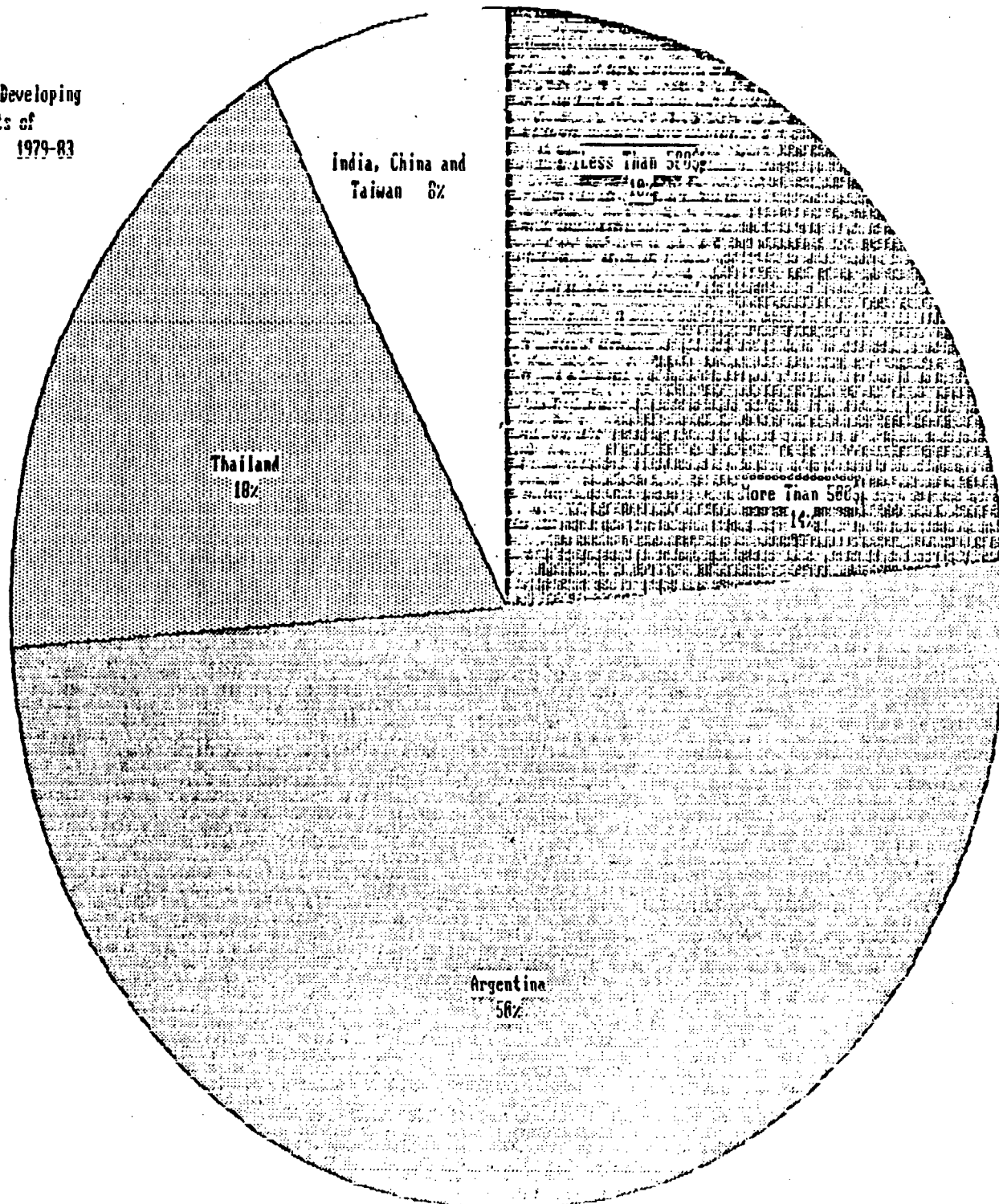
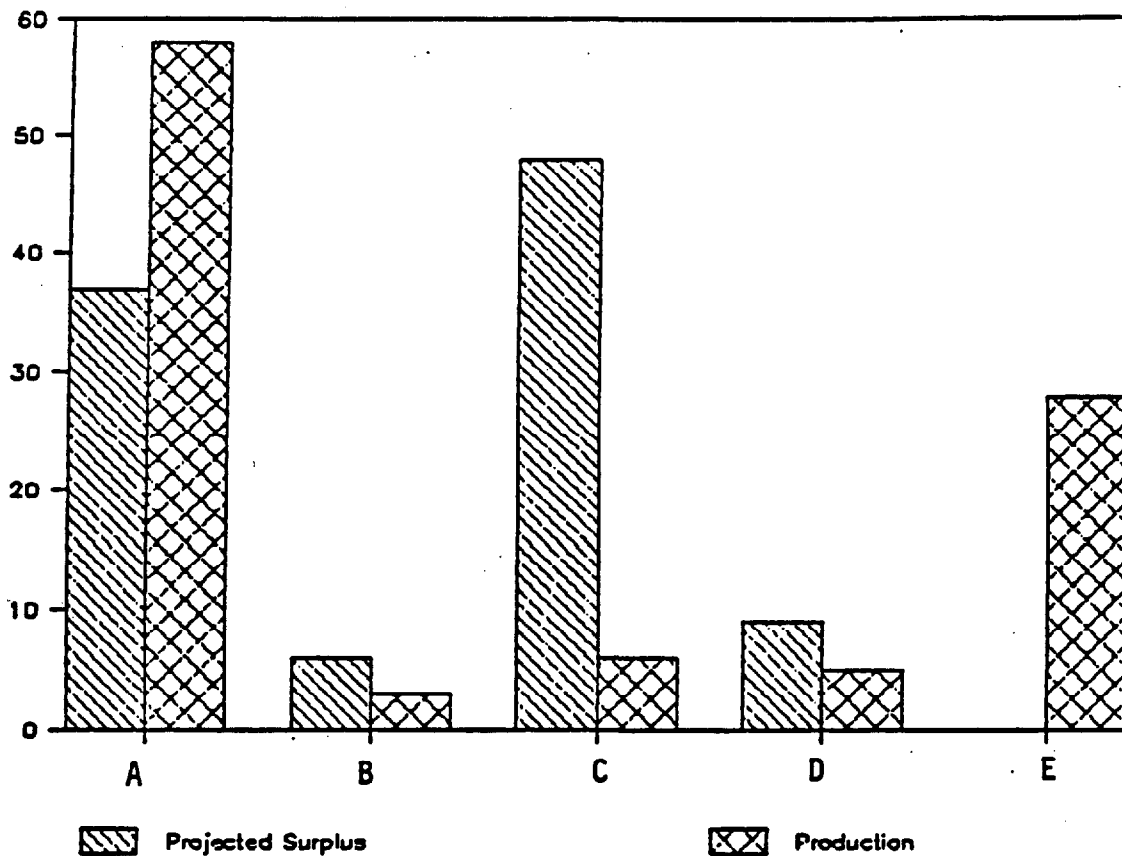


