MEDIUM TERM ESTIMATES OF FOOD AID NEEDS AND THEIR VARIABILITY

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EXECUTIVE SUMMARY

The objective of the study is to obtain demand-based trend estimates of the food aid needs of developing countries for future years and to estimate the likely variability of such needs. The study covers 85 developing countries. In addition to leaving out a number of very small countries, the study excludes four large developing countries - China, India, Nigeria and Brazil. There are two reasons for doing so. Relatively small differences in the estimates of the food aid needs of these countries could represent fairly large differences in regional and overall aggregates. Besides, recent developments have added special uncertainties to the estimation of the food aid needs of these countries by the trend method. Separate studies need to be made of their food aid needs.

The basic conceptual framework used in the estimation of food aid needs is simple. Food aid needs are obtained by deducting commercial cereal imports from food import requirements, which in turn are obtained by deducting domestic food production from total domestic use of food (TDU). Food is defined to cover the major staple foods. These include both cereals and non-cereals, all of which are measured in terms of their cereal equivalents. Total domestic use covers food, feed, seed and other (waste and industrial) uses of the major staple foods. The food and feed uses are estimated for each year as a function of per capita GNP, income elasticities of demand, and population. Other uses of food are taken as a proportion of the sum of food and feed uses. Seed uses are taken as a

proportion of domestic production. For this purpose, per capita GNP is projected from its rates of growth in the past, population is taken from UN projections, income elasticities of demand are taken from the FAO and production is projected from its past trends.

It is possible to conceive of a large number of different assumptions regarding the behavior of commercial cereal imports and exports in estimating food aid requirements. In this study, the assumptions are made directly in terms of the physical quantities of cereal imports and exports rather than of the foreign exchange available for the purchase of cereals and international cereal prices. Within this framework, the study presents ten sets of assumptions to derive ten estimates of food aid needs. These show that some individual country estimates are sensitive to changes in particular assumptions. Except in a few cases, however, aggregate or regional results differ to a much smaller extent because variations in individual country estimates tend to offset each other. Later, for the reasons set out, first two estimates are picked, and then only one, for further analysis. Nevertheless, the other estimates are useful and are, therefore, presented in the study.

The <u>initial estimates</u>, described as 1A, assume that

(1) commercial cereal imports are net of cereal exports.

(2) the base period for cereal imports is 1977-82,

(3) the rate of growth of commercial cereal imports is nil.

Nine other estimates are obtained by varying these assumptions as shown below (See also Table):

1. Variation of the treatment of cereal exports

B. Using <u>gross</u> commercial imports.

Table -- Assumptions Underlying Different Estimates

	Estimate									
	1		2		3		4		5	
	A	B	A	B	A	B	A	B	A	B
Assumptions										
I. Gross Commercial Cereal Imports										
Constant at Base Period Level	X	X	X	X	X	X				
Growing at Aggregate GNP Growth Rate										
Medium Term							X			
Long Term								X		
Growing at Per Capita GNP Growth Rate										
Medium Term									X	
Long Term										X
II. Cereal Exports										
Nil		X		X		X				
Constant at Base Period Level	X		X		X					
Constant Proportion of Production							X	X	X	X
III. Base Period										
1977-82	X	X					X	X	X	X
1972-77			X	X						
Higher of Two					X	X				

Note: Each estimate takes one assumption from each of the three groups of possible assumptions, I, II, III.

2. Using 1972-77 as the base period instead of 1977-82 while
   A. Using net commercial imports (as in 1A),
   B. Using gross commercial imports (as in 1B).
3. Using the higher of the values for 1977-82 and 1972-77 while
   A. Using net commercial imports (as in 1A and 2A),
   B. Using gross commercial imports (as in 1B and 2B).
4. Treating cereal imports and cereal exports independently with food exports forming the same proportion of production as in 1977-82 and with gross commercial imports
   A. Growing at the <u>medium term aggregate</u> GNP growth rate,
   B. Growing at the <u>long term aggregate</u> GNP growth.
5. Also treating cereal imports and cereal exports independently with food exports forming the same proportion of production as in 1977-82 but with gross commercial imports
   A. Growing at the <u>medium term</u> <u>per capita</u> GNP growth rate,
   B. Growing at the <u>long-term</u> <u>per capita</u> GNP growth.

Several caveats need to be stated. The results are affected by the reliability of the underlying data. This varies between countries. Future trends in different variables may differ from those in the past because of changes in the international environment or in the domestic economy. Complete substitutability between different staple foods in terms of their cereal equivalents may not hold as assumed. These caveats are, however, also applicable to other estimates including those based on complex econometric models.

Subject to these caveats, the ten estimates based on different assumptions presented in the study are useful because they throw light on how the estimates, particularly for individual countries, change with different assumptions. Subregional and regional aggregates as well as the aggregates for all countries change to a smaller extent because of offsetting changes in individual country estimates. However, the range of estimates needs to be narrowed by examining the relative merits of the assumptions underlying each of them.

Various factors make 1972-77 a less suitable base period than 1977-82 for projecting commercial imports during 1985-90. These include the sharp rise in world cereal food prices which occurred during that period and the remoteness of the period relative to the period of the projection. Estimates 2A and 2B as well as 3A and 3B are related to the 1972-77 base period. These four estimates can be dropped. Estimate 1B, which is based on gross commercial cereal imports, and therefore neglects any cereal exports altogether, can also be dropped. Of the five remaining estimates, two are based on the use of the rate of growth of aggregate GNP to project gross commercial cereal imports from the base period, while cereal exports are projected separately. The rate of growth of aggregate GNP is the sum of the rates of growth of population and per capita GNP. Faster population growth does not increase a country's capacity to import cereals commercially, but may actually detract from it. These two estimates (4A, 4B) may, therefore, be dropped. This leaves two estimates (5A, 5B) in addition to the initial estimates (1A) as being feasible estimates of food aid needs.

Between estimate 5A and 5B, both of which assume that commercial imports increase at the rate of growth of per capita GNP and that cereal exports grow at the rate of growth of production, the choice is marginal. The only difference between the estimates is that one uses medium term and the other long term rates of growth of per capita GNP for projecting cereal imports. The difference between these rates is large for some countries, but in the aggregate these differences tend to offset one another. Since the long term rate of growth of per capita GNP has been used in projecting per capita GNP in the determination of projected per capita food and feed uses of staple foods in the estimation of total domestic use, this rate may be preferred here as well and estimate 5A may, therefore, be dropped.

In the initial estimate (1A), net commercial cereal imports are assumed to be constant at the level of 1977-82. If food aid is provided to developing countries on this basis, the recipients would have more foreign exchange available for the import of other essential imports. The non-food exports of industrial countries would, therefore, grow more rapidly, while the incomes of developing countries may also tend to grow at a faster pace. This could contribute to a faster recovery of the world economy.

According to the initial estimates, the food aid needs of the 85 developing countries covered by the study come to 23.39 million tons in 1985 and 44.72 million tons in 1990, with 19 countries not having any demand based food aid needs in both years. Sub-Saharan Africa (37 countries) dominates the picture of food aid needs with estimated needs of 7.77 million tons in 1985. Asia (16 countries) and West Asia and North Africa (13 countries) follow with needs of 6.79 million tons and 6.61 million tons respectively. Latin America (19

countries) has needs of only 2.23 million tons in 1985. Between 1985 and 1990, food aid needs more than double in West Asia and North Africa, approximately double in both Sub-Saharan Africa and Latin America and increase by only about half in Asia.

However, food aid donors may not be willing to provide food aid to the extent required to enable recipient countries to avoid increasing their commercial cereal imports altogether. Ultimately, therefore, estimate 1A may have to be dropped, though its results are useful as an indication of the effects of a policy that is not only feasible but even desirable.

The one remaining estimate is based on gross commercial cereal imports growing from their average level during 1977-82 at the long term rate of growth of per capita GNP and cereal exports growing at the rate of growth of food production. According to this estimate, (5B), which may be called the basic estimate, food aid needs work out to 20.54 million tons in 1985 and to 36.11 million tons in 1990. These needs are smaller than those under the initial estimate by 2.85 million tons in 1985 and by 8.61 million tons in 1990. It will be noticed that the difference between these estimates widens rapidly. These differences reflect primarily the growth of commercial cereal imports, offset to a very small extent by the growth of the cereal exports of some of the food aid receiving countries.

As was true for the initial estimates, Sub-Saharan Africa dominates the picture in the basic estimates (5B) with food aid needs of 7.63 million tons in 1985. Asia (5.62 million tons) and West Asia and North Africa (5.18 million tons) follow. Latin America's needs amount to only 2.11 million tons. Between 1985 and 1990, Asia's needs increase by only one-fifth while the needs of all the other

regions approximately double to 15.02 million tons for Sub-Saharan Africa, 10.26 million tons for West Asia and North Africa and about 4 million tons for Latin America.

Among the individual countries, 18 countries in 1985 and 21 countries in 1990 do not have any demand-based food aid needs. The country with the largest needs is Bangladesh - 2.95 million tons in 1985 and 4.19 million tons in 1990. Other countries with food aid needs of one million tons or more in 1985 are Morocco (2.00 million tons) and Egypt (1.84 million tons). By 1990, the needs of these countries rise to 4.19 million tons for Bangladesh, 3.53 million tons for Morocco and 3.06 million tons for Egypt. In 1990, four other countries join the ranks of those with needs of more than one million tons. These are Ethiopia (2.01), Kenya (1.97), Iraq (1.73), and Peru (1.10). Countries with extremely rapid growth of food aid needs between 1985 and 1990, though the absolute levels of their needs are low, are Yemen Arab Republic, Ivory Coast, Niger, Sierra Leone, Burundi, Madagascar, Uganda, Honduras and Ecuador. There are, however, some countries which show a fall in food aid needs over the period. These include Sri Lanka, Republic of Korea, Malaysia, Vietnam and Trinidad.

Attention may now be turned to the issue of the variability of food aid needs. This should show to what extent food aid needs could be expected to vary around their projected values because of factors causing variation without affecting the trend. Most of the studies of food aid needs have been based on trends in the behavior of the underlying variables. They have either not dealt with the variability of food aid trend at all or have not succeeded in being consistent with the concept of variability around trend.

The IFPRI study of 1984 presented trend-based estimates for 1990 but examined variability by looking at the food aid needs of 1976-78 and 1983. The USDA studies (annual and intra-year updates) estimate likely food aid needs in the current year on the basis of the latest available information but do not examine how these differ from those of a normal year. They also do not throw light on the variability implications of recent intra-year updates of such estimates.

FAO's early estimates (1981) did not discuss variability. They were interested in studying the effects of moving away from current trends through the setting of targets. FAO's awareness of the problem is reflected in its more recent study (1983) which obtained estimates of food aid needs as the sum of (a) non-project food aid, (b) project food aid and (c) emergency food aid. The excess of the shortfall in production over a specified percentage of production (5 percent and 10 percent depending on the circumstances of the country) was treated as creating an equal special need for food aid. The average of this over a past 12 year period was treated as the emergency food aid to be added to the trend value of non-project food aid. It is doubtful whether emergency needs estimated in this way are really additive in relation to non-project food aid. Countries may face excesses as well as deficits in production. Both must be taken into account. Trend estimates already reflect both of them.

A recent special USDA study (June 1986) of selected African countries tried to take account of variability in food aid needs by presenting estimates for "crisis" and "optimistic" scenarios in addition to those for its "base" scenario. Its crisis scenario is described in terms of bad weather resulting in a production shortfall for two consecutive years and thus represents a downward variation

relative to trend. However, its optimistic scenario is described in terms of policy reforms and thus represents a favorable structural change causing a shift in the trend. Conceptually, therefore, the two are not symmetrical. This USDA study, therefore, does not throw proper light on the estimation of variability in food aid needs.

In the present study, it is assumed that variability in production (together with any accompanying variability in food exports) is the main source of instability in the system. It is also assumed that variability of production in the future is equal to its variability in the past. The study assumes further that the accepted objective is to maintain stability of consumption with only a limited and extremely short term role in this connection for variations in stocks and none for variations in commercial cereal imports. On this basis, it is assumed that variations in food production are offset entirely (but to the extent needed) by variations in food aid.

Upper and lower limits are then estimated for food aid by applying the coefficient of variation of past production to future trend values of production. The results of this exercise, together with the absolute and percentage differences of these upper and lower limits are presented for all 85 countries in Table 8.1 in the paper.

The size of the absolute difference of the upper limit of food aid from its trend value depends on the volume of production and the coefficient of variation. The peak in a frequency distribution of coefficients of variation falls between 5.00 and 7.00.

The percentage variation in food aid needs depends on the relationship between the possible variation in food production and the absolute volume of food aid needs. An analysis of the results obtained is made on the basis of the factors on which these two

variables depend. A frequency distribution of percentage differences shows a peak on both sides at the interval between 10 percent and 40 percent. The percentage differences diminish over time (from 1985 to 1990) for most countries and variation around the basic estimate is symmetrical except when the constraint on negative food aid needs becomes applicable.

In obtaining estimates for groups of countries, it is important to remember that the variability of a sum is not equal to the sum of the variabilities. This is because the variabilities are not necessarily in the same direction and of the same magnitude in any year. The variability for any group of countries has therefore to be obtained directly from the variability in the aggregate production of that group.

A serious problem arises here from the constraint against negative food aid needs since these would now get submerged in the variability of group production. The study deals with this problem by classifying countries according to whether all the three estimates for it - upper, trend and lower - are positive (Class A), only two are positive (Class B), one is positive (Class C) or none are positive (Class D). Estimates are made by taking only Class A countries, taking Class A and B countries together or taking Class A, B and C countries together in each group or subgroup of countries. The highest estimate of both upper and lower limits is then chosen as the best estimate (that is, one avoiding to the maximum extent the impact of any negative food aid needs).

The results show that for all 85 countries together, the upper limit of food aid needs comes to 23.94 million tons in 1985 and 39.77 million tons in 1990 as compared with the trend estimate of 20.54

million tons in 1985 and 36.10 million tons in 1990. The upper limits are of course smaller than the simple aggregates of country estimates.

The lower limits for all 85 countries is 17.08 million tons in 1985 and 32.33 million tons in 1990. These are higher than the simple aggregates of the country estimates. Both upper and lower differences are thus smaller than those relative to the simple aggregates of the individual country estimates. In other words, the range within which variation takes place for the group is smaller than the sum of the ranges for the individual countries in the group. These results flow from the fact that the coefficients of variation for production in various groups of countries are in general lower than those for production in the individual countries included in them.

The results have been analyzed in the paper for groups and subgroups. It is worth noting that the results at the lower end are not the exact counterparts of the results at the upper end primarily because of the constraint preventing negative food aid needs. There is also some tendency for the results to differ between 1985 and 1990.

1. INTRODUCTION

(a) THE PROBLEM

During 1984/85, a total of 11.7 million metric tons of cereals was provided as food aid to developing countries. Such aid formed an important component of total cereal imports by those countries and a significant though much smaller proportion of their total consumption of staple foods.

Through food aid, an attempt is made to match food surpluses in developed countries with unfilled food needs in developing countries. It is important, therefore, to form an assessment of likely future food needs in developing countries that may have to be met by food aid. Several estimates of future food aid needs have been made in the past. However, as new data become available, these estimates need to be revised. There is also need for testing different approaches to the estimation process and obtaining new estimates of food aid needs based on them.

In this study, an attempt is made to obtain demand-based estimates of food aid needs for future years for a number of developing countries. The methodology used for this purpose is set out in chapter 2. Using this methodology, different estimates are presented in chapters 3-6 below on the basis of different assumptions about the capacity to obtain commercial cereal imports.

Even within the framework of a given set of assumptions, actual needs in any year could differ from estimated needs because of year to year variations in the values of variables such as domestic

production. It would be useful to know how much variability in food aid needs could be expected around the estimated trend values.

The treatment of variability in previous studies of food aid needs is briefly reviewed in Chapter 7. A method of estimating variability in food aid needs is set out in Chapter 8, which also presents the individual results obtained by that method for the 85 countries covered in the study. Chapter 9 focuses on certain problems that arise in estimating variability of food aid needs for groups of countries. It sets out a method of determining group variability of food aid needs in the face of these problems and then presents the results obtained in that manner for all 85 countries taken together and for the geographical regions and subregions into which they fall.

(b) THE CONCEPTUAL FRAMEWORK

The basic conceptual framework for estimation of food aid needs is relatively simple. Food aid needs are obtained by deducting commercial cereal imports from food import requirements, which in turn have been obtained by deducting domestic food production from total domestic use (TDU) of food. For this purpose, total domestic use is defined in this study as being demand-determined but could be given some other appropriate definition, say to allow for need-based food requirements. Some developing countries export some cereals though they also import cereals and even do so when they need food aid. Such cereal exports are treated as a deduction either from food

imports or from domestic food production and thus reduce total availability.

For any single year, changes in stocks also affect the picture. In the long term such changes would tend to offset one another. It is assumed that they would not affect the kind of trend analysis that is used here.

In this framework, food is defined as consisting of all the staple foods consumed in each country. These staple foods are aggregated for each of the variables on the basis of their cereal equivalents. Total domestic use of food consists of all uses of food -- food use, feed use, seed use and waste/industrial uses -- though the latter two are sometimes treated as a deduction from production to obtain estimates of what may be called "available production."

This framework assumes free substitutability between different staple foods in terms of cereal equivalents. In particular, it assumes that the import gap obtained by deducting the production of staple foods in cereal equivalent from total domestic use of staple foods in cereal equivalent can be filled by cereal imports irrespective of the actual composition (in staple foods) of the calculated gap. This assumption is carried forward to food aid needs, which are measured by the difference between the food import gap and commercial cereal imports.

The problems in using the framework relate to

(a) the definitions of these different terms or concepts,

(b) the methods to be used for their estimation for future years, and

(c) the data base to be used in applying that approach.

These problems, particularly those relating to (a) and (b), are not necessarily independent of one another. Solutions to them that are consistent may therefore be necessary. Alternative sets of consistent solutions may emerge. These may represent different approaches to the estimation of food aid needs, with the result in each case representing a different measure of such needs and having a different purpose.

(c) THREE EARLIER ESTIMATES

Three major efforts at food aid estimation have been made so far. These are:

(a) The FAO estimates of food import gaps and food aid needs presented in its study, Agriculture Towards 2000, published in 1981.

(b) The IFPRI estimates of food import gaps prepared by Leonardo Paulino and of food aid needs on that basis presented in Barbara Huddleston's study, Closing The Cereals Gap With Trade and Food Aid, published in January 1984, and

(c) The USDA estimates of such needs contained in its annual studies previously known as Food Aid Needs and Availabilities, but now titled Food Needs and Availabilities (of which the 1985 annual version is considered here).

In looking at the results of these three studies, it should be noted that apart from differences between them in concepts and

methods, these studies differ also in their country and commodity coverage.

The estimation of food aid needs in the three studies is carried out, or can be treated as being carried out, in two stages:

(1) the estimation of the food import gap,

(2) the estimation of food aid needs from that gap.

The methods and results of these three studies are outlined in sections (d) and (e) below. A new FAO study is discussed in section (f).

(d) THE FOOD IMPORT GAP

The FAO study presents three estimates of the food import gap. The first or trend scenario projects past trends in per capita calorie consumption of individual major food crops, multiplies the results by population projections and adds the results to obtain food consumption. It then projects past trends in production. Both trend projections are subject to upper and lower limits. The second and third estimates are based on per capita demand estimates for food derived from income projections and income elasticities of demand, with the results multiplied by projected populations to obtain food consumption. In the second estimate (Scenario A), income is assumed to grow at 6.4 percent for low-income developing countries and 7.2 percent for middle-income developing countries to yield an average of 7.0 percent in accordance with the overall growth objectives of the new UN International Development Strategy. Production is projected so as to improve trends in self-sufficiency in basic foods and improve supplies for export, subject to domestic land, water and

other resource constraints and export market constraints. In the third estimate (Scenario B), more modest income growth rates of 5.9 percent and 5.1 percent are assumed with an average of 5.7 percent and production also grows more modestly, while still improving on past trends. The FAO study does not provide detailed data on its results by region or country.

The IFPRI study presents four methods for estimating food import requirements. Like the second and third FAO methods, the first IFPRI method estimates per capita food consumption from projected growth rates of per capita GNP and multiplies the result by projected population. However, the per capita GNP growth rates it uses for this purpose are their past trend rates rather than rates set normatively as desirable. Similarly, the first IFPRI method also projects food production at past trend rates rather than on a normative basis. Per capita GNP growth rates are subject to lower and upper constraints, while production growth rates are subject to a lower constraint only.

In its second method, IFPRI estimates the dietary energy gap based on 110 percent of the FAO recommended minimum nutritional requirements and calculates import needs as a share of this gap that would be filled by cereals. The production estimates of the second IFPRI method are the same as those of the first. Two other methods based on simple trend extrapolations have been tried. In the third method, total consumption and production are separately extrapolated from past trends. In the fourth, cereal imports are extrapolated directly from the past. Clearly, IFPRI's first method supersedes its third and fourth methods and the results of those two can be dropped.

The USDA estimates are distinguished from the others by the fact that they are made for only two years: the year immediately ahead and the following year. Given the method that is followed, the estimates that are given for the second year are not really important. Two types of estimates are presented. The status quo estimate assumes per capita consumption to be at recent levels, though population growth is taken into account in obtaining aggregate consumption. The nutrition-based estimate assumes per capita consumption to be equal to 100 percent of nutritional requirements. In either case, production is estimated on the basis of the latest available country-specific information about likely production. Wherever specific information is not available, production is assumed to be "normal".

(e) FOOD AID NEEDS

For estimating food aid needs, FAO adopts different versions of a method based on the proportion of food import requirements to be filled by food aid. Thus for its trends scenario, FAO simply assumes future food aid to maintain its share of food imports at past levels for each country. In its more optimistic scenario of development (Scenario A), it assumes this share to be at the recent (1978-79) level of 33 1/3 percent for the 57 most vulnerable countries and 10 percent for others. In its less optimistic development scenario (Scenario B), the share is assumed to remain at 10 percent for other countries but to rise to 45 percent for the most vulnerable countries. This is equal to the share prevailing for them during 1969-71, i.e., before the world food crisis.

The total food aid needs estimated by FAO for 1990 by the three methods are 26 million tons, 15 million tons and 24 million tons with over 80 percent of these requirements being for the 57 most vulnerable countries. Once again, FAO does not make available any breakdown of these estimates by regions or countries.

The IFPRI study first imposed an eligibility criterion for food aid, excluding all countries which in 1976-78 had per capita incomes of $900 or more in 1977 dollars. It then assumed that for eligible countries, commercial food imports could not exceed either 5 percent or 2 percent of export earnings. The excess of estimated food import requirements over these alternative limits would represent food aid needs. For this purpose, estimated food import requirements were valued at a fixed price derived from the average price of wheat during 1960-75 and export earnings were estimated for the future by projecting them at the trend rates of growth for 1961-78. The IFPRI study applied these alternative assumptions to each of the four estimates of food import requirements to yield eight different estimates of food aid needs for each country for 1990. As only the first two estimates of food import requirements are considered relevant here, four IFPRI estimates of food aid needs are obtained.

For demand-based food imports, IFPRI estimates food aid needs in 1990 at 13.03 million tons on the 5 percent criterion and 28.61 million tons on the 2 percent criterion. On the dietary energy basis, these estimates rise to 22.39 million tons and 34.08 million tons respectively.

In the USDA study, commercial cereal imports are assumed to form the same proportion of "available foreign exchange" in the next year

as they did in the base period. The excess of cereal import requirements over these commercial cereal imports represents food aid needs. Available foreign exchange is estimated by taking estimated merchandise exports, allowing for "likely" debt payments (rather than debt payments due) and adjusting for additions to or withdrawals from reserves to maintain the base period proportion of reserves to available foreign exchange earnings.

The USDA method of determining future commercial cereal imports differs from that of IFPRI in three respects:

(a) Merchandise export earnings are adjusted for "likely" debt repayments;

(b) They are adjusted further to allow for the maintenance of the base year proportion of foreign exchange reserves to exchange availability after paying for total merchandise imports;

(c) The actual base period proportion of commercial cereal imports to exchange availability is applied for future years.

The USDA also presents estimates of nutrition-based food aid requirements. In these, the estimated food requirements and food import requirements are different from the comparable status quo estimates. However, the same estimate of commercial cereal imports is used.

The USDA estimates food aid needs in 1985 at 11.45 million tons on a status quo basis and 19.36 million tons on a nutrition basis.

(f) NEW FAO STUDY

In 1983, FAO published a new study, Assessing Food Aid Requirements, in which it carried forward the work it had been doing in this field. In this study, it distinguishes three categories of food aid needs, makes separate estimates for each category and adds these up to yield an estimate of average aggregate food aid needs for 1985. The three categories are:

(1) Non-project food aid needs equal to the gap between market demand at reasonable prices and the sum of domestic production and commercial imports;

(2) Project food aid needs representing the food aid required for special projects to combat malnutrition and contribute to development and food security; and

(3) Emergency food aid needs equal to the additional food aid required on average to meet production shortfalls or exceptional balance-of-payments problems.

Non-project food aid needs are derived as usual by deducting commercial imports from the food import gap, i.e., the gap between projected total domestic utilization (derived from trends in the variables affecting demand) and projected domestic production. However, changes include use of per capita consumption expenditures instead of GNP and adjustment of the results by a trend element to reflect changes in consumption patterns. Commercial cereal imports are derived from independent projections of foreign exchange earnings and the unit price of cereal imports.

Project food aid needs have been estimated not on the basis of any general principles but on the basis of country-by-country empirical estimates of the potential for food aid supported projects made by the World Food Programme's field staff. These estimates measure what would be administratively feasible and socially acceptable rather than the food needs of those who do not have adequate purchasing power or whose consumption could rise as development takes place.

Emergency food aid needs are estimated on the assumption that higher income countries, as well as a few low-income countries which have built substantial reserve food stocks, would be able to absorb shortfalls in production up to 10 percent of trend production, while the remaining low-income countries could absorb only a 5 percent shortfall. Production shortfalls in excess of these represent emergency food aid needs. The average of the totals of such shortfalls has been estimated for the period covered as a percentage of production and applied to estimated production in future years.

The FAO treats the sum of non-project food aid needs and project food aid needs as structural food aid needs.

Four points need to be made about the FAO concept of emergency food aid needs. One, although it is stated that emergency food aid needs could also arise from exceptional balance-of-payments difficulties, these are not actually brought into the process of computing emergency needs. Two, likely emergency needs for refugees are not included in the estimates and will have to be added separately in light of actual developments. Three, no provision is made for production that is in excess of trend production, whatever

the size of the excess. Emergency food aid cannot, therefore, be negative for any country. Four, unlike non-project and project food aid requirements, emergency requirements are calculated on an average annual basis and actual requirements may be higher or lower.

FAO treats the sum of non-project food aid needs and project food aid needs as structural needs and adds average emergency food aid needs to them to obtain total food aid needs on an average basis.

2. METHODOLOGY

(a) THE APPROACH

In this study, food aid needs are defined as that part of food import requirements that cannot be filled by commercial food imports. In turn, food import requirements are defined as the gap between total domestic use (TDU) and the total domestic production of food. Food is defined to cover the major staple foods in each country. These include both cereals and noncereals, measured in terms of their cereal equivalents. The underlying concept of total domestic use is demand-based and therefore does not take into account needs for food that are not backed by purchasing power. However it is taken to cover all uses. The estimates of future production and total domestic use are based on trend projections of the underlying variables. Different assumptions are made about commercial food imports (and any food exports).

Production is projected for the years 1985 through 1990 at 1966-80 trend rates of growth for each of the staple food crops. However, in countries in which production in 1966-80 showed a declining trend, it is assumed that production will remain constant throughout the period at the trend level of production for 1980.

Total domestic use of staple foods is the sum of the (1) food use, (2) feed use, (3) seed use, and (4) waste and other uses of staple foods.

The food use of the staple foods is taken, depending on actual consumption patterns in different countries, as the sum of the food use of (i) cereals, (ii) root crops, (iii) pulses (iv) groundnuts, and (v) bananas and plantains. Estimates of per capita consumption of each of these staple food groups are obtained for future years at five-yearly intervals by applying

(1) trend (1966-80) rates of growth of per capita GNP as estimated by the World Bank (subject to a maximum of 6.0 percent and a minimum of 0.5 percent), and

(2) FAO projections of the relevant income elasticities of demand at five yearly intervals,

to the respective estimate of trend per capita consumption in 1980.

The per capita food use of all staples is then obtained by summing the separate per capita estimates for each year. This sum is multiplied by the population in that year -- as estimated by the UN in its medium variant projections -- to obtain the total food use of all staples in those years.

The feed use of all staples in various years is estimated in basically the same way as the separate components of food use, using the income elasticity of the demand for meat as a proxy for the income elasticity of the demand for feed.

The seed use of staples is estimated by applying the proportion of seed use to production prevailing in 1976-80 to the production estimates of the various staples in different future years.

The other uses of staples, consisting of industrial uses and wastes, are estimated by applying the proportion that such uses

formed to the sum of food and feed use in 1976-80 to the estimated sum of food and feed use in different future years.

These estimates of the various uses of all staples are then summed for each future year to obtain the required estimates of total domestic use. In this study, estimates of total domestic use computed in this way are taken from Leonardo Paulino's study at IFPRI of food trends and projections (Paulino, 1986).

In general, the estimates of production trends make use of the time-series data formed by aggregates of country estimates for past years. Following the approach of previous IFPRI studies, a semi-logarithmic trend equation is fitted to the 1966-80 data of different variables to obtain the respective growth rates.

(b) THE BASIC MODEL

In this section, an attempt is made to provide an algebraic representation of the approach underlying these estimates that has been described above. The algebra is not essential to an understanding of the subsequent results or the various assumptions about commercial cereal imports made to obtain estimates of food aid requirements.

The general equation fitted to each data set is:

$$Y_t = e^{a + bt} \qquad (1)$$

where Y_t = estimate of the variable in year t

a = constant term (the logarithm of the variables estimate for t = o, the base year)

b = logarithm of the value of one plus the annual rate of change of the variable

t = period in years, starting from the base year

The equation can be replaced by its equivalent:

$$Y_t = Y_o (1 + r)^t \qquad (2)$$

where Y = the value or estimate of the variable

t = the year of the estimate

r = the annual rate of change of the variable

For the different variables, population, production, consumption, from which the estimates of food aid requirements are computed, an equation of the form of equation (2) can be used to derive -- or to represent the derivation of -- the relevant estimates.

Thus, for population, the equation would be

$$N_t = N_o (1 + r_N)^t \qquad (3)$$

where N = the value or estimate of the population

r_N = the rate of growth of population.

Similarly, the production of each staple food would be given by the equation

$$P_{nt} = P_{no} (1 + r_{Pn})^t \qquad (4)$$

where P = the value or estimate of production

n = each staple food (n = 1...5)

r_P = the rate of growth of production

For consumption, the basic equation would need to be modified because future consumption would not be projected directly but would be obtained from per capita income projected in the usual way and income elasticities of demand. The relevant equation would thus take this form:

$$C_{nt} = C_o \ (1 + r_Y \ E_n)^t \qquad (5)$$

where C = the value or estimate of per capita consumption

r_Y = the rate of growth of per capita GNP

E = income elasticity of demand

If the FAO estimates of income elasticities of demand are constant for the entire period, the base year t=o is 1980 and the last year of the entire period t=20 is 2000. However, if the income elasticities of demand were not constant over the period for any commodity, the calculations were carried out on a step-wise basis for five-year periods, using the relevant five-year elasticities and treating the result of each five-year calculation as the basis for the next. The equation would be the same as given above, except that

o = the relevant base year - 1980, 1985, 1990 or 1995

t = 5, the relevant last year - 1985, 1990, 1995 or 2000

Consumption cannot, however, be simply derived from equation (5) because it is obtained as the sum of food, feed, seed and waste (and other) uses of each staple food and these different uses are treated differently.

The per capita food use of each staple food is given by

$$C_{n1t} = C_{n1o} (1 + r_Y E_{n1})^t \tag{6}$$

where n1 = the food use of each staple food.

The per capita feed use of each staple food is similarly given by

$$C_{n2t} = C_{n2o} (1 + r_Y E_{n2})^t \tag{7}$$

where n2 = the feed use of each staple food.

The per capita (and other) uses of each staple food, being treated as a proportion of the food and feed uses of that staple food, are given by

$$C_{n3t} = x_n (C_{n1t} + C_{n2t}) \tag{8}$$

where n3 = the waste (and other) uses of each staple food

x = the proportion of such uses to the total of the food and feed uses of that staple food

Expanding equation (8) by inserting equations (6) and (7) into it, we get

$$C_{n3t} = x_n [C_{n1o} (1 + r_Y E_{n1})^t + C_{n2o} (1 + r_Y E_{n2})^t] \tag{9}$$

The seed use of each staple food is not related to consumption or income but to the production of that staple food. Also, it is obtained not as per capita use but as aggregate or national use. It is given by the equation

$$C_{an4t} = y_{nt}\, P_{no}\, (1 + r_{Pn})^t \qquad (10)$$

where a = aggregate or national use

n_4 = the seed use of each staple food

y = the proportion of this use to aggregate or national production of that staple food

To obtain the combined per capita consumption of each staple food in the food, feed and waste (and other) uses, equations (6), (7) and (9) are added together. When the result is summed over all the staple foods, we get the total per capita consumption of all the staple foods in these three uses. Multiplying the result by the population, we get the aggregate or national consumption of all the staple foods in these three uses. To this, the aggregate seed use of all the staple foods has to be added. This is obtained by summing equation (10) over all staple foods. Aggregate national consumption of all staple foods is thus given by the equation

$$C_{at} = N_o\, (1 + r_N)^t \sum_{n=1}^{5} (1 + x_n)\, [C_{n1o}\, (1 + r_Y\, E_{n1})^t$$

$$+ C_{n2o}\, (1 + r_Y\, E_{n2})^t] + \sum_{n=1}^{5} y_{nt}\, P_{no}\, (1 + r_{Pn})^t \qquad (11)$$

Now, aggregate food aid requirements are given by the equation

$$F_{at} = C_{at} - P_{at} - M_{at} \qquad (12)$$

where F = food aid requirements in cereals

M = commercial cereal imports

Inserting equations (4) -- after summation over all staple foods -- and (11) into equation (12), we get

$$F_{at} = N_o\ (1 + r_N)^t \sum_{n=1}^{5}(1 + x_n)\ [C_{n1o}\ (1 + r_Y\ E_{n1})^t + C_{n2o}\ (1 + r_Y\ E_{n2})^t] + \sum_{n=1}^{5} y_{nt}\ P_{no}\ (1 + r_{Pn})^t - \sum_{n=1}^{5} P_{no}\ (1 + r_{Pn})^t - M_t \qquad (13)$$

Combining the second and third terms in equation (13), the effect of which is to show seed use as a deduction from the production available for the other three uses, the result is

$$F_{at} = N_o\ (1 + r_N)^t \sum_{n=1}^{5}(1 + x_n)\ [C_{n1o}\ (1 + r_Y\ E_{n1})^t + C_{n2o}\ (1 + r_Y\ E_{n2})^t] - \sum_{n=1}^{5}(1 - y_{nt})\ P_{no}\ (1 + r_{Pn})^t - M_t \qquad (14)$$

The first two of the three terms on the right hand side of this equation represent the computation of the food import gap. Food aid needs are obtained by deducting commercial cereal imports from that gap. Given the import gap estimate, the estimate of food aid requirements depends on the assumptions made regarding commercial cereal imports. However, the estimate of food aid requirements ultimately depends as much on the food gap itself and therefore also on the first three terms of equation (14). What this equation brings out is that aggregate food aid requirements in cereal terms depend upon:

(1) the base year levels of population, consumption and production

(2) the rates of growth of population, per capita GNP and production

(3) the income elasticities of demand for various staple foods for both food and feed uses

(4) the proportion of food and feed uses that is covered by waste and other uses

(5) the proportion of seed to production

(6) the volume of commercial cereal imports

Of critical importance among these are the rates of growth, the income elasticities and the volume of commercial imports.

(c) COUNTRY COVERAGE

Reliable data on commercial food imports are not available for a number of small developing countries. These countries were, therefore, excluded from the scope of the study. In addition, four large countries were excluded from the study for other reasons. These countries are China, India, Nigeria and Brazil.

Both China and India have a food surplus at the present time. These reflect recent changes in food production. Projections from past data would therefore tend to yield misleading results. Nigeria and Brazil show large increases in food import gaps and food aid needs if past trends continue. The change in oil prices affecting Nigeria and the heavy debt burden affecting Brazil raise doubts about

the likely behavior of food demand in these countries. Given the large sizes of these countries, relatively small changes in the factors affecting food aid requirements could bring about relatively large changes in such requirements. These changes could be large enough to affect regional and overall aggregates significantly. These countries therefore need to be treated separately. They are excluded from the scope of this study. The study thus covers 85 developing countries.

(d) TREATMENT OF COMMERCIAL CEREAL IMPORTS

To obtain estimates of food aid needs in the future, possible commercial cereal imports need to be deducted from estimates of the food import gap obtained by the method described earlier. A method of estimating possible future commercial cereal imports was needed for this purpose. The broad approach adopted was to relate future commercial cereal imports to such imports in a base period. Within this approach, different assumptions are possible regarding

(1) the concept of commercial imports to be used, i.e. the treatment to be accorded to food exports, if any
(2) the base period to be used, and
(3) the rate of growth, if any, of base period imports (and where relevant, of exports).

The <u>initial estimates</u>, described as estimate 1A, assume that

(1) commercial cereal imports are net of cereal exports,
(2) the base period is 1977-82, and
(3) the rate of growth of commercial imports is nil.

Nine other estimates are obtained by varying these assumptions. These are listed below with their assumptions (See also Table 2.1):

1. Variation of the treatment of cereal exports
   B. Using gross commercial imports.
2. Using 1972-77 as the base period instead of 1977-82 while
   A. Using net commercial imports (as in 1A).
   B. Using gross commercial imports (as in 1B).
3. Using the higher of the values for 1977-82 and 1972-77 while
   A. Using net commercial imports (as in 1A and 2A),
   B. Using gross commercial imports (as in 1B and 2B).
4. Treating cereal imports and cereal exports independently with food exports forming the same proportion of production as in 1977-82 and with gross commercial imports
   A. Growing at the medium term aggregate GNP growth rate,
   B. Growing at the long term aggregate GNP growth rate.
5. Also treating cereal imports and cereal exports independently with food exports forming the same proportion of production as in 1977-82 but with gross commercial imports
   A. Growing at the medium term per capita GNP growth rate,
   B. Growing at the long-term per capita GNP growth rate.

Estimates obtained with these assumptions are presented in Chapters 3, 4, and 5.

Table 2.1 -- Assumptions Underlying Different Estimates

	Estimate									
	1		2		3		4		5	
	A	B	A	B	A	B	A	B	A	B
Assumptions										
I. Gross Commercial Cereal Imports										
Constant at Base Period Level	X	X	X	X	X	X				
Growing at Aggregate GNP Growth Rate										
Medium Term							X			
Long Term								X		
Growing at Per Capita GNP Growth Rate										
Medium Term									X	
Long Term										X
II. Cereal Exports										
Nil		X		X		X				
Constant at Base Period Level	X		X		X					
Constant Proportion of Production							X	X	X	X
III. Base Period										
1977-82	X	X					X	X	X	X
1972-77			X	X						
Higher of Two					X	X				

Note: Each estimate takes one assumption from each of the three groups of possible assumptions, I, II, III.

(e) CAVEATS

The results obtained in this study are based on the trend method. In this method, future values of different variables are estimated with reference to their past behavior. Specifically, rates of growth derived from the past values of these variables are used to project their values into the future. Several caveats need to be stated about the results obtained in this way.

These results are ultimately only as reliable as the underlying data. The data used in this study are of varying degrees of reliability for different countries. For some countries, they are particularly unreliable. The results obtained from these data are therefore subject to varying but unknown margins of error.

In general, it is assumed that rates of growth of different variables in the future will be the same as in the past. How long a period in the past to use for this purpose is itself a matter of some uncertainty. Varying this period yields different results. In any case, the future may differ significantly from the past. International conditions may change and produce changes in the ways in which these variables may behave in the future. Thus a rise in the price of oil would tend to raise the rate of growth for oil exporting countries but lower it for oil importers. Various domestic factors, including domestic policy changes, may also bring about changes in trend behavior. Thus, the introduction of a trade regime that is favorable to the food producing sector could bring about an upward shift in the rate of growth of food production.

A troublesome question affecting the reliability of the results arises in relation to the composition of food consumption, production, commercial imports and aid. Data regarding all these for each staple food are combined together on the basis of the cereal equivalents of these foods. Differences between the equivalences assumed for this purpose and those applicable in reality could affect the results. What is more troublesome is the assumption that deficits calculated in this manner, whatever their commodity origin, could be filled by commercial imports of, and food aid in, cereals. The complete substitutability between all staple foods in terms of their cereal equivalents that is assumed here may not prevail and may cause distortions in the estimates of future food aid needs.

In relation to all these points, different countries may be very differently affected. The results for some countries may be quite substantially affected, but the effects for different countries may be in different directions. Aggregate estimates for groups of countries may therefore be affected proportionately less than the estimates of future food aid needs.

Approaches to estimation of food import gaps and food aid needs based on econometric models should not be considered to be free of these potential weaknesses. The values of the parameters in such models are estimated from past data, which may not be reliable. These models also assume that these parameters from the past will apply in the future. International and domestic changes may make this assumption invalid.

The estimates made here are subject to the caveats discussed

above but so are most other estimates that could be made for the future.

3. COMMERCIAL CEREAL IMPORTS: NET OR GROSS

(a) INITIAL ESTIMATES

Initial demand-based estimates of food aid needs by the trend method were made on the assumption that net commercial cereal imports are held constant at their 1977-82 average levels (estimate 1A). These estimates show total food aid needs for 85 developing countries rising from 23.39 million tons in 1985 to 44.72 million tons in 1990 (Table 3.1). Throughout the discussion of different estimates of total regional and sub-regional needs, the fact that four large countries -- China, India, Brazil and Nigeria -- have been excluded from consideration should be kept in mind.

The study found that of the 85 countries covered in the study, 19 countries in both 1985 and 1990 did not need any food aid to satisfy demand-based consumption needs. The estimated need for food aid is, therefore, that of the remaining 66 countries.

Regionally, Sub-Saharan Africa (37 countries) dominates the picture of food aid needs with 7.77 million metric tons needed in 1985, 9.16 million tons in 1986 and 15.36 million tons needed in 1990. The needs of Asia (16 countries) are somewhat lower at 6.79 million tons in 1985 and 7.47 million tons in 1986. They then grow to 10.39 million tons in 1990. For West Asia and North Africa (13 countries), estimated food aid needs at 6.61 million tons in 1985 are somewhat lower than those of Asia but rise at a much faster rate to

Table 3.1 -- FOOD AID NEEDS (METHOD 1A)[a]

(100,000 metric tons)

Region	1985	1986	1987	1988	1989	1990
South Asia	35.18	37.97	40.85	43.83	46.90	50.08
East Asia	32.70	36.69	40.81	45.04	49.39	53.87
Asia	67.88	74.66	81.66	88.87	96.30	103.95
West Asia	13.04	17.09	21.35	25.83	30.54	35.49
North Africa	53.04	63.37	74.17	85.47	97.29	109.64
West Asia & North Africa	66.08	80.46	95.52	111.30	127.83	145.13
West Africa	20.41	24.04	27.80	31.70	35.76	39.96
Central Africa	9.11	10.88	12.73	14.66	16.66	18.74
East Africa	48.17	56.68	65.60	74.93	84.70	94.92
Sub-Saharan Africa	77.69	91.60	106.13	121.29	137.11	153.63
Caribbean/ Central	10.10	11.55	13.06	14.62	16.24	17.93
South America	12.20	14.87	17.65	20.52	23.50	26.59
Latin America	22.30	26.42	30.70	35.14	39.74	44.52
TOTAL	**233.95**	**273.15**	**314.01**	**356.60**	**400.98**	**447.22**

a/ Based on net commercial imports (1977-82).

See appendix on methodology for details.

8.05 million tons in 1986 and 14.51 million metric tons in 1990. The needs of Latin America (19 countries) are relatively small at 2.23 million tons in 1985 and 2.64 million tons in 1986. They rise to 4.45 million tons in 1990. It can be seen that between 1985 and 1990, food aid needs more than double in West Asia and North Africa, approximately double in both Sub-Saharan Africa and Latin America and increase by only 53 percent in Asia.

Within Sub-Saharan Africa (with Nigeria excluded from West Africa) East Africa (14 countries) dominates the food aid picture with needs of 4.82 million tons in 1985, 5.67 million tons in 1986 and 9.49 million tons in 1990. The 8 countries of Central Africa need around a million tons in 1985 and 1986 and about 1.87 million tons in 1990. The 15 countries of West Africa need 2.04 million tons in 1985, 2.40 million tons in 1986 and 4.00 million tons in 1990. Food aid needs approximately double between 1985 and 1990 in all three sub-regions. Within Asia, the needs of East Asia (11 countries) are slightly smaller than those of South Asia (5 countries) in 1985, but increase at a somewhat faster pace and become greater in 1990. Within the West Asia and North African region, the needs of West Asia (8 countries) are less than one-fourth those of North Africa (5 countries) in 1985 but rise at a slightly faster pace to become over one-third in 1990. Within Latin America, with Brazil excluded, the needs of South America (9 countries) are about 20 percent greater than those of Central America (10 countries) in 1985, but increase more rapidly and become almost 50 percent greater in 1990.

(b) ROLE OF CEREAL EXPORTS

The use of the net concept of commercial cereal imports affects the calculations only for those countries which export cereals. Some developing countries which have a food import gap and even some which are unable to fill this gap with commercial cereal imports nevertheless export a part of their domestic food production. Such exports may consist of cereals which differ in type or quality from the imported cereals, or exports could take place from one region while imports occur in another.

In any case, cereal exports reduce domestic supply, just as gross commercial cereal imports increase it. Using the concept of net commercial imports takes this into account. Cereal exports contribute to a country's foreign exchange earnings and thus help to finance commercial cereal imports. Therefore, it cannot be assumed that commercial cereal imports would remain the same if the cereal exports did not take place. Deducting cereal exports from the sum of domestic food production and gross commercial cereal imports is therefore necessary to obtain a correct picture of the domestic food supply situation relative to needs. This is what using the net concept of commercial cereal imports achieves.

Although the use of the net concept of commercial cereal imports is therefore justified, it is in general difficult for donors of food aid to understand how a country needing food aid can still export some cereals itself. It is still more difficult to appreciate why, with everything else remaining the same, food aid needs should be computed in such a way that they increase with the quantity of a country's cereal exports.

The problem can be seen most sharply for those countries for which cereal exports are greater than cereal imports so that net commercial imports are negative. Food aid needs then become greater than the gap between consumption and production. Food aid appears in this case to provide support for cereal exports from the recipient country. A simple way to deal with these extreme cases would be to treat all negative net commercial cereal imports as zero. This would automatically make food aid needs equal to the gap between total consumption and domestic production. However, very few countries have cereal exports that are greater than their commercial cereal imports.

Treating negative net commercial imports as zero would still leave a sufficient portion of the cereal exports of such countries as a deduction from gross commercial imports to offset such imports completely. Food aid would support these exports. It would also support cereal exports for all countries in which these are less than cereal imports (and are therefore, less obtrusive in their impact). One way to deal with this problem would be to use gross commercial cereal imports rather than net in computing food aid needs. This would take care of any sensitivities that food aid donors might have about providing food aid to countries exporting any food and particularly about having the size of needed food aid enlarged by such exports. However, using the concept of gross commercial imports instead of net would mean that the domestic availability of food would be overstated in each case by the quantity of food exports so that an unfilled supply gap would remain even if the estimated needs for food aid were fully met.

(c) GROSS COMMERCIAL CEREAL IMPORTS

On the basis of 1977-82 data, food aid needs were re-estimated using gross commercial cereal imports instead of net (estimate 1B). The results obtained by doing so are presented on a regional basis in Table 3.2. The estimates for all countries that have some food exports are affected. The aggregate impact in comparison with the initial estimates is also clear. The estimate of the food aid needs for all countries in 1985 falls from 23.39 millon tons (1A) to 22.63 million tons (1B) i.e., by 0.76 million tons. For 1990, the estimate falls from 44.72 million tons to 43.96 million tons, i.e., by the same quantity, 0.76 million tons.

By subregions, the estimate falls in 1985 by 85 thousand tons for South Asia, 64 thousand tons for East Asia, by 140 thousand tons for West Asia, by 131 thousand tons for North Africa, by 47 thousand tons for West Africa, by 4 thousand tons for Central Africa, by 224 thousand tons for East Africa, by 25 thousand tons for Central America and by 48 thousand tons for South America.

Table 3.2 -- Food Aid Needs (Method 1B) a/
(100,000 metric tons)

Region	1985	1986	1987	1988	1989	1990
South Asia	34.33	37.12	40.00	42.98	46.06	49.23
East Asia	32.06	36.06	40.17	44.40	48.76	53.24
Asia	66.39	73.18	80.18	87.38	94.81	102.47
West Asia	11.64	15.70	19.96	24.44	29.15	34.10
North Africa	51.73	62.06	72.86	84.16	95.97	108.32
West Asia & North Africa	63.37	77.75	92.82	108.60	125.12	142.42
West Africa	19.94	23.57	27.33	31.23	35.28	39.49
Central Africa	9.07	10.84	12.69	14.61	16.61	18.70
East Africa	45.93	54.44	63.35	72.69	82.45	92.68
Sub-Saharan Africa	74.94	88.85	103.37	118.53	134.35	150.87
Caribbean/ Central	9.85	11.31	12.82	14.38	16.00	17.68
South America	11.72	14.41	17.18	20.07	23.06	26.16
Latin America	21.58	25.71	30.00	34.45	39.06	43.84
TOTAL	**226.28**	**265.49**	**306.36**	**348.95**	**393.34**	**439.60**

a/ Based on gross commercial imports (1977-82). See appendix on methodology for details.

4. THE BASE PERIOD FOR COMMERCIAL IMPORTS

(a) CHANGING THE BASE PERIOD

In the initial projections of food aid needs, the base period used for the estimation of commercial imports was 1977-82. This period was chosen because the latest year for which data were available for all the countries covered by the study was 1982. Several adverse factors affected developing countries during the period 1977-82. The second oil shock, the world economic recession that followed it and the resulting stagnation in world trade occurred during this period. The capacity of developing countries to finance commercial cereal imports was, therefore, limited during the period. It was felt that it would be useful to see the effects of using an earlier base period with other things remaining the same. The exercise was, therefore, repeated with the base period 1972-77.