Figure 5.

Figure 6.

A Comparison of Projected Net Production Surpluses and Production Levels among Projected Net Surplus Developing Countries by Income Level (1980), 2000



A - China, India, Indonesia, Pakistan

B - Other less than \$500 per capita GNP countries

C - Argentina and Thailand

D - Other greater than \$500 per capita GNP countries

E - Net projected deficit countries

Table 1.

Distribution of World Cereal Imports by Country Groupings,
1961-63 and 1981-83

Country Group	1961-80		1961-83	
	Million Metric Tons	Percent	Million Metric Tons	Percent
Developed Countries	54.9	64	130.8	57
Developing Countries	30.9	36	97.5	43
All Countries	85.8	100	228.3	100

Source: FAO, "Agricultural Supply Utilization Accounts Tape, 1984" (Rome: 1985).

Table 2.

Growth Rates and Relative Shares in Cereal Trade, 1961 to 1983

Country Group	Average Annual Growth Rate*			Relative Shares		
	1981-83	1961-72	1972-83	1961-65	1970-74	1981-83
	(percent)			(percent)		
<u>Imports</u>						
Developing	6.0	3.0	8.1	36	35	43
Developed	4.6	4.0	3.3	64	65	57
<u>Exports</u>						
Developing	3.4	2.7	6.2	19	15	15
Developed	5.5	3.9	4.8	81	85	85

* Based on trended FAO data.

Table 3.

Trend Annual Growth Rates of Cereal Consumption and Production
for Developing and Developed Countries, 1961-80 and 1961-83

Country Group	1961-80		1961-83	
	Consumption	Production	Consumption	Production
Developing	3.6	3.5	3.6	3.5
(excluding China)	(3.2)	(2.9)	(3.3)	(2.9)
Developed	2.5	3.1	2.2	2.8

Source: FAO, "Production Yearbook Tape, 1984," and "Agricultural Supply Utilization Accounts Tapes, 1984" (Rome, 1985).

Table 4.

Relative Shares of Projected Developing Country Net Production Surpluses
by Level of Per Capita GNP (1980), 2000

Level of Per Capita GNP 1980	Net Production Surplus 2000		Percentage of Total Production 2000
	(Million Metric Tons)	(Percent)	(Percent)
Less than \$500	50.1	43	61
(China, India, Indonesia, Pakistan)	(42.9)	(37)	(58)
Greater than \$500	66.3	57	11
(Argentina, Thailand)	(56.2)	(48)	(6)

Source: Data set used in preparing IFPRI Research Report 52, Food Trends in the Third World: Past Trends and Projections to 2000. Projections based on FAO "Production" and "Agricultural Supply Utilization Accounts" Tapes according to methodology described in Appendix 1 of Research Report.

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