The results are revealing. For the aggregate of all countries, for almost all the sub-regional groupings of countries and for most of the individual countries, the estimates of food aid needs with the 1972-77 base period turned out to be substantially larger than for the 1977-82 base period. Since the import gaps were unchanged between the two exercises, this indicated that average commercial cereal imports were generally smaller in quantity during 1972-77 than during 1977-82. Even where foreign exchange availability fell between 1972-77 and 1977-82 because of the factors discussed earlier,

the fact that cereal prices had come down by 1977-82 sharply from the peak levels they had reached in 1972-77, made it possible for most countries to raise the quantities of commercial cereal imports between the two periods. The increase in cereal imports between 1972-77 and 1977-82 may also reflect an increase in the import gap for most countries between these periods.

The sharp overall increase in food aid needs when 1972-77 data for commercial imports are used instead of the data for 1977-82 is found for both the concepts of commercial imports discussed in Chapter 3, though the results, as one might expect, differ as between the different concepts with the 1972-77 base period as they do for the 1977-82 base period.

For net commercial imports without any modification (estimate 2A) the estimated aggregate food aid needs in 1985 (Table 4.1) work out to 34.20 million tons with 1972-77 as a base in comparison with 23.39 million tons with 1977-82 as a base, an increase of 10.81 million tons or 57.2 percent. In 1990, these figures are 55.47 million tons and 44.72 million tons, an increase of 10.75 million tons or 24.04 percent. The estimates increase sharply for each region as well. The increase is particularly sharp for West Africa and North Africa, where the estimate of needs more than doubles with the change in the base period.

The only subregion which shows a fall in food aid needs when 1972-77 data are used instead of 1977-82 data is South Asia. For 1985, food aid needs fall from 3.52 million tons to 3.30 million tons, i.e., by 221 thousand tons. This is because of a sharp decrease in Bangladesh offset only partially by increases in Sri Lanka, Nepal and Bhutan. The increase in East Asia is sufficient to

Table 4.1 -- Food Aid Needs (Method 2A) a/
(100,000 metric tons)

Region	1985	1986	1987	1988	1989	1990
South Asia	32.97	35.76	38.64	41.62	44.69	47.87
East Asia	54.47	58.47	62.58	66.85	71.27	75.82
Asia	87.44	94.22	101.22	108.46	115.96	123.69
West Asia	35.85	39.91	44.17	48.65	53.36	58.31
North Africa	97.01	107.34	118.15	129.45	141.26	153.61
West Asia & North Africa	132.87	147.25	162.32	178.09	194.62	211.92
West Africa	26.63	30.25	34.02	37.92	41.97	46.18
Central Africa	11.13	12.91	14.75	16.68	18.68	20.76
East Africa	51.00	59.51	68.43	77.76	87.53	97.75
Sub-Saharan Africa	88.76	102.67	117.20	132.36	148.18	164.70
Caribbean/ Central	13.47	14.92	16.43	17.99	19.62	21.30
South America	19.49	21.30	24.08	26.97	29.96	33.06
Latin America	32.96	36.23	40.51	44.96	49.57	54.36
TOTAL	342.02	380.37	421.24	463.87	508.33	554.66

a/ Based on net commercial imports (1972-77), treating negative values as negative values. See appendix on methodology for details.

offset the fall in South Asia, so that Asia shows a significant rise. For all other subregions also, there is an increase -- often quite sharp. The sharpest absolute increase occurs for North Africa, from 5.30 million tons to 9.70 million tons (for 1985). The proportionate increase is sharpest for West Asia (from 1.30 million tons to 3.58 million tons or an increase of 175.02 percent) and for North Africa (from 5.30 million tons to 9.70 million tons or 82.91 percent). The increases for the other subregions are also large, though somewhat less dramatic.

Table 4.2 presents the results obtained by taking 1972-77 as the base period and using gross commercial imports (estimate 2B). They show somewhat smaller food aid requirements in the aggregate as well as for each region and subregion as compared with the estimates using net commercial imports with the same base period (estimate 2A). However, the total impact is only to reduce food aid needs by 1.11 million tons in 1985 and by somewhat less (1.06 million tons) in 1990. Earlier, it had been noted that even with 1977-82 as the base period, the results with gross commercial imports (estimate 1B) were only slightly smaller than those with net commercial imports (estimate 1A). Thus, whether net or gross commercial imports are used, the use of 1972-77 as the base period instead of 1977-82 results in substantially larger estimates of food aid needs for the years from 1985 through 1990.

Table 4.2 -- Food Aid Needs (Method 2B,) a/

(100,000 metric tons)

Region	1985	1986	1987	1988	1989	1990
South Asia	31.27	34.06	36.94	39.92	42.99	46.17
East Asia	53.55	57.55	61.70	65.99	70.41	74.96
Asia	84.82	91.60	98.64	105.91	113.40	121.13
West Asia	35.25	39.30	43.56	48.04	52.75	57.70
North Africa	94.39	104.72	115.53	126.83	138.64	150.99
West Asia & North Africa	129.64	144.03	159.09	174.87	191.39	208.70
West Africa	25.53	29.15	32.91	36.82	40.87	45.08
Central Africa	10.64	12.41	14.26	16.18	18.19	20.27
East Africa	48.45	56.97	65.88	75.21	84.98	95.20
Sub-Saharan Africa	84.62	98.53	113.05	128.21	144.04	160.55
Carribean/ Central	13.14	14.59	16.10	17.66	19.28	20.97
South America	18.69	20.95	23.73	26.61	29.60	32.70
Latin America	31.83	35.54	39.82	44.27	48.88	53.67
TOTAL	**330.91**	**369.70**	**410.61**	**453.26**	**497.71**	**544.05**

a/ Based on gross commercial imports (1972-77). See appendix on methodology for details.

(b) COMBINING DIFFERENT BASE PERIODS

For countries -- notably Bangladesh -- in which food aid needs show a fall when 1972-77 is used as a base period for commercial imports instead of 1977-82, commercial cereal imports were obviously smaller in quantity in 1977-82 as compared with 1972-77 in spite of the fall in world cereal prices. Four explanations are possible. (1) Their total food needs could have become smaller. (2) The foreign exchange resources available to them could have fallen to a larger extent than in other countries. (3) Other claims on foreign exchange resources could have increased or become more urgent. (4) A larger volume of food aid might have become available to them. It could be argued that, for these countries, any estimate of future commercial imports should be based on the 1972-77 level of commercial imports, as that represented a level these countries were able to achieve even when prices were much higher than in 1977-82. It was therefore decided to re-estimate food aid needs using the higher of the two averages of commercial imports in order to obtain a conservative estimate.

The resulting estimates of food aid needs are naturally lower than the estimates based on the 1977-82 average for each of the two concepts of commercial imports (Tables 4.3 and 4.4). The difference on the aggregate in 1985 varies from 1.15 million tons when the concept of net commercial imports (estimate 3A) is used to 1.02 million tons when gross commercial imports (estimate 3B) form the basis of the computation. Similarly, for 1990, the differences are 1.13 million tons and 1.00 million tons for the two methods in comparison with the estimates based on the 1977-82 base period.

Table 4.3 -- Food Aid Needs (Method 3A) a/
(100,000 metric tons)

Region	1985	1986	1987	1988	1989	1990
South Asia	30.73	33.51	36.40	39.37	42.45	45.62
East Asia	28.47	32.47	36.58	40.85	45.27	49.82
Asia	59.19	65.98	72.98	80.22	87.72	95.45
West Asia	13.04	17.09	21.35	25.83	30.54	35.49
North Africa	53.04	63.37	74.17	85.47	97.29	109.64
West Asia & North Africa	66.08	80.46	95.52	111.30	127.83	145.13
West Africa	20.33	23.96	27.72	31.62	35.68	39.88
Central Africa	9.11	10.88	12.73	14.66	16.66	18.74
East Africa	45.86	54.37	63.28	72.61	82.38	92.61
Sub-Saharan Africa	75.30	89.21	103.73	118.89	134.72	151.23
Caribbean/ Central	9.87	11.32	12.83	14.40	16.02	17.70
South America	11.98	14.66	17.44	20.32	23.31	26.41
Latin America	21.85	25.98	30.27	34.71	39.33	44.11
TOTAL	**222.42**	**261.63**	**302.50**	**345.13**	**389.59**	**435.92**

a/ Based on net commercial imports (maximum of 1972-77 and 1977-82), treating negative values as negative values. See appendix on methodology for details.

Table 4.4 -- Food Aid Needs (Method 3B,) a/
(100,000 metric tons)

Region	1985	1986	1987	1988	1989	1990
South Asia	29.90	32.69	35.57	38.55	41.62	44.80
East Asia	27.88	31.87	36.03	40.32	44.74	49.29
Asia	57.77	64.56	71.60	78.87	86.36	94.09
West Asia	11.64	15.70	19.96	24.44	29.15	34.10
North Africa	51.73	62.06	72.86	84.16	95.97	108.32
West Asia & North Africa	63.37	77.75	92.82	108.60	125.12	142.42
West Africa	19.83	23.45	27.21	31.12	35.17	39.38
Central Africa	9.07	10.84	12.69	14.61	16.61	18.70
East Africa	44.75	53.26	62.18	71.51	81.28	91.50
Sub-Saharan Africa	73.64	87.55	102.07	117.23	133.06	149.57
Caribbean/ Central	9.55	11.00	12.51	14.07	15.70	17.38
South America	11.72	14.41	17.18	20.07	112.18	129.05
Latin America	21.27	25.41	29.70	34.14	38.75	43.54
TOTAL	**216.06**	**255.28**	**296.19**	**338.84**	**383.29**	**429.63**

a/ Based on gross commercial imports (maximum of 1972-77 and 1977-82). See appendix on methodology for details.

Since net commercial imports provide a better basis for determining food aid needs than gross, the effect of varying the base period can be seen by comparing estimates 1A, 2A and 3A (Table 4.5).

TABLE 4.5 - Comparison Between Method 1A (1977-82 net commercial imports), Method 2A (1972-77 net commercial imports), and Method 3A (maximum net commercial imports of 1977-82 and 1972-77) (100,000 metric tons)

	1A		2A		3A		Cl.3-Cl.1 / Cl.1	Cl.4-Cl.2 / Cl.2	Cl.5-Cl.1 / Cl.1	Cl.6-Cl.2 / Cl.2
	1985 (1)	1990 (2)	1985 (3)	1990 (4)	1985 (5)	1990 (6)				
SOUTH ASIA	35.18	50.08	32.97	47.87	30.73	45.62	-6.29%	-4.42%	-12.66%	-8.89%
EAST ASIA	32.70	53.87	54.47	75.82	28.47	49.82	66.59%	40.74%	-12.93%	-7.52%
ASIA	67.88	103.95	87.44	123.69	59.19	95.45	28.82%	18.99%	-12.79%	-8.18%
WEST ASIA	13.04	35.49	35.85	58.31	13.04	35.49	175.02%	64.29%	0.00%	0.00%
N.AFRICA	53.04	109.64	97.01	153.61	53.04	109.64	82.91%	40.11%	0.00%	0.00%
W.A & N.AF	66.08	145.13	132.87	211.92	66.08	145.13	101.08%	46.02%	0.00%	0.00%
WEST AFRIC	20.41	39.96	26.63	46.18	20.33	39.88	30.48%	15.57%	-0.39%	-0.20%
CENTRAL AF	9.11	18.74	11.13	20.76	9.11	18.74	22.18%	10.78%	0.00%	0.00%
EAST AFRIC	48.17	94.92	51.00	97.75	45.86	92.61	5.88%	2.98%	-4.80%	-2.44%
AFRICA	77.70	153.62	88.76	164.70	75.32	151.23	14.23%	7.21%	-3.06%	-1.56%
CENTRAL AM	10.10	17.93	13.47	21.30	9.87	17.70	33.41%	18.82%	-2.22%	-1.25%
SOUTH AMER	12.20	26.59	19.49	33.06	11.98	26.41	59.73%	24.32%	-1.87%	-0.68%
LATIN AMER	22.30	44.52	32.96	54.36	21.85	44.11	47.81%	22.10%	-2.03%	-0.91%
TOTAL	**233.95**	**447.27**	**342.02**	**554.66**	**222.42**	**435.92**	**46.19%**	**24.01%**	**-4.93%**	**-2.54%**

5. CONSTANT OR RISING COMMERCIAL CEREAL IMPORTS

(a) RISING COMMERCIAL IMPORTS

The third assumption that was made in the initial estimates of food aid needs was that the computed average commercial imports in the base period would prevail without change for each of the years 1985-90. This assumption was maintained for the two alternative base period assumptions for which the results have been presented in Chapters 3 and 4 above.

It could be argued that as food needs in developing countries grow, they should also increase their commercial cereal imports from the level prevailing during the base period. Commercial cereal imports should be treated on a gross basis for this purpose and any cereal exports should be separately handled. The most obvious way of letting gross commercial food imports increase would be to relate them in some way to foreign exchange earnings. There are some complex issues here relating to (a) what foreign exchange earnings to take into consideration and (b) how to allow for increases in other claims in those earnings such as debt repayment. If one abstracts from these problems, it would be possible to relate commercial cereal imports in a simplistic manner to aggregate export earnings as other authors have explicitly or implicitly done in different contexts. For the future, this would require three extremely difficult types of projections as far as gross commercial cereal imports are concerned.

First, it would be necessary to project aggregate export earnings on a country by country basis in the extremely volatile and uncertain trade situation that is likely to prevail in the years ahead. Second, it would be necessary to project the proportion of aggregate export earnings that would be used to finance gross commercial cereal imports. Third, it would be necessary to predict world cereal prices in those years and estimate the weighted average price that would be applicable to each country's cereal imports, given differences that exist and changes that might take place in their composition.

(b) USING AGGREGATE GNP GROWTH RATES

Instead of following this complex and uncertain procedure, one could simply apply a given rate of increase to each country's average commercial imports during the period 1977-82. A reasonable rate to use for this purpose might be its rate of growth of aggregate GNP. It is interesting to note that this approach represents a particular way of dealing with the complexities referred to in the previous paragraph. This is because using the growth rate of real aggregate GNP as the average rate of increase in gross commercial cereal imports is consistent with the following set of assumptions:

(a) Total exports grow in value at the same rate as GNP;

(b) The same proportion of export earnings is used to finance gross commercial cereal imports as prevailed in 1977-82; and

(c) The prices of cereal imports in each year 1985-90 do not differ significantly from the average prices of cereal imports in 1977-82.

The rates of growth of aggregate GNP for the period 1985-90 can

be treated as equal to the sum of the rates of growth of per capita GNP and the rates of growth of population.

For the rates of growth of per capita GNP, it was assumed that trend growth rates for the past would continue to prevail in the future. Two trend estimates of past rates of growth of per capita GNP are available from the World Bank. The World Development Report gives long-period (generally 20-year) trend growth rates of per capita GNP. For most countries, the latest issue of World Development Report, that for 1985, provides such estimates for 1965-83. The World Bank Atlas gives medium-period (generally 10-year) growth rates of per capita GNP. For most countries, the latest Atlas, also for 1985, provides such estimates for 1973-82 i.e., the more recent part of the long period for which growth rates are given in the World Development Report. In both cases, earlier issues of these documents have been used where necessary and the exact periods on which the estimates are based may differ for individual countries.

Given the oil price shocks and the world recessionary conditions that prevailed during the recent period on which the medium-term per capita GNP growth rates given in the Atlas are based, it might be assumed that these rates would in general be lower than those for the long-term period given in the World Development Report. Such a view is not supported by the data. Conditions in different countries presumably differed too widely for such a generalization to hold.

Any improvement in the world economic situation should contribute to an improvement in growth rates in the future. However, it is difficult to make any exact judgement about the pace of the world economic recovery and about the extent to which and the pace at which such a recovery would be reflected in the growth rates of

individual developing countries. The period for which the projections are being made is a relatively short one, and it has already begun. It did not, therefore, appear legitimate to make a generalized assumption of an upswing in growth rates within the projection period.

It was decided in this situation to make alternative estimates using both medium-term and long-term rates of per capita GNP growth from the past. The rates of population growth for each country for the period 1982-90, derived from the medium projections of population levels for these years made by the U.N. in 1983, were added to the two per capita GNP growth rates to yield two alternative rates of growth of aggregate GNP for each country (Table 5.1). Applying these two rates of growth of aggregate GNP to average gross commercial cereal imports in 1977-82 (treated as prevalent in 1982) yielded two sets of estimates of gross commercial cereal imports for each of the years 1985-90.

To complete this exercise, it is necessary to make an estimate of cereal exports. In the initial assessment of food aid needs, where constant net cereal imports equal to the average for 1977-82 were used, cereal exports were implicitly assumed to be constant. However, for a cereal exporter, it could be argued that cereal exports should be expected to make an increasing contribution to export earnings. The land producing cereals could in general be assumed to be capable of producing nonfood commercial crops instead, though perhaps less efficiently. No country should be penalized for exporting cereals instead of producing other commercial crops from the same land and exporting them. Exports of cereal should therefore also be allowed to increase. It would be reasonable to assume that

Table 5.1 POPULATION GROWTH RATES AND LONG AND MEDIUM-TERM GNP GROWTH RATES

		Long Term Rates (World Development Report)			Medium Term Rates (World Bank Atlas)		
	Popu Growth Rate a/	GNP/N Growth Rate b/	Adjusted c/	GNP Growth Rate d/	GNP/N Growth Rate e/	Adjusted c/	GNP Growth Rate d/
Algeria	3.4%	3.6%	3.6%	7.0%	2.4%	2.4%	5.8%
Angola	2.6%	-2.3%	0.5%	3.1%	-9.6%	0.0%	2.6%
Bangladesh	2.7%	0.5%	0.5%	3.2%	3.2%	3.2%	5.9%
Benin	3.0%	1.0%	1.0%	4.0%	2.7%	2.7%	5.7%
Bhutan	2.1%	0.1%	0.5%	2.6%	0.0%	0.5%	2.6%
Bolivia	2.8%	0.6%	0.6%	3.4%	-1.1%	0.5%	3.3%
Botswana	3.6%	8.5%	6.0%	9.6%	5.0%	5.0%	8.6%
Burkina Faso	2.6%	1.4%	1.4%	4.0%	1.6%	1.6%	4.2%
Burma	2.5%	2.2%	2.2%	4.7%	3.6%	3.6%	6.1%
Burundi	2.7%	2.1%	2.1%	4.8%	1.5%	1.5%	4.2%
C A R	2.4%	0.1%	0.5%	2.9%	-1.3%	0.5%	2.9%
Cameroon	2.6%	2.7%	2.7%	5.3%	4.6%	4.6%	7.2%
Chad	2.4%	-2.8%	0.5%	2.9%	-7.7%	0.0%	2.4%
Chile	1.6%	-0.1%	0.5%	2.1%	1.4%	1.4%	3.0%
Colombia	2.1%	3.2%	3.2%	5.3%	2.7%	2.7%	4.8%
Congo	2.7%	3.5%	3.5%	6.2%	3.6%	3.6%	6.3%
Costa Rica	2.5%	2.1%	2.1%	4.6%	0.4%	0.5%	3.0%
Cyprus	1.1%	5.5%	5.5%	6.6%	1.4%	1.4%	2.5%
Dom Rep	2.3%	3.9%	3.9%	6.2%	1.5%	1.5%	3.8%
Ecuador	3.2%	4.6%	4.6%	7.8%	3.0%	3.0%	6.2%
Egypt	2.5%	4.2%	4.2%	6.7%	6.6%	6.0%	8.5%
El Salv	3.1%	-0.2%	0.5%	3.6%	-2.3%	0.5%	3.6%
Ethiopia	3.0%	0.5%	0.5%	3.5%	0.7%	0.7%	3.7%
Fiji	1.6%	3.4%	3.4%	5.0%	1.2%	1.2%	2.8%
Gabon	1.8%	3.2%	3.2%	5.0%	-4.7%	0.5%	2.3%
Gambia	2.1%	1.4%	1.4%	3.5%	-0.8%	0.5%	2.6%
Ghana	3.3%	-2.1%	0.5%	3.8%	-3.8%	0.5%	3.8%
Guatemala	2.9%	2.1%	2.1%	5.0%	1.4%	1.4%	4.3%
Guinea	2.5%	1.1%	1.1%	3.6%	0.5%	0.5%	3.0%
Guinea Bissau	2.0%	-1.7%	0.5%	2.5%	-2.1%	0.5%	2.5%
Guyana	1.8%	0.5%	0.5%	2.3%	-1.3%	0.5%	2.3%
Haiti	2.6%	1.1%	1.1%	3.7%	1.9%	1.9%	4.5%
Honduras	3.3%	0.6%	0.6%	3.9%	0.7%	0.7%	4.0%
Indonesia	1.7%	5.0%	5.0%	6.7%	4.6%	4.6%	6.3%
Iraq	3.4%	5.3%	0.5%	3.9%	9.3%	0.5%	3.9%
Ivory Coast	3.4%	1.0%	1.0%	4.4%	1.1%	1.1%	4.5%
Jamaica	1.4%	-0.5%	0.5%	1.9%	-4.0%	0.5%	1.9%
Jordan	3.9%	6.9%	6.0%	9.9%	7.8%	6.0%	9.9%
Kampuchea	3.1%	--	0.0%	3.1%	-6.2%	0.0%	3.1%
Kenya	4.3%	2.3%	2.3%	6.6%	1.0%	1.0%	5.3%
Korea DPR	2.3%	3.5%	3.5%	5.8%	3.8%	3.8%	6.1%
Korea Rep	1.4%	6.7%	6.0%	7.4%	5.6%	5.6%	7.0%
Laos	2.5%	1.8%	1.8%	4.3%	2.0%	2.0%	4.5%
Lebanon	1.3%	3.1%	0.5%	1.8%	3.7%	0.5%	1.8%
Lesotho	2.6%	6.3%	6.0%	8.6%	4.0%	4.0%	6.6%
Liberia	3.2%	0.8%	0.8%	4.0%	-0.9%	0.5%	3.7%

Madagascar	2.9%	-1.2%	0.5%	3.4%	-2.5%	0.5%	3.4%
Malawi	3.4%	2.2%	2.2%	5.6%	1.1%	1.1%	4.5%
Malaysia	2.2%	4.5%	4.5%	6.7%	4.9%	4.9%	7.1%
Mali	2.9%	1.2%	1.2%	4.1%	2.1%	2.1%	5.0%
Mauritania	3.1%	0.3%	0.5%	3.6%	0.7%	0.7%	3.8%
Mauritius	1.8%	2.8%	2.8%	4.6%	2.3%	2.3%	4.1%
Morocco	3.2%	2.9%	2.9%	6.1%	2.1%	2.1%	5.3%
Mozambique	3.0%	-0.1%	0.5%	3.5%	-5.3%	0.5%	3.5%
Nepal	2.3%	0.1%	0.5%	2.8%	0.3%	0.5%	2.8%
Nicaragua	3.4%	-1.8%	0.5%	3.9%	-5.3%	0.5%	3.9%
Niger	3.0%	-1.2%	0.5%	3.5%	2.8%	2.8%	5.8%
Pakistan	2.5%	2.5%	2.5%	5.0%	2.9%	2.9%	5.4%
Panama	2.1%	2.9%	2.9%	5.0%	2.5%	2.5%	4.6%
Paraguay	2.9%	4.5%	4.5%	7.4%	6.8%	6.0%	8.9%
Peru	2.6%	0.1%	0.5%	3.1%	-0.4%	0.5%	3.1%
Philippines	2.4%	2.9%	2.9%	5.3%	2.9%	2.9%	5.3%
Rwanda	3.6%	2.3%	2.3%	5.9%	2.3%	2.3%	5.9%
Senegal	2.8%	-0.5%	0.5%	3.3%	-0.7%	0.5%	3.3%
Sierra Leone	1.9%	1.1%	1.1%	3.0%	-0.3%	0.5%	2.4%
Somalia	2.1%	-0.8%	0.5%	2.6%	1.9%	1.9%	4.0%
Sri Lanka	1.9%	2.9%	2.9%	4.8%	3.2%	3.2%	5.1%
Sudan	2.9%	1.3%	1.3%	4.2%	3.5%	3.5%	6.4%
Surinam	0.5%	4.5%	4.5%	5.0%	5.1%	5.1%	5.6%
Swaziland	3.1%	2.6%	2.6%	5.7%	0.0%	0.0%	3.1%
Syria	3.8%	4.9%	4.9%	8.7%	4.9%	4.9%	8.7%
Tanzania	3.7%	0.9%	0.9%	4.6%	0.1%	0.1%	3.8%
Thailand	1.9%	4.3%	4.3%	6.2%	4.0%	4.0%	5.9%
Togo	3.0%	1.1%	1.1%	4.1%	0.4%	0.5%	3.5%
Tri Tob	1.1%	3.4%	3.4%	4.5%	5.2%	5.2%	6.3%
Tunisia	2.4%	5.0%	5.0%	7.4%	4.1%	4.1%	6.5%
Turkey	2.3%	3.0%	3.0%	5.3%	1.4%	1.4%	3.7%
Uganda	3.6%	-4.4%	0.5%	4.1%	-5.6%	0.5%	4.1%
Uruguay	0.7%	2.0%	2.0%	2.7%	2.9%	2.9%	3.6%
Vietnam	2.0%	--	0.5%	2.5%	-0.8%	0.5%	2.5%
Yemen AR	2.6%	5.7%	5.7%	8.3%	3.5%	3.5%	6.1%
Yemen PDR	2.9%	6.4%	6.0%	8.9%	6.4%	6.0%	8.9%
Zaire	3.0%	-1.3%	0.5%	3.5%	-4.2%	0.5%	3.5%
Zambia	3.4%	-1.3%	0.5%	3.9%	-2.5%	0.5%	3.9%
Zimbabwe	3.6%	1.5%	1.5%	5.1%	0.4%	0.5%	4.1%

a/ Average Annual growth rate for 1982-1990, based on UN 1983 Assessment figures (medium variant).

b/ These per capita GNP growth rates are mostly from the World Development Report, 1985. Where figures were not available in the 1985 issue, they were drawn from earlier issues. Most of the rates from the 1985 issue are based on the period 1965-83. These rates are referred to in the text and tables as long-term rates.

c/ Adjustments were made on the basis of a general constraint -- max = 6.0%, min = 0.5% -- and with consideration for particularly disturbed conditions in some countries.

d/ GNP growth rates are approximated by adding the acquired (adjusted) per capita GNP growth rates to population growth rates.

e/ These per capita GNP growth rates are mostly from the World Bank Atlas, 1985. Where figures were not available int he 1985 issue, they were drawn from earlier issues, Most of the rates from the 1985 issue are based on the period 1973-1982. These rates are referred to in the text and tables as medium-term rates.

cereal exports form a constant proportion of aggregate production, i.e., they grow at the same rate. Since the cereal exports of developing countries during the base period were relatively small, assuming that they grow with domestic production instead of remaining constant does not make a very large difference to the estimates of food aid needs.

(c) THE RESULTS WITH AGGREGATE GNP GROWTH RATES

When cereal exports grow with production and either short term or long term rates of growth of aggregate GNP are used to determine the growth of commercial cereal imports, two estimates (4A and 4B) are obtained for food aid needs. The only difference between these estimates is that in one of them medium term rates of aggregate GNP growth (estimate 4A) and in the other long term rates (estimate 4B) are used to determine the growth of gross commercial cereal imports. Any cereal exports are assumed to remain a constant proportion of domestic food production (in other words to grow with domestic production) in both estimates.

When medium term rates of growth of aggregate GNP are used to project commercial cereal imports from their 1977-82 base (estimate 4A), aggregate food aid needs are 18.25 million tons in 1985 and 29.18 million tons in 1990 (Table 5.2), i.e. 5.15 million tons less than the initial estimates in 1985 and 15.55 million tons less in 1990. When the long term rates of aggregate GNP growth are used instead (estimate 4B), total food aid needs are 18.35 million tons in 1985 and 29.69 million tons in 1990 (Table 5.3). These estimates are

Table 5.2 -- Food Aid Needs (Method 4A) a/
(100,000 metric tons)

Region	1985	1986	1987	1988	1989	1990
South Asia	33.44	35.63	37.87	40.76	43.78	46.92
East Asia	18.22	16.66	14.84	13.52	13.19	12.79
Asia	51.67	52.29	52.71	54.27	56.97	59.71
West Asia	7.18	9.05	11.00	13.03	15.25	17.64
North Africa	31.69	33.80	35.79	37.64	39.30	40.76
West Asia & North Africa	38.87	42.85	46.79	50.67	54.55	58.40
West Africa	19.06	22.09	25.23	28.49	31.87	35.37
Central Africa	8.17	9.60	11.08	12.62	14.22	15.89
East Africa	46.50	54.52	62.91	71.70	80.90	90.53
Sub-Saharan Africa	73.74	86.20	99.22	112.81	126.98	141.79
Caribbean/ Central	8.57	9.56	10.59	11.66	12.77	13.92
South America	9.61	11.11	12.66	14.27	16.08	17.95
Latin America	18.18	20.67	23.25	25.93	28.85	31.87
TOTAL	**182.46**	**202.01**	**221.97**	**243.68**	**267.36**	**291.77**

a/ Imports growing at the growth rate of GNP (medium term rates of aggregate GNP growth).

See appendix on methodology for details

Table 5.3 -- Food Aid Needs (Method 4B) a/
(100,000 metric tons)

Region	1985	1986	1987	1988	1989	1990
South Asia	33.75	36.05	38.43	41.30	44.44	47.70
East Asia	17.71	15.93	14.04	13.86	13.63	13.33
Asia	51.46	51.98	52.47	55.16	58.07	61.03
West Asia	6.48	8.06	9.70	11.38	13.21	15.17
North Africa	33.69	36.37	39.05	41.73	44.65	47.57
West Asia & North Africa	40.17	44.44	48.75	53.11	57.86	62.74
West Africa	19.12	22.17	25.34	28.62	32.03	35.57
Central Africa	8.19	9.62	11.12	12.67	14.29	15.97
East Africa	46.37	54.34	62.67	71.39	80.51	90.06
Sub-Saharan Africa	73.68	86.13	99.12	112.68	126.84	141.60
Caribbean/ Central	8.39	9.27	10.20	11.17	12.17	13.20
South America	9.81	11.37	12.98	14.65	16.44	18.35
Latin America	18.20	20.64	23.19	25.82	28.61	31.56
TOTAL	183.51	203.18	223.53	246.77	271.37	296.93

a/ Imports growing at the growth rate of GNP (long term rates of aggregate GNP growth). See appendix on methodology for details

smaller than the initial estimates by 5.04 million tons in 1985 and 15.03 million tons in 1990.

The differences between the two estimates in any year are small in aggregate as well as for each region and subregion. It would appear that offsetting changes occur in the estimates for individual countries when long term rates of aggregate GNP growth are used instead of medium term growth rates so that changes in group totals are relatively small. However, when these two estimates are compared with the initial estimate (1A), relatively large reductions take place in estimated food aid requirements. The two estimates are smaller than the initial estimates by about 22 percent in 1985 and by about 34 percent in 1990. The percentage difference is thus not only relatively large but widens over time. This is because the growth in commercial imports keeps reducing the estimates of food aid needs by these methods relative to the estimates obtained by assuming net commercial imports to be constant. Using rates of growth of aggregate GNP for determining the growth of commercial imports in these two estimates has a particularly strong effect in reducing the rate at which estimated food aid needs grow over time since these rates are generally large in developing countries because of high population growth rates.

Large reductions in food aid needs are obviously produced for those countries with relatively high rates of growth of aggregate GNP. This is shown for estimate 4B in Table 5.4. The reduction is particularly large in absolute magnitude when the quantity of average commercial cereal imports in 1977-82 is itself large in absolute terms.

Table 5.4 -- Some Countries With Relatively High Long-term GNP Growth Rates: Comparison Between Method 4B and Method 1A a/ (100,000 metric tons).

Country	GNP b/ Growth Rate (%)	GNP/N Growth Rate c/ (%)	Population d/ Growth Rate (%)	1977-82 e/ Average Gross comm. Imports	4B 1985	4B 1990	1A 1985	1A 1990	Col.7 - Col.5 / Col.7	Col.8 - Co / Col.:
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(percent)	
Burkina Faso	4.0	1.4	2.6	0.01	2.97	5.09	2.98	5.11	0.34	0.39
Mali	4.1	1.2	2.9	0.34	3.46	5.82	3.48	5.92	0.57	1.69
Sri Lanka	4.8	2.9	1.9	7.12	1.22	0.00	2.29	1.55	46.72	n.d
Malawi	5.6	2.2	3.4	0.28	3.39	6.44	3.43	6.59	1.17	2.28
Kenya	6.6	2.3	4.3	0.83	8.89	19.33	9.05	19.84	1.77	2.57
Egypt	6.7	4.2	2.5	42.85	14.83	18.33	23.85	47.06	37.82	61.05
Malaysia	6.7	4.5	2.2	13.41	4.15	1.42	6.82	10.29	39.15	86.20
Tunisia	7.4	5.0	2.4	6.96	0.62	0.00	2.27	4.73	72.69	n.d
Ecuador	7.8	4.6	3.2	2.98	1.24	5.09	1.97	7.50	37.06	32.13

n.d Not defined.

a/4B: Long-term GNP growth rate; exports are a proportion of production.
1A: Based on net commercial imports (1977-82), treating negative values as negative values.
See appendix on methodology for details.

b/ Approximated by adding the relevant population and per capita GNP growth rates.

c/ World Development Report, 1985. Average annual growth rate, 1965-1983 (referred to in the text and tables as long-term per capita GNP growth rate).

d/ Average annual growth rate for 1982-1990, based on UN 1983 Assessment figures (medium variant).

e/ Derived from figures taken from FAO Trade Yearbooks (different issues), and Food Aid in Figures (FAO, 1984). See appendix on methodology for details.

(d) USING PER CAPITA GNP GROWTH RATES

In the projections given above, the long-term and medium-term rates of growth that have been applied to 1977-82 average commercial cereal imports are those for aggregate GNP. These rates are approximately equal to the sums of population growth rates and of the relevant rates of growth of per capita GNP. It follows that the same rate of growth of aggregate GNP (say 5 percent) could result from a high per capita GNP growth (say 4 percent) combined with a low population growth rate (say 1 percent) or from a low per capita GNP growth rate (say 1 percent) combined with a high population growth rate (say 4 percent). Could countries with such different contributions of their population growth rates to identical aggregate GNP growth rates be expected to have identical rates of growth of their base period average commercial cereal imports?

Two forces would probably tend to affect commercial cereal imports for countries that have high population growth rates (relative to any given rate of growth of aggregate GNP). First, these countries would find it difficult to maintain the growth of their total export earnings at the same rate as the growth of their aggregate GNP. Second, they would find it difficult to allocate the same proportion of their export earnings to commercial cereal imports because of the increasing pressure of other demands. The rate at which commercial imports could rise would tend to fall below the rate of growth of aggregate GNP because of the combined effect of these two factors. Since both these factors reflect the effect of the rate of population growth, it could be reasonably argued that commercial cereal imports could not really be expected to grow at a rate faster

than the rate of growth of per capita GNP. This would imply that the proportion of the value of commercial cereal imports (at constant prices) to aggregate GNP could be expected to fall over time at the rate of growth of population.

(e) THE RESULTS WITH PER CAPITA GNP GROWTH RATES

Food aid needs can be estimated using two rates of growth of per capita GNP (both long-term and medium-term) and, as before, assuming cereal exports to grow from their 1977-82 level at the same rate as production. The two sets of results obtained in this way (Tables 5.5 5.6 and 5.7) can once again be compared with the initial results that were obtained on the basis of constant net commercial imports held at the level of their 1977-82 average (estimate 1A).

If commercial imports are assumed to grow at medium term rates of growth of per capita GNP and cereal exports are assumed as before to grow at the rate of growth of food production (estimate 5A), estimated aggregate food aid needs rise from 20.54 million tons in 1985 to 36.14 million tons in 1990 (Table 5.5). If long term rates of growth of per capita GNP are used (estimate 5B), food aid needs still amount to 20.54 million tons in 1985 but rise to a slightly lower level of 36.11 million tons in 1990 (Table 5.6).

In comparison with the initial estimates (1A), the reduction in aggregate food aid needs is smaller than when rates of growth of aggregate GNP are used to determine the growth of gross commercial cereal imports. This reduction amounts to 2.85 million tons in 1985 and 8.58 million tons in 1990 when the medium term per capita GNP growth rates are used and to 2.86 million tons in 1985 and 8.62

Table 5.5 -- Food Aid Needs (Method 5A) a/
(100,000 metric tons)

Region	1985	1986	1987	1988	1989	1990
South Asia	34.14	36.59	39.12	41.74	44.46	47.72
East Asia	22.26	22.33	22.30	22.17	21.93	21.56
Asia	56.39	58.92	61.42	63.91	66.38	69.28
West Asia	10.81	14.05	17.46	21.06	24.88	28.90
North Africa	40.86	46.69	52.77	59.11	65.72	72.60
West Asia & North Africa	51.67	60.74	70.23	80.17	90.60	101.50
West Africa	19.98	23.47	27.10	30.87	34.79	38.85
Central Africa	8.84	10.51	12.25	14.06	15.95	17.91
East Africa						
Sub-Saharan Africa	76.31	89.86	104.01	118.79	134.23	150.34
Caribbean/ Central	9.38	10.66	12.00	13.39	14.83	16.34
South America	11.65	13.89	16.21	18.64	21.24	23.99
Latin America	21.03	24.55	28.21	32.02	36.07	40.33
TOTAL	**205.41**	**234.06**	**263.88**	**294.90**	**327.27**	**361.44**

a/ Imports growing at the growth rate of GNP (Medium term per capita GNP growth rate). See appendix on methodology for details

Table 5.6 -- Food Aid Needs (Method 5B) a/
(100,000 metric tons)

Region	1985	1986	1987	1988	1989	1990
South Asia	34.43	36.99	39.63	42.36	45.19	48.38
East Asia	21.75	21.62	21.36	20.97	20.45	19.77
Asia	56.18	58.60	60.99	63.34	65.64	68.14
West Asia	10.13	13.11	16.24	19.54	23.03	26.70
North Africa	41.66	47.86	54.37	61.20	68.37	75.90
West Asia & North Africa	51.79	60.97	70.61	80.74	91.40	102.60
West Africa	20.05	23.57	27.22	31.01	34.96	39.05
Central Africa	8.85	10.53	12.28	14.11	16.01	17.99
East Africa	47.38	55.72	64.45	73.60	83.18	93.20
Sub-Saharan Africa	76.28	89.81	103.95	118.72	134.14	150.24
Caribbean/ Central	9.29	10.47	11.68	12.95	14.31	15.73
South America	11.84	14.15	16.54	19.02	21.61	24.40
Latin America	21.14	24.61	28.22	31.97	35.92	40.13
TOTAL	**205.39**	**234.00**	**263.77**	**294.77**	**327.09**	**361.10**

a/ Imports growing at the growth rate of GNP (Long term per capita GNP growth rate).

See appendix on methodology for details

TABLE 5.7 -- Comparison Between Method 5A (imports growing at medium-term per capita GNP growth rate) and Method 5B (imports growting at long-term per capita GNP growth rate). (100,000 Metric Tons).

	5A		5B			
	1985	1990	1985	1990	C1.1-C1.3	C1.2-C1.3
SOUTH ASIA	34.14	47.72	34.43	48.38	-0.29	-0.66
EAST ASIA	22.26	21.56	21.75	19.77	0.50	1.79
ASIA	56.39	69.28	56.18	68.14	0.21	1.13
WEST ASIA	10.81	28.90	10.13	26.70	0.68	2.20
N.AFRICA	40.86	72.60	41.66	75.90	-0.80	-3.30
W.A. & N.AF	51.67	101.50	51.79	102.60	-0.12	-1.10
WEST AFRIC	19.98	38.85	20.05	39.05	-0.07	-0.20
CENTRAL AF	8.84	17.91	8.85	17.99	-0.02	-0.07
EAST AFRIC	47.50	93.58	47.38	93.20	0.12	0.38
AFRICA	76.31	150.34	76.28	150.24	0.03	0.10
CENTRAL AM	9.38	16.34	9.29	15.73	0.08	0.61
SOUTH AMER	11.65	23.99	11.84	24.40	-0.20	-0.41
LATIN AMER	21.03	40.33	21.14	40.13	-0.11	0.20
TOTAL	**205.40**	**361.44**	**205.39**	**361.11**	**0.01**	**0.33**

million tons when the long term rates of growth of per capita GNP are used (Tables 5.8, 5.9, and 5.10).

How do the results obtained by using per capita GNP growth rates compare with those obtained by using aggregate GNP growth rates for determining the growth of gross commercial cereal imports? As might be expected, the methods using per capita GNP growth rates give higher food aid needs than the methods using aggregate GNP growth rates. Total food aid needs are higher by 2.29 million tons in 1985 and 6.97 million tons in 1990 when medium term rates are used (estimate 5A compared with estimate 4A) and by 2.19 million tons in 1985 and 6.42 million tons in 1990 when long term rates are used (estimate 5B compared with estimate 4B -- Table 5.11).

As one would expect, the estimated food aid needs for those regions, subregions and countries in which expected population growth rates are relatively high increase most dramatically when per capita GNP growth rates are used instead of aggregate GNP growth rates. In other words, the lowering of their estimates of food aid needs that is produced when commercial cereal imports are assumed to grow instead of remaining constant is less dramatic when per capita rates of growth of GNP are used and this is seen most powerfully for those countries whose population growth rates are high.

As was found when the results obtained by using medium term and long term rates of growth of <u>aggregate</u> GNP were used to determine commercial cereal imports, there is little difference between the estimates obtained for total food aid needs or for those of regions and subregions also when medium term and long term <u>per capita</u> GNP growth rates are used for the purpose. Differences do exist between

Table 5.8 -- Food Aid Needs for Different Assumptions On Commercial Imports 1985

(100,000 metric tons)

Region	A (1A)	B (5A)	C (5B)	B-A	C-A	C-A / A (%)	B-A / A (%)
South Asia	35.18	34.14	34.43	-1.05	-0.75	-2.14	-2.97
East Asia	32.70	22.26	21.75	-10.44	-10.94	-33.47	-31.93
Asia	67.88	56.39	56.18	-11.48	-11.69	-17.23	-16.92
West Asia	13.04	10.81	10.13	-2.23	-2.91	-22.31	-17.11
North Africa	53.04	40.86	41.66	-12.17	-11.37	-21.45	-22.95
West Asia & North Africa	66.08	51.67	51.79	-14.41	-14.28	-21.62	-21.80
West Africa	20.41	19.98	20.05	-0.43	-0.36	-1.76	-2.11
Central Africa	9.11	8.84	8.85	-0.27	-0.26	-2.82	-3.00
East Africa	48.17	47.50	47.38	-0.68	-0.79	-1.65	-1.40
Sub-Saharan Africa	77.70	76.31	76.28	-1.39	-1.42	-1.83	-1.79
Carribean/ Central	10.10	9.38	9.29	-0.72	-0.80	-7.93	-7.10
South America	12.20	11.65	11.84	-0.56	-0.36	-2.94	-4.56
Latin America	22.30	21.03	21.14	-1.27	-1.16	-5.20	-5.71
TOTAL	**233.95**	**205.40**	**205.39**	**-28.55**	**-28.56**	**-12.20**	**-12.20**

Assumptions:

A = Constant Net Commercial Imports (Method 1A)
B = Cereal Exports as Proportion of Production and Gross Commercial Cereal Imports Growing at Medium Term Rates of Growth of Per Capita GNP (Method 5A).
C = Cereal Exports as Proportion of Production and Gross Commercial Cereal Imports Growing at L.T. Rates of Growth of Per Capita GNP (Method 5B).

Note: Numbers may not add up to totals because of rounding.

Table 5.9 -- Different Assumptions on Commercial Imports - 1990
(in 100,000 tons)

Region	D (1A)	E (5A)	F (5B)	E-D	F-D	$\frac{F-D}{D}$ (%)	$\frac{E-D}{D}$ (%)
South Asia	50.08	47.72	48.38	-2.36	-1.70	-3.40	-4.71
East Asia	53.87	21.56	19.77	-32.32	-34.10	-63.30	-59.98
Asia	103.95	69.28	68.14	-34.67	-35.81	-34.45	-33.36
West Asia	35.49	28.90	26.70	-6.59	-8.79	-24.77	-18.58
North Africa	109.64	72.60	75.90	-37.74	-33.74	-30.77	-33.78
West Asia & North Africa	145.13	101.50	102.60	-43.63	-42.53	-29.31	-30.06
West Africa	39.96	38.85	39.05	-1.11	-0.91	-2.30	-2.78
Central Africa	18.74	17.91	17.99	-0.83	-0.76	-4.04	-4.44
East Africa	94.92	93.58	93.20	-1.34	-1.72	-1.81	-1.42
Sub-Saharan Africa	153.62	150.34	150.24	-3.28	-3.38	-2.20	-2.14
Carribean/ Central	17.93	16.34	15.73	-1.59	-2.20	-12.27	-8.86
South America	26.59	23.99	24.40	-2.60	-2.19	-8.24	-9.79
Latin America	44.52	40.33	40.13	-4.19	-4.39	-9.86	-9.41
TOTAL	**447.27**	**361.44**	**361.11**	**-85.83**	**-86.16**	**-19.26**	**-19.19**

Assumptions:

D = Constant Net Commercial Imports (Method 1A)
E = Cereal Exports as Proportion of Production and Gross Commercial Cereal Imports Growing at Medium Term Rates of Growth of Per Capita GNP (Method 5B).
F = Cereal Exports as Proportion of Production and Gross Commercial Cereal Imports Growing at L.T. Rates of Growth of Per Capita GNP (Method 5D)

Table 5.10 -- Growth in Food Aid Needs, 1985-90 (100,000 metric tons)

Region	1985 A (1A)	1985 B (5A)	1985 C (5B)	1990 D (1A)	1990 E (5A)	1990 F (5B)	D-A / A (%)	F-C / B (%)	E-B / C (%)
South Asia	35.18	34.14	34.43	50.08	47.72	48.38	42.35	39.79	40.51
East Asia	32.70	22.26	21.75	53.87	21.56	19.77	64.77	-3.14	-9.12
Asia	67.88	56.3	56.18	103.95	69.28	68.14	53.15	22.85	21.29
West Asia	13.04	10.81	10.13	35.49	28.90	26.70	172.24	167.41	163.60
North Africa	53.04	40.86	41.66	109.64	72.60	75.90	106.71	77.66	82.17
West Asia & North Africa	66.08	51.67	51.79	145.13	101.50	102.60	119.64	96.43	98.09
West Africa	20.41	19.98	20.05	39.96	38.85	39.04	95.79	94.44	94.71
Central Africa	9.11	8.84	8.85	18.74	17.91	17.99	105.74	102.70	103.16
East Africa	48.17	47.50	47.38	94.92	93.58	93.20	97.04	97.01	96.72
Sub-Saharan Africa	77.70	76.31	76.28	153.62	150.34	150.24	97.71	97.01	96.96
Carribean/ Central	10.10	9.38	9.29	17.93	16.34	15.73	77.55	74.19	69.18
South America	12.20	11.65	11.84	26.59	23.99	24.40	117.19	105.97	106.02
Latin America	22.20	21.03	21.14	44.52	40.33	40.13	99.64	91.80	89.82
TOTAL	**233.95**	**205.40**	**205.39**	**447.27**	**361.44**	**361.11**	**91.18**	**75.97**	**75.82**

Assumptions:

A,D = Constant Net Commercial Imports (Method 1A)
B,E = Cereal Exports as Proportion of Production and Gross Commercial Cereal Imports Growing at Medium Term Rates of Growth of Per Capita GNP (Method 5A).
C,F = Cereal Exports as Proportion of Production and Gross Commercial Cereal Imports Growing at L.T. Rates of Growth of Per Capita GNP (Method 5B).

Table 5.11 -- Comparison Between Method 4B (imports growing at growth rate of aggregate GNP) and Method 5B (imports growing at growth rate of per capita GNP)[a/] (100,000 metric tons)

Region	4B 1985	4B 1990	5B 1985	5B 1990	Col.3-Col.1	Col.3-Col.1 / Col.1 (%)	Col.4-Col.2	Col.4-Col.2 / Col.2 (%)
	1	2	3	4	5	6	7	8
South Asia	33.75	47.70	34.43	48.38	0.68	2.01	0.67	1.41
East Asia	17.71	13.33	21.75	19.77	4.05	22.85	6.44	48.34
Asia	51.64	61.03	56.18	68.14	4.72	9.18	7.11	11.66
West Asia	6.48	15.17	10.13	26.70	3.65	56.34	11.53	75.98
North Africa	33.69	47.57	41.66	75.90	7.97	23.65	28.33	59.57
West Asia & North Africa	40.17	62.74	51.79	102.60	11.62	28.93	39.86	63.53
West Africa	19.12	35.57	20.05	39.05	0.93	4.86	3.48	9.78
Central Africa	8.19	15.97	8.85	17.97	0.66	8.10	2.01	12.60
East Africa	46.37	90.06	47.38	93.20	1.00	2.16	3.14	3.49
Sub-Saharan Africa	73.68	141.60	76.28	150.24	2.60	3.53	8.64	6.10
Caribbean/ Central	8.39	13.20	9.29	15.73	0.91	10.82	2.52	19.11
South America	9.81	18.35	11.84	24.40	2.03	20.73	6.04	32.94
Latin America	18.20	31.56	21.14	40.13	2.94	16.16	8.57	27.15
TOTAL	**183.51**	**296.93**	**205.39**	**361.11**	**21.88**	**11.92**	**64.18**	**21.61**

a/4B: Long-term growth rate of aggregate GNP; exports are a proportion of production.
5B: Long-term growth rate of per capita GNP; exports are a proportion of production.
See appendix on methodology for details.

these two estimates for some individual countries (Table 5.12) but they offset one another for groups of countries.

Table 5.12 -- Some Countries With a Relatively Large Difference Between Medium-Term and Long-Term Per Capita GNP Growth Rates. Comparison Between Method 5A (Medium-Term rate) and Method 5B (Long-Term rate).a/

Country	Medium-Term rate (%) b/ (1)	Long-Term rate (%)c/ (2)	5A (100,000 MT) 1985 (3)	5A (100,000 MT) 1990 (4)	5B (100,000 MT) 1985 (5)	5B (100,000 MT) 1990 (6)	Col.5-Col.3	Col.6-Col.4
Algeria	2.4	3.6	3.21	12.12	2.09	8.66	-1.12	-3.46
Bangladesh	3.2	0.5	29.27	41.20	29.49	41.86	0.22	0.66
Chile	1.4	0.5	2.13	3.99	2.46	4.91	0.33	0.92
Dominican Republic	1.5	3.9	2.75	4.47	2.56	3.88	-0.19	0.59
Egypt	6.0	4.2	15.80	21.83	18.35	30.58	2.56	8.74
Kenya	1.0	2.3	9.04	19.81	9.00	19.71	0.04	-0.10
Niger	2.8	0.5	1.44	3.33	1.49	3.46	0.05	0.13
Yemen AR	3.5	5.7	1.94	5.11	1.65	4.12	-0.30	-0.99

a/5A: Imports grow at a medium-term per capita GNP growth rate; exports are a proportion of production.
5B: Imports grow at a long-term per capita GNP growth rate; exports are a proportion of production.

b/ World Bank Atlas, 1985. Rates are adjusted where necessary. See appendix on methodology for details.
c/ World Development Report, 1985. Rates are adjusted where necessary. See appendix on methodology for details.

6. FOOD AID NEEDS 1985-90

(a) NARROWING THE LIST OF ESTIMATES

Varying the three basic assumptions underlying the new initial estimates presented in Chapter 2 above has generated 9 additional estimates of food aid needs. These 10 estimates (Table 6.1) differ from one another to varying degrees in the aggregate as well as for regions, subregions and individual countries. For each change in assumptions, significant differences tend to be produced for certain countries, which share certain characteristics related to the change in assumption. This emphasizes the sensitivity of the individual country results to the assumptions made.

For aggregate food aid needs, estimates that are much larger than the initial estimates are produced only when 1972-77 is used instead of 1977-82 as a base period for estimating commercial imports. As has already been noted, the sharp rise in international food prices during 1972-77 created extremely difficult conditions for developing countries trying to import food on a commercial basis. The volume of commercial food imports during this period cannot, therefore be treated as providing a relevant base for projecting likely commercial food imports during 1985-90. That is why no attempt was made to make estimates on the 1972-77 base by varying all the other assumptions. This helped to limit the number of estimates. Even so, this number is too large for any detailed examination to be

Table 6.1 - Food Aid Needs: All Projections

Projection		1985					1990				
		Asia	W. Asia & N. Africa	Africa	Latin America	Total	Asia	W. Asia & N. Africa	Africa	Latin America	Total
		(100,000 Metric Tons)									
1	A	67.88	66.08	77.70	22.30	233.95	103.95	145.13	153.62	44.52	447.27
	B	66.39	63.37	74.94	21.58	226.28	102.47	142.42	150.87	43.84	439.60
2	A	87.44	132.87	88.76	32.96	342.02	123.69	211.92	164.70	54.36	554.66
	B	84.82	129.64	84.62	31.83	330.91	121.13	208.70	160.56	53.67	544.05
3	A	59.19	66.08	75.32	21.85	222.42	95.45	145.13	151.23	44.11	435.92
	B	57.77	63.37	73.64	21.27	216.06	94.09	142.42	149.57	43.54	429.62
4	A	51.67	38.87	73.74	18.18	182.46	59.71	58.40	141.79	31.87	291.77
	B	51.46	40.17	73.68	18.20	183.51	61.03	62.74	141.60	31.56	296.93
5	A	56.39	51.67	76.31	21.03	205.40	69.28	101.50	150.34	40.33	361.44
	B	56.18	51.79	76.28	21.14	205.39	68.14	102.60	150.24	40.13	361.11

a/ See appendix on methodology for details.

made of how food aid needs vary with the circumstances of different countries. There is need to narrow the options down to obtain a very small number of estimates. Undoubtedly, in doing so,the base period chosen should be 1977-82. This would exclude from consideration the four estimates (2A, 2B, and 3A, 3B,) in which the base period 1972-77 is involved, thus leaving only six estimates for consideration.

For the reasons that have been set out in Chapter 3, and carried forward in Chapter 5, it is clear that the cereal exports of developing countries, even those needing food aid, cannot be ignored. The fact that these countries export cereals reflects the complex nature of food, which is not only essential for life but is also a commodity like any other. Employment and incomes are generated in its production and sale. Foreign exchange is generated from its export. Its production utilizes resources (like land) that have alternative uses, including the production of export crops. Cereal exports cannot be left out of the computations of food supply merely because it seems strange for a country to export food when it faces a long-run inadequacy of food. For a food-short country to export food is not really different in character from its exporting other commodities that use land which could otherwise produce food or exporting other products that use capital which could otherwise be invested in food production. The neglect of food exports in estimating food aid does not, therefore, appear to be justified. For these reasons, estimate 1B should be dropped.

This leaves four estimates in addition to estimate 1A. For the reasons discussed in Chapter 5, it is more appropriate to use growth rates of <u>per capita</u> GNP rather than those of <u>aggregate</u> GNP to project the average 1977-82 levels of commercial cereal imports into the

future. The two estimates (4A, B,) based on growth rates of aggregate GNP should, therefore, be dropped.

In two of the remaining estimates, cereal exports are assumed to form a constant proportion of production, i.e. to grow at the same rate as production, while the rates of growth of per capita income used to project commercial cereal imports are medium-term (estimate 5A) or long-term (estimate 5B) rates. In choosing between the medium-term rates and long-term growth of per capita GNP as the rates to be used for the growth of commercial imports, the arguments appear to be about evenly divided. The medium-term rate might appear to provide a better reflection of more recent developments, but doubts could be raised about whether those rates would really continue to prevail in the years ahead. The long-term rates may have greater validity for the determination of what are after all trend values. Since the original food consumption projections were made on the basis of long-term trends in GNP, there may be some justification for choosing them over the medium-term growth rates. Estimate 5A may, therefore, be dropped and estimate 5B retained.

In the initial estimates (1A) of food aid needs, it was assumed that net commercial imports of food in the future would be equal to average net commercial imports for the period 1977-82. This has the important policy implication that developing countries should not be required to import more food commercially to meet their needs as the years pass, though their export earnings and other factors affecting their ability to pay for food imports would tend to increase with time. The justification for such a policy is provided by the increased imports of energy, raw materials, intermediate goods and machinery and equipment that the foreign exchange thus freed would

make possible. Developing countries facing debt problems would also find it easier to deal with them. All this will facilitate more rapid development in these countries as well as expand the market for the exports of developed countries and thus give a stimulus to world trade. The food aid estimates made on this assumption (Estimate 1A) could, therefore, be retained to show the implication for food aid needs of the adoption of such a policy.

Two estimates thus remain. These are:

1. Estimate 1A, based on net commercial imports, which are held constant at average 1977-82 levels;
2. Estimate 5B, based on cereal exports forming a constant proportion of production and commercial cereal imports growing at the long-term rates of growth of per capita GNP.

A comparison of the regional and aggregate results obtained in these two estimates are presented in Table 6.2.

(b) THE BASIC ESTIMATES

As already indicated, it could be reasonably argued that developing countries should increase their commercial cereal imports to some extent with the passage of time. Therefore, estimate 5B can be treated as the basic estimate with respect to which further analysis should be carried out, though the initial estimate would continue to have important uses. The results of the initial estimates (1A) have been discussed earlier (Section 3.a).

Table 6.2 -- Initial Set of Estimates (1A) and Basic Estimates (5B)[a]

Region	1A 1985	1A 1990	5D 1985	5D 1990
South Asia	35.18	50.08	34.43	48.38
East Asia	32.70	53.87	21.75	19.77
Asia	67.88	103.95	56.18	68.14
West Asia	13.04	35.49	10.13	26.70
North Africa	53.04	109.64	41.66	75.90
West Asia & North Africa	66.08	145.13	51.79	102.60
West Africa	20.41	39.96	20.05	39.05
Central Africa				
East Africa	48.17	94.92	47.38	93.20
Sub-Saharan Africa	77.70	153.62	76.28	150.24
Carribean/ Central	10.10	17.93	9.29	15.73
South America	12.20	26.59	11.84	24.40
Latin America	22.30	44.52	21.14	40.13
TOTAL	**233.95**	**447.27**	**205.39**	**361.11**

a/1A: Based on net commercial imports (1977-82), treating negative values as negative values.
5B: Imports growing at the growth rate of per capita GNP; Long-term per capita GNP growth rate; exports are a proportion of production.

See appendix on methodology for details.

These basic estimates (5B) of demand-based and trend-based food aid requirements for the 85 developing countries covered in the study make the following assumptions about the cereals trade of developing countries:

(1) The base period is 1977-82,

(2) Gross commercial cereal imports in quantity grow at the long-term rate of growth of per capita GNP,

(3) Cereal exports in quantity grow at the same rate as domestic production (i.e. form a constant proportion of production).

The results obtained in estimate 5B are presented for individual countries and for regions and subregions in Table 6.3.

In examining these results, it should be kept in mind that for the reasons discussed earlier, four large countries - China, India, Nigeria and Brazil - have been excluded. Some very small countries for which food aid estimates are sometimes made have also been excluded, though their needs are so small that the aggregate estimates are not affected much by their exclusion.

For the 85 countries covered in the study, the trend-based demand-oriented estimates of food aid needs work out to 20.54 million tons in 1985 and to 36.11 million tons in 1990. Sub-Saharan Africa with 7.63 million tons of food aid needs in 1985 dominates the scene, while Asia (5.62 million tons) and West Asia and North Africa (5.18 million tons) follow. With Brazil excluded, Latin America's needs are estimated at only 2.11 million tons in 1985. The needs of Asia increase by about one-fifth between 1985 and 1990 -- from 5.62 million tons to 6.81 million tons, while those of the other regions approximately double over the period. As a result, Sub-Saharan

Table 6.3: Method 5B (Imports growing by long-term growth rate of GNP; exports are a proportion of production)

Individual Country Results 1985-1990
(100,000 METRIC TONS)

	1985	1986	1987	1988	1989	1990
BANGLADESH	29.49	31.78	34.15	36.62	39.19	41.86
BHUTAN	0.23	0.23	0.24	0.24	0.24	0.25
NEPAL	3.04	3.65	4.27	4.92	5.58	6.27
PAKISTAN	0.00	0.00	0.00	0.00	0.00	0.00
SRI LANKA	1.66	1.33	0.96	0.58	0.17	0.00
SOUTH ASIA	**34.43**	**36.99**	**39.63**	**42.36**	**45.19**	**48.38**
BURMA	0.00	0.00	0.00	0.00	0.00	0.00
FIJI	0.23	0.23	0.24	0.25	0.26	0.26
INDONESIA	0.00	0.00	0.00	0.00	0.00	0.00
KAMPUCHEA	5.15	5.64	6.14	6.66	7.20	7.75
KOREA DPR	0.00	0.00	0.00	0.00	0.00	0.00
KOREA REP	5.72	4.98	4.12	3.12	1.97	0.67
LAOS	1.32	1.54	1.76	1.99	2.23	2.48
MALAYSIA	5.16	5.14	5.11	5.06	5.01	4.95
PHILIPPINES	0.00	0.00	0.00	0.00	0.00	0.00
THAILAND	0.00	0.00	0.00	0.00	0.00	0.00
VIETNAM	4.17	4.09	3.99	3.89	3.77	3.65
EAST ASIA	**21.75**	**21.62**	**21.36**	**20.97**	**20.45**	**19.77**
ASIA	**56.18**	**58.60**	**60.99**	**63.34**	**65.64**	**68.14**
CYPRUS	0.92	0.88	0.83	0.77	0.71	0.64
IRAQ	5.01	7.21	9.53	11.97	14.54	17.25
JORDAN	0.96	1.14	1.34	1.56	1.80	2.06
LEBANON	1.59	1.77	1.96	2.15	2.35	2.55
SYRIA	0.00	0.00	0.00	0.00	0.00	0.00
TURKEY	0.00	0.00	0.00	0.00	0.00	0.00
YEMEN AR	1.65	2.10	2.58	3.08	3.59	4.12
YEMEN PDR	0.00	0.00	0.00	0.01	0.04	0.08
WEST ASIA	**10.13**	**13.11**	**16.24**	**19.54**	**23.03**	**26.70**
ALGERIA	2.09	3.24	4.46	5.77	7.17	8.66
EGYPT	18.35	20.61	22.95	25.39	27.94	30.58
MOROCCO	20.05	22.80	25.69	28.72	31.91	35.25
SUDAN	0.00	0.00	0.00	0.00	0.00	0.00
TUNISIA	1.17	1.22	1.27	1.32	1.36	1.41
N. AFRICA	**41.66**	**47.86**	**54.37**	**61.20**	**68.37**	**75.90**
W.ASIA & N. AFRICA	**51.79**	**60.97**	**70.61**	**80.74**	**91.40**	**102.60**

Table 6.3 contd.

	1985	1986	1987	1988	1989	1990
BENIN	0.67	0.79	0.91	1.05	1.19	1.33
BURKINA FASO	2.98	3.37	3.78	4.20	4.65	5.10
CHAD	1.23	1.48	1.73	1.99	2.26	2.53
GAMBIA	0.00	0.00	0.00	0.00	0.00	0.00
GHANA	4.30	4.97	5.67	6.40	7.16	7.96
GUINEA	1.41	1.64	1.87	2.12	2.37	2.63
GUINEA-BISSAU	0.40	0.43	0.46	0.49	0.53	0.56
IVORY COAST	0.02	0.16	0.30	0.45	0.61	0.78
LIBERIA	0.24	0.29	0.35	0.40	0.46	0.53
MALI	3.49	3.93	4.40	4.88	5.38	5.91
MAURITANIA	1.10	1.18	1.27	1.35	1.44	1.54
NIGER	1.49	1.85	2.22	2.62	3.03	3.46
SENEGAL	0.98	1.50	2.02	2.56	3.12	3.69
SIERRA LEONE	0.26	0.29	0.33	0.37	0.40	0.44
TOGO	1.48	1.69	1.90	2.12	2.35	2.59
WEST AFRICA	**20.05**	**23.57**	**27.22**	**31.01**	**34.96**	**39.05**
ANGOLA	2.06	2.50	2.95	3.42	3.90	4.39
BURUNDI	0.84	1.13	1.44	1.77	2.11	2.47
CAMEROON	0.55	0.55	0.56	0.57	0.58	0.58
CENT AFR REP	0.00	0.00	0.00	0.00	0.00	0.00
CONGO	0.31	0.36	0.42	0.47	0.53	0.59
GABON	0.56	0.59	0.62	0.65	0.69	0.72
RWANDA	0.00	0.00	0.00	0.00	0.00	0.00
ZAIRE	4.55	5.40	6.29	7.23	8.21	9.24
CENT. AFRICA	**8.85**	**10.53**	**12.28**	**14.11**	**16.01**	**17.99**
BOTSWANA	0.83	0.90	0.98	1.06	1.15	1.24
ETHIOPIA	9.51	11.47	13.51	15.63	17.82	20.09
KENYA	9.00	10.90	12.91	15.05	17.31	19.71
LESOTHO	1.70	1.90	2.11	2.34	2.57	2.82
MADAGASCAR	1.94	2.43	2.95	3.49	4.06	4.65
MALAWI	3.42	3.99	4.58	5.21	5.86	6.54
MAURITIUS	0.29	0.30	0.30	0.31	0.31	0.32
MOZAMBIQUE	6.13	6.79	7.47	8.17	8.89	9.63
SOMALIA	1.74	1.81	1.87	1.94	2.01	2.09
SWAZILAND	0.48	0.53	0.59	0.66	0.72	0.80
TANZANIA	4.83	5.64	6.50	7.42	8.38	9.39
UGANDA	4.12	5.13	6.19	7.30	8.47	9.69
ZAMBIA	3.39	3.92	4.46	5.03	5.62	6.23
ZIMBABWE	0.00	0.00	0.00	0.00	0.00	0.00
EAST AFRICA	**47.38**	**55.72**	**64.45**	**73.60**	**83.18**	**93.20**
S. S. AFRICA	**76.28**	**89.81**	**103.95**	**118.72**	**134.14**	**150.24**

Table 6.3 contd.

	1985	1986	1987	1988	1989	1990
COSTA RICA	0.00	0.00	0.00	0.00	0.00	0.00
DOMINICAN RP	2.56	2.79	3.04	3.30	3.58	3.88
EL SALVADOR	0.93	0.92	0.91	0.89	0.87	0.85
GUATEMALA	1.26	1.48	1.72	1.96	2.22	2.50
HAITI	1.79	2.06	2.35	2.64	2.93	3.24
HONDURAS	0.42	0.68	0.96	1.25	1.54	1.85
JAMAICA	0.94	0.98	1.02	1.06	1.11	1.15
NICARAGUA	1.29	1.47	1.65	1.85	2.05	2.26
PANAMA	0.00	0.00	0.00	0.00	0.00	0.00
TRINIDAD ETC	0.12	0.08	0.04	0.00	0.00	0.00
CENT. & CARIB.	**9.29**	**10.47**	**11.68**	**12.95**	**14.31**	**15.73**
BOLIVIA	0.92	1.12	1.32	1.53	1.75	1.99
COLOMBIA	0.00	0.00	0.00	0.00	0.00	0.00
ECUADOR	1.55	2.39	3.28	4.21	5.19	6.23
GUYANA	0.25	0.26	0.27	0.28	0.29	0.30
PARAGUAY	0.00	0.00	0.00	0.00	0.00	0.00
PERU	6.23	7.12	8.04	8.99	9.96	10.96
SURINAM	0.00	0.00	0.00	0.00	0.00	0.00
CHILE	2.46	2.94	3.42	3.91	4.41	4.91
URUGUAY	0.43	0.32	0.21	0.10	0.00	0.00
SOUTH AMERICA	11.84	14.15	16.54	19.02	21.61	24.40
LATIN AMERICA	21.14	24.61	28.22	31.97	35.92	40.13
TOTAL	205.39	234.00	263.77	294.77	327.09	361.10

Africa, with food aid needs of 15.02 million tons, continues to dominate the scene and West Asia and North Africa with food aid needs of 10.26 million tons pulls substantially ahead of Asia. Latin America without Brazil needs only about 4 million tons in 1990.

Among subregions, East Asia (excluding China) is the only area to show a slight fall in needs between 1985 and 1990. The needs of South Asia (excluding India) grow but at a slow pace. The fastest growth in needs is found in West Asia (from 1.01 to 2.67 million tons). In all other regions, food aid needs approximately double between 1985 and 1990.

Among individual countries, 18 countries in 1985 and 21 countries in 1990 do not have any demand-based food aid needs at all. The largest needs are those of Bangladesh - 2.95 million tons in 1985 and 4.19 million tons in 1990. Other countries with one million tons or more of food aid needs in 1985 are Morocco (2.00 million tons) and Egypt (1.84 million tons). By 1990, the needs of these countries rise to 4.19 million tons for Bangladesh, 3.53 million tons for Morocco and 3.06 million tons for Egypt. Four other countries with needs of more than one million tons in 1990 are Ethiopia (2.01), Kenya (1.97 million tons), Iraq (1.73 million tons), and Peru (1.10 million tons). Iraq's case is particularly noteworthy because its food aid needs more than triple over the five year period, while those of Ethiopia and Kenya approximately double and those of Peru increase by three-fourths. Other countries with extremely rapid growth of food aid needs between 1985 and 1990 - though the absolute levels of their needs are low - are Yemen Arab Republic in West Asia, Ivory Coast (where needs in 1985 are extremely low), Niger and Sierra Leone in West Africa, Burundi in Central Africa, Madagascar and

Uganda in East Africa, Honduras in Central America and Ecuador in Latin America.

However, not all countries show an increase in food aid requirements over the period. Countries which show a fall in food aid needs include Sri Lanka, Republic of Korea, Malaysia, Vietnam, and Trinidad.

(c) FOOD AID NEEDS BY INCOME CLASS

The per capita GNP of the 85 developing countries covered by the study is spread over an extremely wide range. It is of some interest to see how the estimated total food aid needs are distributed among countries belonging to different per capita income classes. For the purpose of analysis, developing countries have been divided into four income classes according to their per capita GNP in 1980 as follows:

I. Less than $250

II. $250 - $499

III. $500 - $1249

IV. $1250 or more.

Seventeen of the 85 countries fell in Class I, nineteen in Class II, 41 in class III and 8 in class IV. The distribution of countries from different regions and subregions between these income classes is extremely uneven. This is also reflected in the distribution of food aid requirements by area and income class (Table 6.4).

Out of total estimated food aid needs (estimate 5B) of 20.54 million tons in 1985, countries in class I accounted for 6.99 million tons, those in class II for 3.44 million tons, those in class III for 8.95 million tons and those in class IV for 1.16 million tons (Table

6.4) Countries in classes I and II taken together, i.e. those with incomes of less than $500, thus absorb only somewhat more than 50 percent of total food aid needs in 1985. In 1990, with 17.91 million tons, these countries absorb less than half of the total food aid needs of 36.0 million tons. The group of countries with per capita incomes of less than $500 excludes all the countries in West Asia and North Africa and all the countries except Haiti in Latin America.

Table 6.4 CLASSIFICATION OF FOOD AID REQUIREMENTS BY COUNTRY/REGION AND BY INCOME CLASS a/
(Based on Method 5B)

	Less than $250		$250-$499		$500-$1,249		$1,250 or More	
	1985	1990	1985	1990	1985	1990	1985	1990
			(100,000 Metric Tons)					
BANGLADESH	29.49	41.86						
BHUTAN	0.23	0.25						
NEPAL	3.04	6.27						
PAKISTAN			0.00	0.00				
SRI LANKA			1.66	0.00				
SOUTH ASIA	32.76	48.38	1.66	0.00	0.00	0.00	0.00	0.00
BURMA	0.00	0.00						
FIJI					0.23	0.26		
INDONESIA			0.00	0.00				
KAMPUCHEA	5.15	7.75						
KOREA DPR					0.00	0.00		
KOREA REP					5.72	0.67		
LAOS	1.32	2.48						
MALAYSIA					5.16	4.95		
PHILIPPINES					0.00	0.00		
THAILAND					0.00	0.00		
VIETNAM	4.17	3.65						
EAST ASIA	10.64	13.88	0.00	0.00	11.11	5.88	0.00	0.00
ASIA	43.40	62.26	1.66	0.00	11.11	5.88	0.00	0.00
CYPRUS							0.92	0.64
IRAQ							5.01	17.25
JORDAN					0.96	2.06		
LEBANON					1.59	2.55		
SYRIA					0.00	0.00		
TURKEY					0.00	0.00		
YEMEN AR					1.65	4.12		
YEMEN PDR			0.00	0.00				
WEST ASIA	0.00	0.00	0.00	0.00	4.20	8.73	5.93	17.89
ALGERIA							2.09	8.66
EGYPT					18.35	30.58		
MOROCCO					20.05	35.25		
SUDAN			0.00	0.00				
TUNISIA					1.17	1.41		
N.AFRICA	0.00	0.00	0.00	0.00	39.57	67.24	2.09	8.66
W.AS & N.AFR	0.00	0.00	0.00	0.00	43.77	75.97	8.02	26.55
BENIN			0.67	1.33				
BURKINA FASO	2.98	5.10						
CHAD	1.23	2.53						
GAMBIA			0.00	0.00				
GHANA					4.30	7.69		
GUINEA			1.41	2.63				

Table 6.4 con't

GUINEA-BISSAU	0.40	0.56						
IVORY COAST					0.02	0.78		
LIBERIA					0.24	0.53		
MALI	3.49	5.91						
MAURITANIA			1.10	1.54				
NIGER			1.49	3.46				
SENEGAL			0.98	3.69				
SIERRA LEONE			0.26	0.44				
TOGO			1.48	2.59				
WEST AFRICA	8.10	14.10	7.39	15.68	4.56	9.00	0.00	0.00
ANGOLA					2.06	4.39		
BURUNDI	0.84	2.47						
CAMEROON					0.55	0.58		
CENT AFR REP			0.00	0.00				
CONGO					0.31	0.59		
GABON							0.56	0.72
RWANDA	0.00	0.00						
ZAIRE	4.55	9.24						
CENTRAL AFRICA	5.39	11.71	0.00	0.00	2.92	5.56	0.56	0.72
BOTSWANA					0.83	1.24		
ETHIOPIA	9.51	20.09						
KENYA			9.00	19.71				
LESOTHO					1.70	2.82		
MADAGASCAR			1.94	4.65				
MALAWI			3.42	6.54				
MAURITIUS					0.29	0.32		
MOZAMBIQUE			6.13	9.63				
SOMALIA	1.74	2.09						
SWAZILAND					0.48	0.80		
TANZANIA			4.83	9.39				
UGANDA					4.12	9.69		
ZAMBIA					3.39	6.23		
ZIMBABWE					0.00	0.00		
EAST AFRICA	11.25	22.18	25.32	49.92	10.81	21.10	0.00	0.00
S.S. AFRICA	24.74	47.99	32.71	65.60	18.29	35.66	0.56	0.72
COSTA RICA					0.00	0.00		
DOMINICAN RP					2.56	3.88		
EL SALVADOR					0.93	0.85		
GUATEMALA					1.26	2.50		
HAITI	1.79	3.24						
HONDURAS					0.42	1.85		
JAMAICA					0.94	1.15		
NICARAGUA					1.29	2.26		
PANAMA					0.00	0.00		
TRINID & TOB							0.12	0.00
CENTRAL AMERIC	1.79	3.24	0.00	0.00	7.40	12.49	0.12	0.00
BOLIVIA					0.92	1.99		
COLOMBIA					0.00	0.00		

Table 6.4 con't

ECUADOR					1.55	6.23		
GUYANA					0.25	0.30		
PARAGUAY					0.00	0.00		
PERU					6.23	10.96		
SURINAM							0.00	0.00
CHILE							2.46	4.19
URUGUAY							0.43	0.00
SOUTH AMERICA	0.00	0.00	0.00	0.00	8.95	19.48	2.89	4.19
LATIN AMERICA	1.79	3.24	0.00	0.00	16.35	31.97	3.01	4.19
TOTAL	69.93	113.49	34.37	65.60	89.52	149.48	11.59	31.46
Number (85)	17	17	19	19	41	41	8	8

a/ Income classification based on GNP per capita income in U.S. dollars (1961-80 trend of real GNP; 1979-81=100) (as cited in L.Paulino, IFPRI Research Report #58).

7. INTRODUCTION TO VARIABILITY

(a) THE PROBLEM

Most of the studies which have attempted to estimate future food aid needs--including the earlier FAO (1981) and IFPRI (1984) studies, the recent FAO study (1983) and the earlier paper by the present author (Draft, April 10, 1986)--have been trend-based studies. They have all been based on trends in the behavior of the underlying variables, though their estimates have differed because of differences in concepts and assumptions. For any given set of concepts and assumptions, each of the estimates in these studies, as well as those in the USDA studies (which are not trend-based), presents a single value for the food aid needs of any particular future year.

As is to be expected, the validity of these different estimates depends on the validity of the assumptions underlying them. However, even if all the underlying assumptions are fully satisfied in any given year, this cannot be taken to mean that the food aid needs of that year will be equal to the estimate for that year. This is because the estimate represents a trend-based value rather than an actual value. It is in the nature of a trend-based value that actual values should fluctuate around it. Since the actual values of the underlying variables fluctuate around their trend values, actual food

aid needs should also be expected to fluctuate around their estimated trend-based values.

It is, therefore, not sufficient to present single estimates of food aid needs for each year for each set of assumptions. An indication needs to be given of the range within which variation in food aid needs around the trend-based estimate should be expected in each year for each such set.

(b) IFPRI STUDY

The IFPRI study of 1984 provides specific estimates of food aid needs for 1990 for individual countries as well as groups of countries under eight different sets of concepts and assumptions. The study makes no attempt to estimate the possible range of variation in food aid needs for these different estimates. It does, however, give explicit recognition to the problem of variability and tries to throw some light on it by presenting food aid need estimates for earlier years (1976-78 and 1983) on the basis of actual data and by drawing attention to differences between these results.

The limited focus of this variability exercise in the IFPRI study is brought out in the following statement.

> "Requirements for food aid are estimated as if 1990 were a normal year for all countries. In reality, fluctuations in the values of exports and cereal imports will have a significant effect on the amount of food aid a country would require from one year to another. Annual application of the procedure used in this study would result in estimates of food aid requirements that responded to the food security needs of recipients, but the aggregate amount required could vary considerably from one year to another. The extent of this possible variation is shown, using a scenario that uses food aid to make up the difference between actual cereal imports and the amount needed to meet 100 percent of the FAO/WHO standard for 1976-78 and 1983." (p. 54)

On the basis of the need-based criteria used, the study found that the actual volume of food aid required by several middle-income countries "could fluctuate substantially from one year to another, depending on the volume of domestic staple crops production, world market prices for cereals, and the volume and value of a country's export earnings." (p. 56) It found the same result for low-income countries as well. It pointed out that the "combination of good domestic production, strong markets for commodity exports and low world prices for cereals can relieve even those countries where the food situation is generally unsatisfactory from having to depend on food aid in some years." (p. 56)

This study thus recognizes the existence of variability in food aid needs and shows an understanding of the factors affecting such variability. However, it has some serious limitations. The concept used in estimating food aid needs in 1976-78 and 1983 to throw light on variability is that of the dietary energy gap. However, dietary energy requirements are defined for this purpose as being equal to "100 percent of the FAO/WHO standard," whereas the two dietary energy gap estimates included among the eight estimates of food aid needs in 1990 in the study are based on 110 percent of the FAO/WHO standard. Thus, the estimates in the variability exercise in this study relate not only to different years but to different concepts from those on which the trend estimates are based. The study, therefore, does not throw any light on the extent to which the actual needs could be expected to differ from trend needs as estimated for any given year or years on the basis of a given set of concepts and methods.

(c) USDA STUDIES

The USDA studies of food aid requirements differ from most of the other studies in this field. They do not generate trend-based medium-term estimates as the other studies do but produce estimates of likely food aid needs in the year immediately ahead as well as in one subsequent year. Therefore, the question of variability in the sense considered here does not arise for them at all. However, they do show some interesting features involving variations.

The USDA estimates are made on the basis of the latest available information on crop prospects and other relevant information drawn from field offices in different countries. Variability gets reflected in the estimates in two ways. First, the estimates for one year differ from those of the previous year in either direction as a result of changes in economic conditions. Second, the estimate of food aid needs for the "second year" in each annual study tends to be an estimate of such needs under "normal" conditions so that differences between a "second year" estimate and the estimate for the same year when it becomes the current year also provide a measure of variation.

Variations between the estimates of different years could be taken to reflect variability in "actual" requirements and variations between the advance estimate of "normal" requirements and the current estimate for the same year could be treated as conceptually similar to variations around trend. However, no analysis of the changing estimates has been made along those lines. No framework therefore exists for determining likely variations relative to the estimates presented at any given time.

The picture is complicated by the fact that the estimates for the "current" year for different countries are based on information which varies a great deal between countries, partly because of timing factors, in its reliability in predicting actual developments during that year. For at least some countries, a "normal" estimate of production may be taken in the absence of the necessary information, while in others the estimate may be the result of raising or lowering the estimate relative to the normal on the basis of rainfall or other information. The aggregate USDA estimate is thus the sum of individual country estimates some of which are "normal" estimates while others are estimates of the production that is expected in that year on the basis of information of varying degrees of reliability and certainty relative to actual conditions.

Recently, USDA has started providing revised estimates within each year based on new information. The revisions, as could be expected, are quite substantial. However, as has happened for differences between different "current year" estimates, as well as for the differences between "second year" estimates and the later estimates for the same year prepared when it becomes the current year, these differences between the various estimates of the "current" year produced during the course of that year have not been analyzed so far, nor has a framework for such analysis been evolved.

(d) FAO STUDIES

FAO's early estimates (1981) of food import gaps and food aid needs did not raise the question of variability in food aid needs at all. Its food aid estimates were therefore in the form of specific numbers for the year 1990 under alternative assumptions (FAO's Table

3.18 on p. 53). As noted earlier (Chapter 1), food import gaps were estimated first on the basis of continuation of past trends. The authors of this study found the results unacceptable because they would imply "a horrifying increase in the number of seriously undernourished, to some 600-650 million..." The study, therefore, presented two alternative scenarios, one described as modestly ambitious (Scenario B), and the other "which really defines the path of change that is needed" (Scenario A) (p. 124). Its food aid estimates for 1990 are presented for these two scenarios. They can, therefore, be considered to be in the nature of "targets." Against that background, possible variability in these needs could not have appeared to be very important at that time.

FAO was, of course, fully conscious of the tendency of food aid needs to vary depending on circumstances relating to food production and other economic variables. It raised this question in an important paper (1983) presenting a revised approach to the assessment of food aid needs. In this paper, FAO discussed the implications of the variability of food production and developed a concept of emergency food aid needs to which such variations might give rise.

The revised FAO approach obtained estimates of food aid needs as the sum of (a) nonproject food aid, (b) project food aid, and (c) emergency food aid. Nonproject food aid is demand-based. Project food aid is need-based. Emergency food aid represents additional food aid that is needed under exceptional circumstances. The concept of emergency food aid can thus be treated as an attempt to measure the variable component in nonproject food aid. It is examined as

such here. Project food aid raises other questions and need not be examined at all in the present context.

Nonproject food aid needs are estimated on a trend basis from demand, domestic production, and commercial imports. It is then assumed that a country will be able to take care of the effects produced by a fall in production below trend level by a specified percentage--10 percent for higher income countries and those which have invested in food stocks but 5 percent for all others. Whenever the production falls by more than the specified percentage the country is said to face an emergency that is measured by the excess of the shortfall over the specified percentage of production. For each year, these emergency requirements are summed over all countries and the average of these over a past period is treated as the emergency requirements that are added to the trend estimate of nonproject food aid.

Although emergency requirements are thus treated as a variation in trend needs, the FAO notes that "unlike nonproject and project food aid requirements, the average level of food aid requirements for emergency assistance . . . does not correspond directly to the level needed year after year. Actual emergency food aid requirements for a given year could be much higher or lower than the long-term average." (p. 9)

It is doubtful whether the estimates of emergency and nonproject food aid needs obtained in this way are really additive. This can be seen by noting that an estimate of a desirable reduction in nonproject food aid needs can be obtained in a similar manner by summing the average of all specified production excesses for each country. If the two are combined, the latter could be expected to

offset the former but may do so more or less than fully, so that the result may be positive or negative. This net result could be used to adjust the trend figure, yielding an adjusted estimate that would be larger or smaller than the original trend estimate. However, given the nature of the original trend estimate, which includes the effects of all shortfalls and excesses of production, it is difficult to see what precise significance should be attached to this adjusted value. The adjustment does not in any case provide any measure of variability in food aid needs.

In the FAO approach, average "emergency" needs for each country over a past period are aggregated over all countries. A different approach is possible. This would aggregate the emergency needs of all countries for each year (a positive value) and similarly aggregate the reductions in food aid needs of all countries for each year (a negative value). Separate averages of the positive and negative values could then be obtained. These could be expressed as percentages of the average trend value. These estimates could then be applied to the trend estimates of future needs to determine the amounts by which these food aid needs could rise above or fall below their trend levels. These figures would provide the needed estimates of variability.

FAO does not adopt this approach. It does not recognize the possibility of a reduction in food aid needs below trend due to excess production corresponding to the addition to food aid needs that could occur due to a shortfall in production. The FAO exercise therefore fails to throw light on the question of variability of food aid needs.

(e) NEW USDA SPECIAL STUDY

In a recent special study (USDA, June 1986), the USDA has raised the question of variability in relation to trend food aid needs. Its very correct appreciation of the problem is reflected in its statement that,

> "The most we can do in this situation is to calculate the probability with which a point representing attainable food availability will fall a certain amount above or below the extrapolation of a "trend" line plotted on the basis of how we have modeled our historical data." (p. 65).

However, to deal with this problem, its approach is to present three scenarios for 1990:

> "In the basic scenario, the points are right on "trend." In the optimistic scenario, attainable food availability would rise above "trend" due to policy reforms and improved economic performance. In the crisis scenario, however, attainable food availability would fall below "trend" due to two consecutive years of drought." (Ibid)

The study defines the food aid needs created by the crisis as "emergency" food aid needs. Unlike the new FAO study (1983), however, this study recognizes that "emergency food aid needs defined in this manner become absorbed by the chronic food gap" (or the trend-based need that results in the basic scenario). It, therefore, concludes that, "...in practice there is no way of separating our structural food aid from emergency food aid..."

On the assumption that 1990 is a second year of drought, the study presents estimates of additional emergency food aid needed by the countries studied by it. This is described as the crisis scenario. The study also provides estimates of food aid needs -- less than the base case -- for its optimistic scenario. It thus appears to deal correctly with the issue of variability by providing

an indication of the extent to which food aid needs might vary around its base estimates.

The main difficulty about this approach is conceptual in nature. The "optimistic" and "crisis" scenarios that are presented are not conceptually symmetrical, although they are presented as if they are. Thus, the "optimistic" scenario is defined in structural terms and therefore brings about an upward shift in the trend, while the "crisis" scenario is defined in terms of weather and therefore brings about a production shortfall relative to trend. Combining a favorable trend shifter on one side with an unfavorable short-term variability factor on the other confuses the issues. Correctly, the pessimistic counterpart of policy reforms and improved economic performance are a worsening of the policy environment and deterioration in economic performance. Similarly, the optimistic counterpart of two consecutive drought years should be two consecutive years of good rainfall. The former would represent structural changes which cause shifts in trends. The latter would represent year to year changes which cause variations around trends. It is the latter with which variability is concerned. As a result of its failure to recognize this distinction, the study is not really able to throw light on how possible variability in food production should be dealt with in estimating variability in food aid needs.

8. VARIABILITY IN INDIVIDUAL COUNTRIES

(a) THE APPROACH

The medium term estimates of food aid needs that are presented in earlier chapters can be described as trend-based estimates. They represent the likely trend need for food aid on the definition given and the assumptions made. Even if all the assumptions are satisfied, however, actual food aid needs as defined will not necessarily conform to the trend estimates in any particular year, but could be expected to fluctuate around them. It is important to throw some light on the likely range of such fluctuations.

Although it is correct to describe the basic estimates of food aid needs as trend-based estimates, it is important to recognize that they have not been derived by projecting past trends in food aid needs directly into the future. Food aid needs in the past and past trends in them were not in fact separately estimated at all for this purpose. The trend-based estimates of future food aid needs were obtained as a relationship between estimated future values of a number of variables. Amongst these, production and per capita income were projected from past trends. Population was obtained from UN medium estimates based on a number of demographic variables. Income elasticities of demand were separately obtained from FAO estimates for future years. The levels of per capita trend consumption (or total domestic use) in the base year, to which the income

elasticities and projected per capita income levels were applied, were the trend values of such consumption in that year.

For commercial cereal imports, different assumptions were used to obtain different estimates of food aid needs. In the basic estimate (5B), which was chosen for further analysis, it was assumed that average gross commercial cereal imports prevailing during 1977-82 grow at the long term rate of growth of per capita GNP and that cereal exports if any grow from the same base period at the rate of growth of food production.

Likely variations in estimated food aid requirements in the future cannot, therefore, be estimated directly from the trend-based estimates of food aid needs. It becomes necessary to go back to the variables on which the main estimates of food aid needs are based.

One of these variables is domestic food production. This variable is particularly important because variations in domestic food production resulting from weather and other factors are the principal source of instability in the food system.

When domestic food production in any country varies from its trend value, the immediate effect is a corresponding variation in total food availability. It is assumed here that the objective is to maintain the stability of consumption (or more accurately of total domestic utilization) and, therefore, not allow this immediate effect to prevail. Offsetting changes must, therefore, take place in the other components of total food availability. It is assumed here that the offsetting changes take place entirely in food aid. The variability of food aid is estimated here on that basis.

No attempt is made here to deal with other independent sources of instability in the food system, such as an independent variation

in commercial food imports that may result from changes in international food prices or a variation in foreign exchange availability.

(b) FOOD STOCKS, COMMERCIAL FOOD IMPORTS AND FOOD AID

The estimates of variability in food aid requirements that are presented here are based on the assumption that any variation in production is entirely offset by a corresponding variation in food aid requirements. However, other changes could take place. Given the assumption that total domestic utilization (which is equal to total availability) is maintained in each year at that year's trend level, the variation in production could be offset by variations in stocks, commercial imports, or exports of food, instead of in food aid -- all these being components of total availability in any year.

To understand the role of stocks in this analysis, two points need to be noted. First, for each year in the past, actual withdrawals from or additions to food stocks form one component of total food availability (equal to total domestic utilization). Second, over a period of time, additions to and withdrawals from food stocks tend to offset one another and therefore can be treated as nil in the long run.

As a result, on a trend basis, i.e. in relation to the estimated trend values of the variables for past years, the identity that total domestic utilization of food must be equal to total availability of food holds without any component for additions to or withdrawals from stocks. The trend estimates for future years also have this characteristic.

In variability analysis for future years, however, possible variations in stocks need to be taken into account once again. This is because in variability analysis estimates are made, on certain assumptions, of the extent to which the actual values of different variables in the future could be expected to differ from their estimated trend values. Stocks can vary from year to year even though the trend value of such variation is nil.

The use of stockholding to deal with variations in production is subject to certain constraints. The quantity of food withdrawn from stocks to meet production shortfalls cannot exceed the quantity held in them. Also, the quantity added to stocks to cover production excesses cannot exceed available storage capacity (though this term may have a somewhat flexible definition).

The capital costs of building storage capacity and the current costs of holding stocks (including the servicing of capital and storage losses) tend in general to be very high. Since variations in production tend to be large, stockholding capacity and actual stocks required to deal with these variations also tend to be large. Stockholding, particularly in developing countries, therefore tends to be expensive. A policy of variation in stocks to deal with variations in production is thus likely to impose a heavy burden on the country following it.

If such a policy is nevertheless followed, it is important to remember that stock levels must be maintained by balancing withdrawals in some years by additions in others. Such additions would have to be made in years when production is in excess of trend since withdrawals would presumably be made when production shows a shortfall relative to trend.

This has important implications for food aid. To make it possible for countries to add to their stocks in "good" production years, food aid (and net commercial imports) would have to be maintained at trend levels even in such years. In other words, if food aid is not to be increased when production is below trend, it must also not be decreased when production is above trend. A policy of steady food aid at trend levels is necessary if a stockholding policy to deal with food aid variations is to work. However, it would not alleviate the high costs of a stockholding policy, which would therefore impose a heavy burden on any developing country that follows it.

It can also be shown that total stocks required by all developing food deficit countries would be extremely large if they all hold stocks to take separate care of variations in their domestic production, while food aid quantities are held at trend levels. If, instead, food aid to these countries is varied to offset variations in their domestic production, the variation in aggregate food aid that would become necessary may be relatively small because of offsetting variations in the needs of different countries. Such variations would probably fall well within the limits of the stockholding that takes place in any case in aid-giving countries. Developing countries may thus benefit from considerable cost savings at little cost to food aid donors.

Even if variations in food aid are used as the principal means by which variations in food production are offset, each aid-receiving country may still need to hold some minimum food stocks. These would be small and their principal purpose would be to provide protection until food aid flows (and commercial food imports if necessary)

increase sufficiently to deal with any production shortfall. Stocks would then be replenished from that year's total supplies to enable them to meet any contingencies of that kind that might arise in the future. In good years, such stocks could increase until the necessary reduction in that year's food aid had become effective.

Another component of total availability that could be varied to deal with variations in production is commercial food imports. There is no reason, however, to believe that the capacity to import food commercially varies inversely with domestic food production. On the contrary, since the same factors are likely in general to affect the production of food and export crops, one may expect some fall (rise) in export earnings to take place in any year in which food production falls (rises). True, cereal exports if any would also fall (rise) and thus increase (decrease) domestic food supply to some extent, but it seems unlikely that the combined effect would be a rise (fall) in the capacity for obtaining net commercial cereal imports. These arguments suggest that if a developing country tries to offset variations in domestic food production with opposite variations in commercial cereal imports, the burden of such a policy, other things remaining the same, would tend to fall on imports of other essential goods. If commercial cereal imports are required to be increased when domestic food production falls, other essential imports may have to be cut.

There are of course ways in which commercial food imports could be increased to deal with production shortfalls without making it necessary to cut into other essential imports. One way to do this would be to draw on foreign exchange reserves for the purpose. However, this approach would require an analysis of foreign exchange

reserves similar to that outlined above in relation to food stocks. Reserves must be large enough to permit their being drawn down to finance additional commercial food imports in certain years. They must be replenished by reducing commercial imports below trend levels in years when food production is above trend. It follows that food aid must then not be reduced when production is above trend (just as under this policy it is not raised when production is below trend) so that the country can cut into its commercial imports at that time and thus replenish its reserves.

Given the overall balance of payments problems of developing countries and the various contingencies affecting the balance of payments that these countries face from time to time, adequate foreign exchange reserves may not always be available to finance additional commercial imports when there is a shortfall in production. External financial assistance could be used for this purpose if it were available.

One arrangement that could be used in this connection is the International Monetary Fund's scheme for financing excess commercial cereal imports. Once again, however, it would be necessary to ensure that commercial food imports are reduced below trend levels in years in which domestic food production is good in order to make foreign exchange available to repay the IMF as required under the scheme. This would happen only if food aid is maintained at trend levels in years of good domestic production. In other words, food aid would have to be maintained at trend levels in both good and bad years if this approach is to work. Appropriate variations in food aid in good and bad years with commercial imports held at trend levels is thus an alternative to a policy of variations in commercial food imports with

food aid held at trend levels. It makes sense because it saves the aid recipient country the costs of obtaining finance, which can be sizeable even on the IMF's concessional terms for such assistance.

It should be noted that the IMF Cereal Import Financing Scheme has various limitations. As a result, it cannot be relied upon to provide support when it is needed (Ezekiel, 1986). Various suggestions have been made for making it more reliable and effective in financing excess cereal imports. If these are carried out, it may be easier for developing countries to use variations in commercial imports to deal with variations in domestic food production while food aid is held at trend levels. Even if these changes are carried out, however, the costs of borrowing from the IMF would have to be taken into account. On balance, therefore, variation in food aid appears to offer the best method of dealing with variations in food production.

These arguments provide a reasonable justification for a policy using variations in food aid as an instrument for dealing with variations in food production and therefore support the estimates of food aid variability that are presented here. It may be worth noting that the USDA annual estimates of food aid requirements on a current year basis (updated even during the year) are based on the latest available information about production in that year and therefore imply that food aid should be adjusted from year to year with variations in production.

As in connection with other questions relating to food aid estimates, the assumptions made here in estimating the variability of food aid needs can also be treated as being reasonable policy decisions in the situation under consideration. If the actual policy

decisions with regard to variability are different, these results may have to be modified accordingly.

Variability of food aid needs as it has been estimated in this study flows entirely from variability in food production and the resulting variability in food exports (given the assumption of proportionality between food exports and food production). No other changes are allowed to occur. It is assumed that variability in production in future years will be the same as in the past. There is some evidence that production variability is increasing (Hazell, 1985). However, this is not taken into account in this study.

(c) METHODOLOGY

To estimate the variability of food aid needs on these assumptions, it is necessary first to estimate the past variability of food production around trend for each country. This past variability is measured as the coefficient of variation, which is the percentage of the standard deviation to the geometric mean of past trend values. This is then applied to the projected trend values of food production estimated for future years. The quantities thus obtained are added to and deducted from trend food production to give the upper and lower limits of expected production around the trend. Corresponding quantities of food exports are estimated by applying the proportion of such exports to production in the base period 1977-82 to these new upper and lower values of possible production in each year.

Upper and lower limits for food aid needs around the basic estimates are then obtained by deducting estimated commercial cereal

imports and the lower and upper estimates of production from the estimated consumption and then adding back the lower and higher estimates of cereal exports. These computations are carried out with respect to the basic estimates (5B).

(d) THE RESULTS

The estimates of the upper and lower limits of the food aid needs of 85 developing countries for the years 1985 through 1990 obtained by the method and on the assumptions set out above can now be examined (Table 8.1). To make this possible, the trend estimates around which variations in food aid may occur and the absolute and percentage differences between the upper and lower limits on the one hand and the trend estimates on the other are also computed.

Given our assumptions, the lower limit of food aid for any country, like the trend estimate itself, can never be negative. Any negative results obtained from the computation are treated as nil. It follows from this that the absolute difference of the lower limit for any country from the trend level cannot exceed the trend estimate itself so that the percentage lower difference can never be more than one hundred percent. This contrasts with the position regarding upward variations in food aid needs, where no artificial constraint is imposed. As a result, the upper limit can reach any level, the absolute upper difference can be much larger than the trend estimate itself and the percentage upper difference can be substantially above a hundred percent.

The absolute difference by which the food aid needs for individual countries can vary upwards or downwards can be quite

Table 8.1
FOOD AID REQUIREMENTS FOR 85 COUNTRIES AS BASED ON METHOD 5B
(IMPORTS GROWING BY GROWTH RATE OF PER CAPITA GNP (WDR) AND EXPORTS AS A PROPORTION OF PRODUCTION (77-82 EXP/77-82 PROD))

Absolute Amounts
Row 1: FAR based on (prod - 1 S.D.)
Row 2: FAR based on trend production (5B)
Row 3: FAR based on (prod + 1 S.D.)

Difference from Basic Estimates (row 2)

Percentage Difference from Basic Estimates (row 2

n.d. not defined

Class	Absolute Amounts 1985	1986	1987	1988	1989	1990	Difference 1985	1986	1987	1988	1989	1990	Percentage Difference 1985	1986	1987	1988	1989	1990
	(100,000 Metric Tons)																	
A 1 BANGLADESH	42.70	45.24	47.88	50.62	53.47	56.41	13.20	13.46	13.73	14.00	14.28	14.56	44.77%	42.37%	40.20%	38.23%	36.43%	34.78%
	29.49	31.78	34.15	36.62	39.19	41.86												
	16.29	18.31	20.43	22.62	24.91	27.30	13.20	13.46	13.73	14.00	14.28	14.56	44.77%	42.37%	40.20%	38.23%	36.43%	34.78%
A 2 BHUTAN	0.24	0.24	0.24	0.25	0.25	0.25	0.00	0.00	0.01	0.01	0.01	0.01	2.11%	2.13%	2.16%	2.18%	2.21%	2.24%
	0.23	0.23	0.24	0.24	0.24	0.25												
	0.23	0.23	0.23	0.24	0.24	0.24	0.00	0.00	0.01	0.01	0.01	0.01	2.11%	2.13%	2.16%	2.18%	2.21%	2.24%
A 3 NEPAL	4.96	5.59	6.23	6.89	7.58	8.28	1.92	1.94	1.96	1.97	1.99	2.01	63.29%	53.21%	45.80%	40.13%	35.64%	32.01%
	3.04	3.65	4.27	4.92	5.58	6.27												
	1.12	1.71	2.32	2.95	3.59	4.26	1.92	1.94	1.96	1.97	1.99	2.01	63.29%	53.21%	45.80%	40.13%	35.64%	32.01%
D 4 PAKISTAN	8.55	5.16	1.50	0.00	0.00	0.00	8.55	5.16	1.50	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
B 5 SRI LANKA	3.54	3.28	3.00	2.69	2.36	2.01	1.88	1.95	2.03	2.11	2.19	2.01	113.10%	147.52%	210.70%	364.51%	1298.42%	n.d.
	1.66	1.33	0.96	0.58	0.17	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	1.66	1.33	0.96	0.58	0.17	0.00	100.00%	100.00%	100.00%	100.00%	100.00%	n.d.
C 6 BURMA	4.87	4.60	4.31	3.99	3.66	3.30	4.87	4.60	4.31	3.99	3.66	3.30	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 7 FIJI	0.25	0.26	0.27	0.28	0.28	0.29	0.03	0.03	0.03	0.03	0.03	0.03	11.93%	11.79%	11.67%	11.54%	11.43%	11.32%
	0.23	0.23	0.24	0.25	0.26	0.26												
	0.20	0.21	0.21	0.22	0.23	0.23	0.03	0.03	0.03	0.03	0.03	0.03	11.93%	11.79%	11.67%	11.54%	11.43%	11.32%
D 8 INDONESIA	1.96	0.00	0.00	0.00	0.00	0.00	1.96	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 9 KAMPUCHEA	8.39	8.88	9.38	9.91	10.44	11.00	3.24	3.24	3.24	3.24	3.24	3.24	62.98%	57.53%	52.80%	48.68%	45.04%	41.82%
	5.15	5.64	6.14	6.66	7.20	7.75												
	1.91	2.39	2.90	3.42	3.96	4.51	3.24	3.24	3.24	3.24	3.24	3.24	62.98%	57.53%	52.80%	48.68%	45.04%	41.82%

Table 8.1 con't

D 10 KOREA DPR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00	9.18	9.29	9.40	9.50	9.61	9.72	160.50%	186.46%	228.20%	304.77%	486.97%	1444.86%
B 11 KOREA REP	14.90	14.27	13.51	12.62	11.59	10.40	5.72	4.98	4.12	3.12	1.97	0.67	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	5.72	4.98	4.12	3.12	1.97	0.67	0.97	0.98	0.99	1.00	1.01	1.02	73.69%	63.91%	56.29%	50.18%	45.17%	41.00%
	0.00	0.00	0.00	0.00	0.00	0.00	0.97	0.98	0.99	1.00	1.01	1.02	73.69%	63.91%	56.29%	50.18%	45.17%	41.00%
A 12 LAOS	2.29	2.52	2.75	2.99	3.24	3.50	2.48	2.56	2.65	2.73	2.82	2.91	48.12%	49.90%	51.83%	53.95%	56.27%	58.84%
	1.32	1.54	1.76	1.99	2.23	2.48	2.48	2.56	2.65	2.73	2.82	2.91	48.12%	49.90%	51.83%	53.95%	56.27%	58.84%
	0.35	0.55	0.77	0.99	1.23	1.47	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 13 MALAYSIA	7.64	7.70	7.75	7.80	7.83	7.86	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	5.16	5.14	5.11	5.06	5.01	4.95	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	2.68	2.57	2.46	2.33	2.19	2.04	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
D 14 PHILIPPINE	0.00	0.00	0.00	0.00	0.00	0.00	6.69	6.85	7.02	7.19	7.36	7.54	160.15%	167.48%	175.65%	184.79%	195.08%	206.75%
	0.00	0.00	0.00	0.00	0.00	0.00	4.17	4.09	3.99	3.89	3.77	3.65	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.52	0.52	0.52	0.52	0.52	56.17%	58.86%	62.31%	66.82%	72.81%	81.02%
D 15 THAILAND	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.52	0.52	0.52	0.52	0.52	56.17%	58.86%	62.31%	66.82%	72.81%	81.02%
	0.00	0.00	0.00	0.00	0.00	0.00	5.47	5.47	5.47	5.47	5.47	5.47	109.07%	75.79%	57.36%	45.66%	37.59%	31.69%
	0.00	0.00	0.00	0.00	0.00	0.00	5.01	5.47	5.47	5.47	5.47	5.47	100.00%	75.79%	57.36%	45.66%	37.59%	31.69%
B 16 VIETNAM	10.86	10.94	11.01	11.07	11.13	11.19	0.29	0.29	0.29	0.29	0.29	0.29	30.26%	25.48%	21.71%	18.67%	16.18%	14.11%
	4.17	4.09	3.99	3.89	3.77	3.65	0.29	0.29	0.29	0.29	0.29	0.29	30.26%	25.48%	21.71%	18.67%	16.18%	14.11%
	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.60%	0.54%	0.49%	0.44%	0.41%	0.37%
A 17 CYPRUS	1.43	1.39	1.34	1.29	1.22	1.15	0.01	0.01	0.01	0.01	0.01	0.01	0.60%	0.54%	0.49%	0.44%	0.41%	0.37%
	0.92	0.88	0.83	0.77	0.71	0.64												
	0.40	0.36	0.31	0.26	0.19	0.12												
A 18 IRAQ	10.48	12.68	15.00	17.44	20.01	22.71												
	5.01	7.21	9.53	11.97	14.54	17.25												
	0.00	1.75	4.06	6.50	9.08	11.78												
A 19 JORDAN	1.25	1.43	1.63	1.85	2.09	2.35												
	0.96	1.14	1.34	1.56	1.80	2.06												
	0.67	0.85	1.05	1.27	1.51	1.77												
A 20 LEBANON	1.60	1.78	1.97	2.16	2.36	2.56												
	1.59	1.77	1.96	2.15	2.35	2.55												
	1.58	1.76	1.95	2.14	2.34	2.54												

Table 8.1 con't

C 21 SYRIA	6.58	6.64	6.68	6.69	6.68	6.64	6.58	6.64	6.68	6.69	6.68	6.64	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
C 22 TURKEY	24.05	25.58	27.19	28.89	30.68	32.56	24.05	25.58	27.19	28.89	30.68	32.56	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 23 YEMEN AR	2.80	3.26	3.74	4.23	4.75	5.28	1.16	1.16	1.16	1.16	1.16	1.16	70.25%	54.92%	44.77%	37.57%	32.19%	28.03%
	1.65	2.10	2.58	3.08	3.59	4.12												
	0.49	0.95	1.43	1.92	2.43	2.97	1.16	1.16	1.16	1.16	1.16	1.16	70.25%	54.92%	44.77%	37.57%	32.19%	28.03%
C 24 YEMEN RDR	0.01	0.04	0.07	0.10	0.14	0.17	0.01	0.04	0.07	0.09	0.09	0.10	n.d.	n.d.	n.d.	858.35%	215.70%	122.48%
	0.00	0.00	0.00	0.01	0.04	0.08												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.08	n.d.	n.d.	n.d.	100.00%	100.00%	100.00%
B 25 ALGERIA	7.58	8.82	10.14	11.54	13.04	14.63	5.49	5.58	5.68	5.77	5.87	5.97	263.04%	172.61%	127.26%	100.02%	81.86%	68.90%
	2.09	3.24	4.46	5.77	7.17	8.66												
	0.00	0.00	0.00	0.00	1.30	2.69	2.09	3.24	4.46	5.77	5.87	5.97	100.00%	100.00%	100.00%	100.00%	81.86%	68.90%
A 26 EGYPT	21.21	23.50	25.89	28.37	30.95	33.64	2.86	2.90	2.94	2.98	3.02	3.06	15.56%	14.05%	12.79%	11.72%	10.80%	10.00%
	18.35	20.61	22.95	25.39	27.94	30.58												
	15.50	17.71	20.02	22.42	24.92	27.52	2.86	2.90	2.94	2.98	3.02	3.06	15.56%	14.05%	12.79%	11.72%	10.80%	10.00%
A 27 MOROCCO	33.28	36.15	39.17	42.33	45.64	49.11	13.23	13.36	13.48	13.61	13.74	13.86	66.00%	58.58%	52.48%	47.38%	43.05%	39.33%
	20.05	22.80	25.69	28.72	31.91	35.25												
	6.82	9.44	12.21	15.11	18.17	21.38	13.23	13.36	13.48	13.61	13.74	13.86	66.00%	58.58%	52.48%	47.38%	43.05%	39.33%
D 28 SUDAN	2.06	0.94	0.00	0.00	0.00	0.00	2.06	0.94	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
B 29 TUNISIA	4.09	4.23	4.38	4.53	4.68	4.83	2.92	3.01	3.11	3.21	3.31	3.42	248.11%	246.40%	245.02%	243.94%	243.18%	242.72%
	1.17	1.22	1.27	1.32	1.36	1.41												
	0.00	0.00	0.00	0.00	0.00	0.00	1.17	1.22	1.27	1.32	1.36	1.41	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
A 30 BENIN	1.49	1.63	1.77	1.93	2.09	2.26	0.82	0.84	0.86	0.88	0.90	0.92	123.05%	106.68%	94.09%	84.09%	75.97%	69.23%
	0.67	0.79	0.91	1.05	1.19	1.33												
	0.00	0.00	0.05	0.17	0.29	0.41	0.67	0.79	0.86	0.88	0.90	0.92	100.00%	100.00%	94.09%	84.09%	75.97%	69.23%
A 31 BURKINA FA	4.36	4.77	5.19	5.64	6.09	6.57	1.38	1.40	1.42	1.43	1.45	1.46	46.44%	41.50%	37.44%	34.04%	31.16%	28.68%
	2.98	3.37	3.78	4.20	4.65	5.10												
	1.60	1.97	2.36	2.77	3.20	3.64	1.38	1.40	1.42	1.43	1.45	1.46	46.44%	41.50%	37.44%	34.04%	31.16%	28.68%

Table 8.1 con't

A 32 CHAD	2.13	2.38	2.63	2.89	3.16	3.43	0.90	0.90	0.90	0.90	0.90	0.90	73.03%	60.82%	51.91%	45.13%	39.80%	35.50%
	1.23	1.48	1.73	1.99	2.26	2.53												
	0.33	0.58	0.83	1.09	1.36	1.63	0.90	0.90	0.90	0.90	0.90	0.90	73.03%	60.82%	51.91%	45.13%	39.80%	35.50%
D 33 GAMBIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 34 GHANA	5.80	6.50	7.22	7.97	8.75	9.57	1.51	1.53	1.55	1.57	1.59	1.62	35.03%	30.74%	27.33%	24.56%	22.25%	20.31%
	4.30	4.97	5.67	6.40	7.16	7.96												
	2.79	3.44	4.12	4.83	5.57	6.34	1.51	1.53	1.55	1.57	1.59	1.62	35.03%	30.74%	27.33%	24.56%	22.25%	20.31%
A 35 GUINEA	1.96	2.19	2.43	2.68	2.94	3.21	0.55	0.55	0.56	0.56	0.57	0.57	38.92%	33.82%	29.83%	26.63%	24.00%	21.81%
	1.41	1.64	1.87	2.12	2.37	2.63												
	0.86	1.08	1.32	1.55	1.80	2.06	0.55	0.55	0.56	0.56	0.57	0.57	38.92%	33.82%	29.83%	26.63%	24.00%	21.81%
A 36 GUINEA-BIS	0.57	0.60	0.64	0.67	0.70	0.73	0.17	0.17	0.17	0.17	0.17	0.17	43.09%	40.05%	37.35%	34.95%	32.80%	30.86%
	0.40	0.43	0.46	0.49	0.53	0.56												
	0.23	0.26	0.29	0.32	0.35	0.39	0.17	0.17	0.17	0.17	0.17	0.17	43.09%	40.05%	37.35%	34.95%	32.80%	30.86%
B 37 IVORY COAS	1.05	1.22	1.40	1.59	1.78	1.98	1.03	1.07	1.10	1.13	1.17	1.21	5391.84%	679.88%	365.16%	250.70%	191.49%	155.30%
	0.02	0.16	0.30	0.45	0.61	0.78												
	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.16	0.30	0.45	0.61	0.78	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
A 38 LIBERIA	0.39	0.44	0.50	0.57	0.63	0.70	0.15	0.15	0.16	0.16	0.17	0.18	62.08%	52.85%	46.07%	40.88%	36.77%	33.44%
	0.24	0.29	0.35	0.40	0.46	0.53												
	0.09	0.14	0.19	0.24	0.29	0.35	0.15	0.15	0.16	0.16	0.17	0.18	62.08%	52.85%	46.07%	40.88%	36.77%	33.44%
A 39 MALI	5.33	5.79	6.28	6.79	7.32	7.87	1.84	1.86	1.88	1.91	1.93	1.96	52.69%	47.33%	42.88%	39.12%	35.91%	33.13%
	3.49	3.93	4.40	4.88	5.38	5.91												
	1.65	2.07	2.51	2.97	3.45	3.95	1.84	1.86	1.88	1.91	1.93	1.96	52.69%	47.33%	42.88%	39.12%	35.91%	33.13%
A 40 MAURITANIA	1.23	1.31	1.39	1.48	1.57	1.66	0.12	0.12	0.12	0.12	0.12	0.12	11.13%	10.37%	9.68%	9.06%	8.50%	7.99%
	1.10	1.18	1.27	1.35	1.44	1.54												
	0.98	1.06	1.14	1.23	1.32	1.41	0.12	0.12	0.12	0.12	0.12	0.12	11.13%	10.37%	9.68%	9.06%	8.50%	7.99%
B 41 NIGER	4.99	5.41	5.84	6.29	6.76	7.25	3.50	3.56	3.62	3.67	3.73	3.79	235.76%	192.65%	162.51%	140.25%	123.14%	109.57%
	1.49	1.85	2.22	2.62	3.03	3.46												
	0.00	0.00	0.00	0.00	0.00	0.00	1.49	1.85	2.22	2.62	3.03	3.46	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
B 42 SENEGAL	5.00	5.51	6.04	6.58	7.13	7.71	4.02	4.02	4.02	4.02	4.02	4.02	407.94%	268.54%	198.74%	156.84%	128.91%	108.96%
	0.98	1.50	2.02	2.56	3.12	3.69												
	0.00	0.00	0.00	0.00	0.00	0.00	0.98	1.50	2.02	2.56	3.12	3.69	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table 8.1 con't

B 43 SIERRA LEO	0.66	0.70	0.75	0.79	0.84	0.89	0.40	0.41	0.42	0.42	0.43	0.44	154.28%	138.91%	126.31%	115.80%	106.89%	99.25%
	0.26	0.29	0.33	0.37	0.40	0.44												
	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.29	0.33	0.37	0.40	0.44	100.00%	100.00%	100.00%	100.00%	100.00%	99.25%
A 44 TOGO	1.95	2.16	2.38	2.60	2.83	3.07	0.47	0.47	0.48	0.48	0.48	0.48	31.81%	28.03%	24.99%	22.48%	20.38%	18.60%
	1.48	1.69	1.90	2.12	2.35	2.59												
	1.01	1.22	1.43	1.65	1.87	2.11	0.47	0.47	0.48	0.48	0.48	0.48	31.81%	28.03%	24.99%	22.48%	20.38%	18.60%
A 45 ANGOLA	2.65	3.09	3.54	4.01	4.49	4.98	0.59	0.59	0.59	0.59	0.59	0.59	28.78%	23.70%	20.06%	17.32%	15.19%	13.48%
	2.06	2.50	2.95	3.42	3.90	4.39												
	1.46	1.90	2.36	2.82	3.30	3.80	0.59	0.59	0.59	0.59	0.59	0.59	28.78%	23.70%	20.06%	17.32%	15.19%	13.48%
A 46 BURUNDI	1.20	1.50	1.82	2.15	2.50	2.87	0.37	0.37	0.38	0.39	0.39	0.40	43.67%	32.87%	26.26%	21.80%	18.58%	16.16%
	0.84	1.13	1.44	1.77	2.11	2.47												
	0.47	0.76	1.06	1.38	1.72	2.07	0.37	0.37	0.38	0.39	0.39	0.40	43.67%	32.87%	26.26%	21.80%	18.58%	16.16%
B 47 CAMEROON	2.15	2.21	2.27	2.33	2.39	2.46	1.61	1.66	1.71	1.76	1.82	1.88	294.98%	300.01%	305.22%	310.62%	316.23%	322.05%
	0.55	0.55	0.56	0.57	0.58	0.58												
	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.55	0.56	0.57	0.58	0.58	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
B 48 CENT AFR R	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 49 CONGO	0.42	0.48	0.53	0.59	0.64	0.70	0.11	0.11	0.11	0.12	0.12	0.12	35.79%	31.18%	27.57%	24.66%	22.28%	20.29%
	0.31	0.36	0.42	0.47	0.53	0.59												
	0.20	0.25	0.30	0.35	0.41	0.47	0.11	0.11	0.11	0.12	0.12	0.12	35.79%	31.18%	27.57%	24.66%	22.28%	20.29%
A 50 GABON	0.61	0.64	0.67	0.70	0.74	0.77	0.05	0.05	0.05	0.05	0.05	0.05	8.90%	8.43%	8.00%	7.61%	7.24%	6.91%
	0.56	0.59	0.62	0.65	0.69	0.72												
	0.51	0.54	0.57	0.60	0.64	0.67	0.05	0.05	0.05	0.05	0.05	0.05	8.90%	8.43%	8.00%	7.61%	7.24%	6.91%
B 51 RWANDA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 52 ZAIRE	6.13	7.02	7.95	8.92	9.94	11.01	1.59	1.62	1.66	1.69	1.73	1.77	34.91%	30.03%	26.32%	23.41%	21.06%	19.13%
	4.55	5.40	6.29	7.23	8.21	9.24												
	2.96	3.78	4.64	5.54	6.48	7.47	1.59	1.62	1.66	1.69	1.73	1.77	34.91%	30.03%	26.32%	23.41%	21.06%	19.13%
A 53 BOTSWANA	1.22	1.30	1.38	1.47	1.55	1.65	0.39	0.40	0.40	0.40	0.41	0.41	47.39%	43.96%	40.88%	38.10%	35.58%	33.29%
	0.83	0.90	0.98	1.06	1.15	1.24												
	0.44	0.51	0.58	0.66	0.74	0.82	0.39	0.40	0.40	0.40	0.41	0.41	47.39%	43.96%	40.88%	38.10%	35.58%	33.29%

Table 8.1 con't

A 54 ETHIOPIA	11.58	13.55	15.60	17.72	19.92	22.21	2.07	2.08	2.09	2.10	2.11	2.12	21.75%	18.11%	15.45%	13.42%	11.82%	10.53%
	9.51	11.47	13.51	15.63	17.82	20.09												
	7.44	9.40	11.42	13.53	15.71	17.98	2.07	2.08	2.09	2.10	2.11	2.12	21.75%	18.11%	15.45%	13.42%	11.82%	10.53%
A 55 KENYA	12.39	14.34	16.40	18.58	20.89	23.34	3.39	3.44	3.49	3.53	3.58	3.63	37.68%	31.54%	26.99%	23.47%	20.68%	18.41%
	9.00	10.90	12.91	15.05	17.31	19.71												
	5.61	7.46	9.43	11.52	13.73	16.08	3.39	3.44	3.49	3.53	3.58	3.63	37.68%	31.54%	26.99%	23.47%	20.68%	18.41%
A 56 LESOTHO	2.19	2.39	2.60	2.83	3.07	3.32	0.49	0.49	0.49	0.49	0.50	0.50	28.66%	25.74%	23.26%	21.12%	19.27%	17.65%
	1.70	1.90	2.11	2.34	2.57	2.82												
	1.21	1.41	1.62	1.84	2.08	2.33	0.49	0.49	0.49	0.49	0.50	0.50	28.66%	25.74%	23.26%	21.12%	19.27%	17.65%
A 57 MADAGASCAR	3.05	3.57	4.11	4.67	5.26	5.87	1.12	1.14	1.16	1.18	1.20	1.22	57.71%	46.73%	39.18%	33.68%	29.48%	26.18%
	1.94	2.43	2.95	3.49	4.06	4.65												
	0.82	1.30	1.80	2.32	2.86	3.43	1.12	1.14	1.16	1.18	1.20	1.22	57.71%	46.73%	39.18%	33.68%	29.48%	26.18%
A 58 MALAWI	5.29	5.89	6.51	7.16	7.83	8.54	1.88	1.90	1.92	1.95	1.97	2.00	54.93%	47.66%	41.98%	37.41%	33.67%	30.55%
	3.42	3.99	4.58	5.21	5.86	6.54												
	1.54	2.09	2.66	3.26	3.89	4.54	1.88	1.90	1.92	1.95	1.97	2.00	54.93%	47.66%	41.98%	37.41%	33.67%	30.55%
A 59 MAURITIUS	0.30	0.31	0.31	0.32	0.32	0.33	0.01	0.01	0.01	0.01	0.01	0.01	3.14%	3.14%	3.14%	3.14%	3.14%	3.15%
	0.29	0.30	0.30	0.31	0.31	0.32												
	0.28	0.29	0.29	0.30	0.30	0.31	0.01	0.01	0.01	0.01	0.01	0.01	3.14%	3.14%	3.14%	3.14%	3.14%	3.15%
A 60 MOZAMBIQUE	7.05	7.71	8.39	9.09	9.81	10.55	0.92	0.92	0.92	0.92	0.92	0.92	15.02%	13.57%	12.33%	11.28%	10.37%	9.57%
	6.13	6.79	7.47	8.17	8.89	9.63												
	5.21	5.87	6.55	7.24	7.96	8.70	0.92	0.92	0.92	0.92	0.92	0.92	15.02%	13.57%	12.33%	11.28%	10.37%	9.57%
A 61 SOMALIA	2.07	2.14	2.21	2.27	2.34	2.42	0.33	0.33	0.33	0.33	0.33	0.33	19.00%	18.29%	17.62%	17.00%	16.40%	15.85%
	1.74	1.81	1.87	1.94	2.01	2.09												
	1.41	1.48	1.54	1.61	1.68	1.75	0.33	0.33	0.33	0.33	0.33	0.33	19.00%	18.29%	17.62%	17.00%	16.40%	15.85%
A 62 SWAZILAND	0.83	0.90	0.97	1.05	1.13	1.21	0.36	0.37	0.38	0.39	0.40	0.41	74.53%	68.81%	63.82%	59.43%	55.54%	52.07%
	0.48	0.53	0.59	0.66	0.72	0.80												
	0.12	0.17	0.21	0.27	0.32	0.38	0.36	0.37	0.38	0.39	0.40	0.41	74.53%	68.81%	63.82%	59.43%	55.54%	52.07%
A 63 TANZANIA	6.71	7.57	8.48	9.44	10.45	11.51	1.88	1.93	1.97	2.02	2.07	2.12	38.96%	34.13%	30.33%	27.24%	24.70%	22.56%
	4.83	5.64	6.50	7.42	8.38	9.39												
	2.95	3.72	4.53	5.39	6.31	7.27	1.88	1.93	1.97	2.02	2.07	2.12	38.96%	34.13%	30.33%	27.24%	24.70%	22.56%
A 64 UGANDA	6.06	7.10	8.19	9.33	10.53	11.78	1.94	1.97	2.00	2.03	2.06	2.09	47.09%	38.38%	32.27%	27.76%	24.28%	21.52%
	4.12	5.13	6.19	7.30	8.47	9.69												
	2.18	3.16	4.19	5.28	6.41	7.61	1.94	1.97	2.00	2.03	2.06	2.09	47.09%	38.38%	32.27%	27.76%	24.28%	21.52%

Table 8.1 con't

A 65 ZAMBIA	4.82	5.35	5.91	6.49	7.09	7.71	1.43	1.44	1.45	1.46	1.46	1.47	42.07%	36.68%	32.40%	28.93%	26.06%	23.65%
	3.39	3.92	4.46	5.03	5.62	6.23												
	1.96	2.48	3.02	3.57	4.16	4.76	1.43	1.44	1.45	1.46	1.46	1.47	42.07%	36.68%	32.40%	28.93%	26.06%	23.65%
C 66 ZIMBABWE	3.71	4.08	4.48	4.90	5.33	5.79	3.71	4.08	4.48	4.90	5.33	5.79	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
D 67 COSTA RICA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 68 DOMINICAN	3.07	3.32	3.59	3.87	4.16	4.48	0.51	0.53	0.55	0.56	0.58	0.60	20.14%	19.02%	18.00%	17.08%	16.24%	15.46%
	2.56	2.79	3.04	3.30	3.58	3.88												
	2.04	2.26	2.49	2.74	3.00	3.28	0.51	0.53	0.55	0.56	0.58	0.60	20.14%	19.02%	18.00%	17.08%	16.24%	15.46%
B 69 EL SALVADO	2.01	2.04	2.08	2.11	2.15	2.18	1.08	1.12	1.17	1.22	1.27	1.33	115.38%	121.68%	128.83%	136.99%	146.39%	157.31%
	0.93	0.92	0.91	0.89	0.87	0.85												
	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.92	0.91	0.89	0.87	0.85	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
A 70 GUATEMALA	2.04	2.28	2.53	2.80	3.08	3.37	0.78	0.80	0.82	0.83	0.85	0.87	62.00%	53.84%	47.52%	42.48%	38.36%	34.93%
	1.26	1.48	1.72	1.96	2.22	2.50												
	0.48	0.68	0.90	1.13	1.37	1.62	0.78	0.80	0.82	0.83	0.85	0.87	62.00%	53.84%	47.52%	42.48%	38.36%	34.93%
A 71 HAITI	2.31	2.59	2.87	3.16	3.46	3.76	0.52	0.52	0.52	0.52	0.52	0.52	29.17%	25.32%	22.28%	19.83%	17.81%	16.12%
	1.79	2.06	2.35	2.64	2.93	3.24												
	1.27	1.54	1.82	2.11	2.41	2.72	0.52	0.52	0.52	0.52	0.52	0.52	29.17%	25.32%	22.28%	19.83%	17.81%	16.12%
A 72 HONDURAS	0.89	1.15	1.43	1.72	2.02	2.33	0.47	0.47	0.47	0.47	0.48	0.48	112.29%	68.79%	49.18%	38.03%	30.83%	25.81%
	0.42	0.68	0.96	1.25	1.54	1.85												
	0.00	0.21	0.49	0.77	1.07	1.38	0.42	0.47	0.47	0.47	0.48	0.48	100.00%	68.79%	49.18%	38.03%	30.83%	25.81%
A 73 JAMAICA	1.07	1.11	1.16	1.20	1.25	1.30	0.13	0.14	0.14	0.14	0.14	0.15	14.18%	13.87%	13.58%	13.31%	13.06%	12.83%
	0.94	0.98	1.02	1.06	1.11	1.15												
	0.80	0.84	0.88	0.92	0.96	1.00	0.13	0.14	0.14	0.14	0.14	0.15	14.18%	13.87%	13.58%	13.31%	13.06%	12.83%
A 74 NICARAGUA	1.78	1.96	2.16	2.36	2.56	2.78	0.49	0.50	0.50	0.51	0.51	0.51	38.47%	34.01%	30.40%	27.40%	24.88%	22.74%
	1.29	1.47	1.65	1.85	2.05	2.26												
	0.79	0.97	1.15	1.34	1.54	1.75	0.49	0.50	0.50	0.51	0.51	0.51	38.47%	34.01%	30.40%	27.40%	24.88%	22.74%
D 75 PANAMA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

Table 8.1 con't

C 76 TRINIDAD E	0.15	0.11	0.08	0.04	0.00	0.00	0.03	0.03	0.04	0.04	0.00	0.00	28.10%	43.70%	93.03%	n.d.	n.d.	n.d.
	0.12	0.08	0.04	0.00	0.00	0.00												
	0.08	0.04	0.00	0.00	0.00	0.00	0.03	0.03	0.04	0.00	0.00	0.00	28.10%	43.70%	93.03%	n.d.	n.d.	n.d.
A 77 BOLIVIA	1.53	1.74	1.96	2.19	2.43	2.68	0.61	0.63	0.64	0.66	0.68	0.69	66.14%	56.12%	48.72%	43.03%	38.51%	34.85%
	0.92	1.12	1.32	1.53	1.75	1.99												
	0.31	0.49	0.68	0.87	1.08	1.30	0.61	0.63	0.64	0.66	0.68	0.69	66.14%	56.12%	48.72%	43.03%	38.51%	34.85%
D 78 COLOMBIA	0.61	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 79 ECUADOR	2.63	3.47	4.35	5.28	6.27	7.31	1.08	1.08	1.08	1.08	1.08	1.08	69.16%	44.94%	32.82%	25.54%	20.70%	17.25%
	1.55	2.39	3.28	4.21	5.19	6.23												
	0.48	1.32	2.20	3.13	4.12	5.16	1.08	1.08	1.08	1.08	1.08	1.08	69.16%	44.94%	32.82%	25.54%	20.70%	17.25%
B 80 GUYANA	0.66	0.69	0.71	0.73	0.75	0.78	0.42	0.43	0.44	0.45	0.46	0.47	168.76%	165.87%	163.21%	160.74%	158.47%	156.36%
	0.25	0.26	0.27	0.28	0.29	0.30												
	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.26	0.27	0.28	0.29	0.30	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
C 81 PARAGUAY	1.63	1.49	1.34	1.17	0.99	0.79	1.63	1.49	1.34	1.17	0.99	0.79	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 82 PERU	7.95	8.84	9.77	10.73	11.71	12.72	1.71	1.72	1.73	1.74	1.75	1.76	27.50%	24.17%	21.52%	19.34%	17.54%	16.01%
	6.23	7.12	8.04	8.99	9.96	10.96												
	4.52	5.40	6.31	7.25	8.21	9.21	1.71	1.72	1.73	1.74	1.75	1.76	27.50%	24.17%	21.52%	19.34%	17.54%	16.01%
D 83 SURINAM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	0.00	0.00	0.00	0.00	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
A 84 CHILE	4.70	5.17	5.65	6.14	6.64	7.15	2.23	2.23	2.23	2.23	2.23	2.23	90.71%	76.08%	65.36%	57.16%	50.70%	45.47%
	2.46	2.94	3.42	3.91	4.41	4.91												
	0.23	0.70	1.18	1.67	2.17	2.68	2.23	2.23	2.23	2.23	2.23	2.23	90.71%	76.08%	65.36%	57.16%	50.70%	45.47%
B 85 URUGUAY	2.02	1.96	1.89	1.81	1.74	1.66	1.60	1.63	1.67	1.71	1.74	1.66	375.31%	507.51%	778.13%	1643.16%	n.d.	n.d.
	0.43	0.32	0.21	0.10	0.00	0.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.32	0.21	0.10	0.00	0.00	100.00%	100.00%	100.00%	100.00%	n.d.	n.d.

large. The largest absolute upper difference is for Turkey, where it comes to 2.41 million tons in 1985 and 3.26 million tons in 1990. However, Turkey's lower difference is nil; it is one of the countries whose trend estimate is itself nil. Two other countries have absolute differences of more than one million tons - Bangladesh and Morocco. For these two countries, the upper and lower absolute differences are 1.32 million tons in 1985 but amount to 1.46 million tons and 1.39 million tons respectively in 1990.

It should be noted that the percentage difference - upper or lower - cannot be defined when the trend food aid requirements are nil, even though it may be possible to calculate the absolute upper and lower differences in some of those cases. There are 19 countries in 1985 and 21 countries in 1990 which have nil trend requirements. Among the remaining countries, the percentage upper differences can be extremely high in some cases. All of the extremely high percentage differences for the upper limits are due to very small trend estimates both in absolute terms and in relation to the country's production. The most extreme case in 1985 is that of Ivory Coast, where the percentage upper difference is 5,392 percent. Trend food aid needs in 1985 amount to only two thousand tons whereas the upper difference is 103 thousand tons. In 1990, the most extreme case is that of the Republic of Korea, where the percentage upper difference works out to 1,445 percent. Trend food aid needs for this country in 1990 are only 67 thousand tons whereas the upper difference is 972 thousand tons.

Given the nature of the underlying relationship, it is clear that the size of the absolute difference between the upper limit and the basic estimate of food aid depends mainly on the volume of

production and the coefficient of variation for past production years (Table 8.2). Large production with a medium-sized coefficient of variation or a medium volume of production with a relatively large coefficient of variation both yield large absolute differences between the upper limit and the basic estimates. Even a very high coefficient of variation does not yield a very large absolute difference if the trend volume of production is small.

These conclusions are illustrated by the cases of Turkey and Morocco. For Turkey, large trend production of 31.98 million tons in 1985 combined with a medium-sized coefficient of variation of 9.282 yields the large absolute upper difference of 2.41 million tons in 1985 referred to earlier. For Morocco, medium sized trend production of 5.08 million tons in 1985 combined with a much larger coefficient of variation of 26.165 yields the large absolute difference in food aid needs of 1.32 million tons in that year. For Jordan, even the extremely large coefficient of variation in production of 71.595 is not sufficient to yield a very large absolute difference. This difference in food aid needs is about 29 thousand tons in all six years with trend production in all years being only 74 thousand tons (zero growth rate).

A frequency distribution of percentage coefficients of variation in production is presented in Chart 8.1. This shows a peak at values between 5.00 and 7.00 with 70 percent of the countries falling between 3.00 and 12.00 and 93 percent falling between 2.00 and 21.00.

The percentage variation in food aid needs, particularly at the upper end where no constraint on size is imposed, is dependent on the relationship between possible variation in production and the

Table 8.2 COEFFICIENTS OF VARIATION OF PAST PRODUCTION AND PROJECTED PRODUCTION FOR 85 COUNTRIES

	Coefficients of Variation of Past Production a/ %	Projected Production 1985	1986	1987	1988	1989	1990
		(100,000 Metric Tons)					
BANGLADESH	6.975	189.33	193.07	196.87	200.76	204.71	208.75
BHUTAN	0.443	1.14	1.17	1.20	1.23	1.26	1.29
NEPAL	5.618	34.92	35.22	35.52	35.82	36.12	36.43
PAKISTAN	6.208	216.71	226.82	237.41	248.48	260.08	272.21
SRI LANKA	7.855	23.97	24.92	25.90	26.92	27.98	29.08
SOUTH ASIA		466.08	481.19	496.89	513.20	530.15	547.76
BURMA	7.945	117.36	121.12	125.00	129.01	133.14	137.40
FIJI	3.587	0.76	0.78	0.79	0.81	0.82	0.83
INDONESIA	4.575	386.46	400.67	415.40	430.67	446.50	462.91
KAMPUCHEA	34.399	9.49	9.49	9.49	9.49	9.49	9.49
KOREA DPR	2.039	105.52	110.60	115.92	121.51	127.36	133.49
KOREA REP	11.061	83.16	84.12	85.09	86.07	87.07	88.07
LAOS	11.960	8.14	8.21	8.29	8.36	8.44	8.52
MALAYSIA	10.612	23.93	24.71	25.50	26.33	27.18	28.06
PHILIPPINES	5.469	143.03	150.79	158.97	167.60	176.69	186.28
THAILAND	8.286	277.04	289.64	302.80	316.56	330.95	346.00
VIETNAM	5.189	128.98	132.12	135.33	138.62	142.00	145.45
EAST ASIA		1283.89	1332.24	1382.59	1435.03	1489.63	1546.50
ASIA		1749.96	1813.43	1879.49	1948.23	2019.78	2094.26
CYPRUS	32.986	1.61	1.61	1.61	1.61	1.61	1.61
IRAQ	30.410	17.97	17.97	17.97	17.97	17.97	17.97
JORDAN	71.595	0.74	0.74	0.74	0.74	0.74	0.74
LEBANON	17.219	0.94	0.94	0.94	0.94	0.94	0.94
SYRIA	37.461	42.35	45.34	48.53	51.95	55.61	59.52
TURKEY	9.282	319.77	331.42	343.50	356.02	368.99	382.44
YEMEN AR	11.809	9.79	9.79	9.79	9.79	9.79	9.79
YEMEN PDR	6.031	1.39	1.43	1.47	1.51	1.55	1.59
WEST ASIA		394.56	409.24	424.55	440.52	457.20	474.60
ALGERIA	25.080	21.90	22.27	22.64	23.02	23.40	23.79
EGYPT	3.198	90.54	91.80	93.07	94.36	95.67	96.99
MOROCCO	26.165	50.79	51.26	51.74	52.23	52.72	53.22
SUDAN	14.052	59.50	62.93	66.55	70.38	74.42	78.71
TUNISIA	20.074	14.54	15.02	15.51	16.01	16.53	17.07
							0.00
NORTH AFRICA		237.28	243.27	249.51	255.99	262.75	269.78
W.ASIA & N.AFRICA		631.84	652.51	674.05	696.52	719.94	744.38
							0.00
BENIN	8.539	9.60	9.83	10.07	10.31	10.56	10.82
BURKINA FASO	9.141	15.13	15.31	15.48	15.66	15.84	16.02
CHAD	10.748	8.37	8.37	8.37	8.37	8.37	8.37
GAMBIA	9.152	1.98	1.98	1.98	1.98	1.98	1.98
GHANA	6.380	23.60	23.94	24.28	24.63	24.98	25.33

Table 8.2 con't

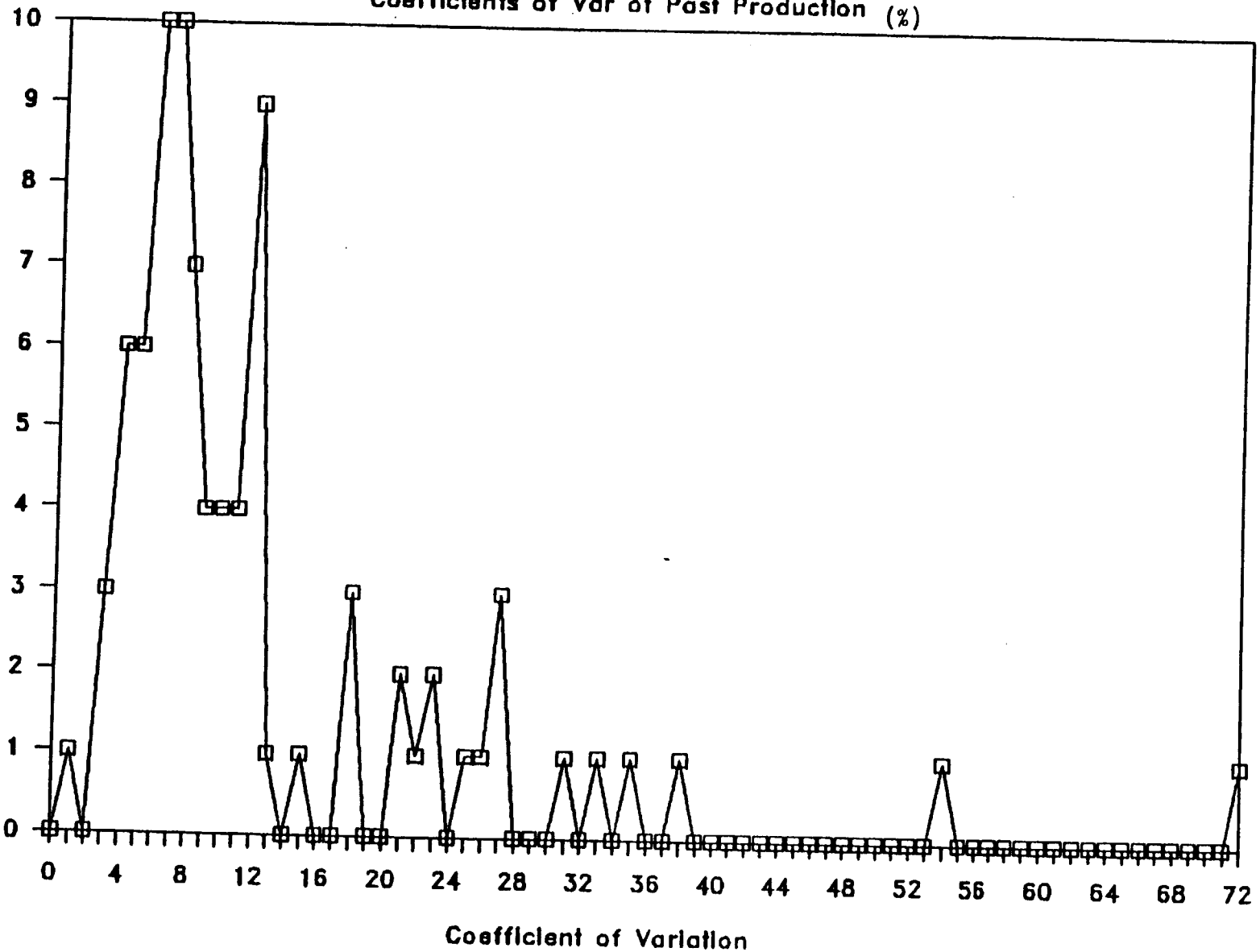
GUINEA	6.123	8.97	9.05	9.13	9.22	9.30	9.38
GUINEA-BISSAU	17.715	0.98	0.98	0.98	0.98	0.98	0.98
IVORY COAST	4.728	21.90	22.58	23.29	24.02	24.77	25.55
LIBERIA	3.569	4.18	4.32	4.46	4.61	4.77	4.93
MALI	12.550	14.70	14.88	15.07	15.26	15.45	15.65
MAURITANIA	24.040	0.51	0.51	0.51	0.51	0.51	0.51
NIGER	17.816	19.89	20.21	20.53	20.86	21.19	21.53
SENEGAL	26.476	15.29	15.29	15.29	15.29	15.29	15.29
SIERRA LEONE	6.105	6.55	6.68	6.81	6.95	7.09	7.23
TOGO	8.105	5.82	5.84	5.87	5.89	5.91	5.94
WEST AFRICA		157.46	159.77	162.13	164.53	166.99	169.51
ANGOLA	5.002	11.83	11.83	11.83	11.83	11.83	11.83
BURUNDI	2.502	14.61	14.87	15.13	15.40	15.67	15.95
CAMEROON	6.092	26.48	27.31	28.16	29.04	29.94	30.87
CENT AFR REP	3.718	7.52	7.76	8.00	8.25	8.50	8.77
CONGO	4.427	2.52	2.56	2.59	2.62	2.65	2.68
GABON	5.525	0.90	0.90	0.90	0.90	0.90	0.90
RWANDA	4.264	16.28	16.89	17.52	18.18	18.86	19.57
ZAIRE	2.531	62.71	64.08	65.47	66.89	68.35	69.83
CENTRAL AFRICA		142.86	146.18	149.59	153.10	156.70	160.40
BOTSWANA	53.087	0.75	0.75	0.76	0.77	0.78	0.78
ETHIOPIA	3.759	55.04	55.28	55.53	55.78	56.03	56.28
KENYA	8.765	39.06	39.59	40.13	40.67	41.22	41.78
LESOTHO	21.393	2.28	2.29	2.30	2.31	2.32	2.33
MADAGASCAR	3.862	28.99	29.49	29.99	30.51	31.04	31.57
MALAWI	9.631	19.58	19.82	20.07	20.33	20.58	20.84
MAURITIUS	10.538	0.09	0.09	0.09	0.09	0.09	0.10
MOZAMBIQUE	6.182	15.96	15.96	15.96	15.96	15.96	15.96
SOMALIA	11.685	2.83	2.83	2.83	2.83	2.83	2.83
SWAZILAND	26.880	1.33	1.37	1.42	1.46	1.50	1.55
TANZANIA	4.578	41.34	42.34	43.36	44.41	45.48	46.58
UGANDA	5.259	36.90	37.44	37.99	38.54	39.10	39.67
ZAMBIA	11.791	12.24	12.32	12.40	12.48	12.57	12.65
ZIMBABWE	22.128	27.38	28.10	28.84	29.60	30.38	31.18
EAST AFRICA		283.77	287.68	291.67	295.74	299.88	304.10
S.S. AFRICA		584.09	593.64	603.40	613.37	623.57	634.01
COSTA RICA	7.871	7.11	7.40	7.72	8.04	8.38	8.73
DOMINICAN RP	5.637	9.15	9.43	9.72	10.02	10.33	10.65
EL SALVADOR	11.067	9.80	10.23	10.67	11.13	11.62	12.12
GUATEMALA	5.825	13.44	13.74	14.04	14.35	14.67	15.00
HAITI	7.948	6.58	6.58	6.58	6.58	6.58	6.58
HONDURAS	5.960	7.87	7.91	7.94	7.97	8.01	8.04
JAMAICA	10.473	1.27	1.29	1.32	1.35	1.38	1.41
NICARAGUA	11.132	4.50	4.54	4.57	4.61	4.64	4.68
PANAMA	6.670	5.21	5.30	5.38	5.47	5.56	5.65
TRINIDAD ETC	7.395	0.50	0.53	0.57	0.60	0.63	0.67
CARIB & CEN AM		65.43	66.94	68.51	70.13	71.80	73.53
BOLIVIA	5.467	11.18	11.47	11.76	12.07	12.38	12.70

Table 8.2 con't

COLOMBIA	4.962	64.78	68.08	71.56	75.21	79.05	83.09
ECUADOR	7.941	13.59	13.59	13.59	13.59	13.59	13.59
GUYANA	22.161	2.71	2.78	2.86	2.93	3.01	3.09
PARAGUAY	11.178	16.65	17.44	18.26	19.13	20.03	20.98
PERU	7.656	22.42	22.53	22.64	22.74	22.85	22.96
SURINAM	6.579	2.73	2.90	3.07	3.26	3.45	3.66
CHILE	11.646	19.34	19.34	19.34	19.34	19.34	19.34
URUGUAY	20.738	11.05	11.30	11.56	11.83	12.10	12.38
SOUTH AM		164.44	169.42	174.64	180.09	185.81	191.79
LATIN AM		229.87	236.37	243.15	250.22	257.61	265.32
TOTAL		3195.76	3295.95	3400.08	3508.34	3620.91	3737.96

a/ Based on past production years 1966-1980

Chart 8.1 FREQUENCY DISTRIBUTION:
Coefficients of Var of Past Production (%)



absolute volume of basic or trend food aid needs. The variation in production depends on the two factors, volume of production and coefficient of variation, already discussed in connection with the size of absolute positive differences in food aid needs. The absolute volume of trend food aid needs depends on (a) the difference between consumption and production, that is, the import gap and (b) the proportion of this import gap that is filled by commercial food imports.

High upper percentage differences are likely when the possible absolute downward variation in production is large and the volume of trend food aid needs is small. Thus, for the Ivory Coast for which, as pointed out earlier, the percentage difference is at the extremely high level of 5,392 percent in 1985, the downward variation in production is 103 thousand tons while the trend estimate of food aid needs is only two thousand tons. Similarly, for Uruguay the high upper percentage difference of 375 percent in 1985 results from a downward variation in production of 160 thousand tons with a trend food aid need of only 43 thousand tons. Again, for Cameroon, in 1990, the upper percentage difference of 322 percent results from a downward variation in production in that year of 188 thousand tons, with a trend food aid need estimated at 58 thousand tons.

Similarly, relatively small positive percentage differences are likely when the downward variation in production is small and the volume of trend food aid needs is large. Thus, in 1985, for Mauritania where the downward variation in production is small (12 thousand tons) and the trend needs are large (110 thousand tons), the upper percentage difference in food aid needs is only 11 percent.

The terms "small" (or "large") for the variation in production and "large" (or "small") for the trend food aid needs are to be understood in relation to each other. They can therefore apply at any level so long as the relationship between them holds. Thus a downward variation of 3 thousand tons in production in 1990 for Fiji, a country with a trend food aid requirement in that year of 26 thousand tons, yields a relatively small percentage difference -- 11.32 percent. However, a much larger variation in production of 306 thousand tons in 1990 for Egypt, a country with a trend food aid requirement in that year of 3.06 million tons, also yields a small percentage difference - 10 percent.

Again, a variation of 350 thousand tons in production in 1985 for Niger, a country with a trend food aid requirement in that year of 149 thousand tons, yields a large percentage difference (236 percent), but a much smaller variation in production of 42 thousand tons in 1985 for Guyana, a country with trend needs in that year that are also smaller at 25 thousand tons, similarly yields a large percentage difference (169 percent).

Table 8.3 lists countries belonging to a selected 10 percent range of upper percentage differences and gives their trend food aid needs for the relevant year to bring out the fact that countries with both large and small trend food aid needs may fall into the same range.

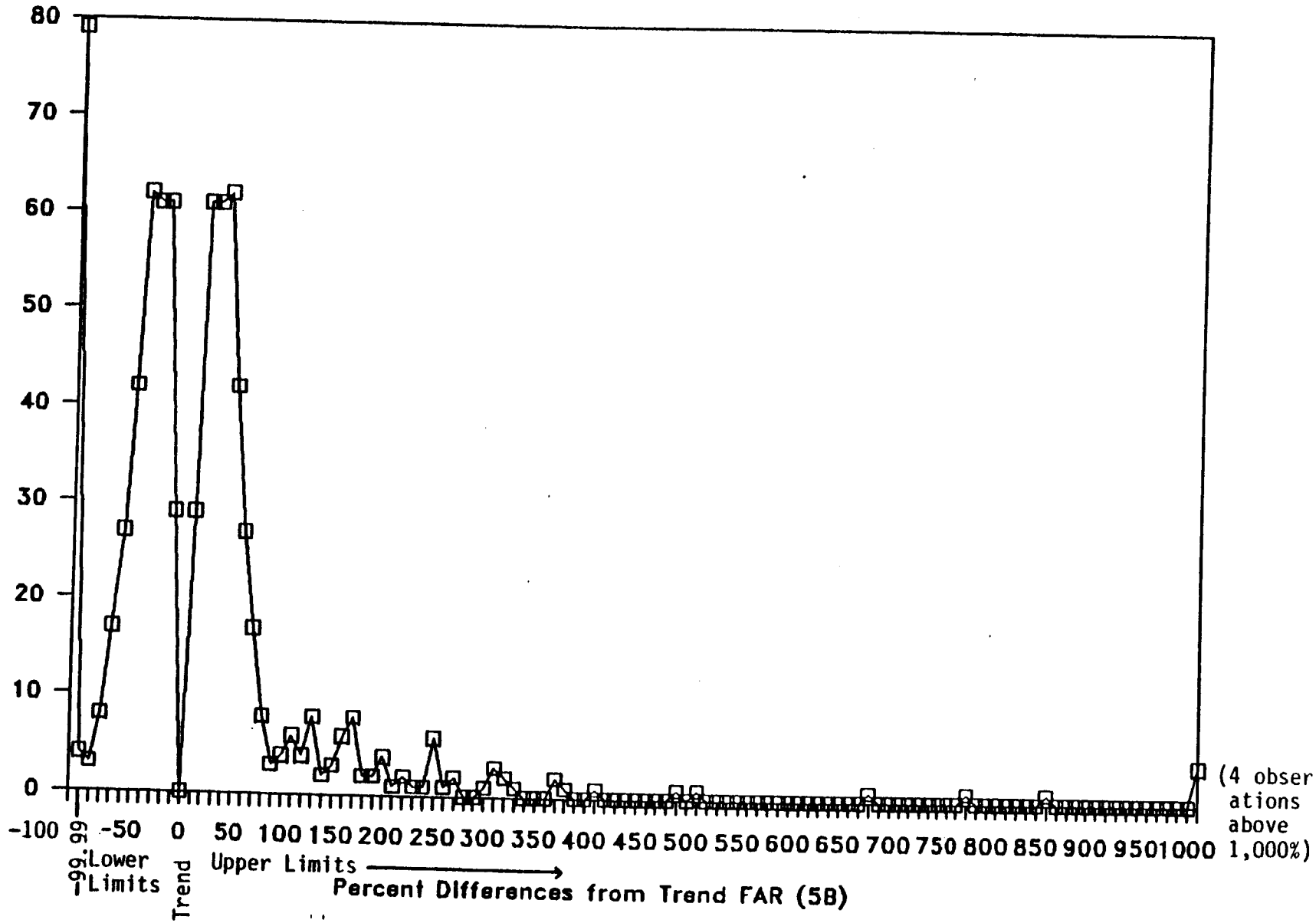
A frequency distribution of both upper and lower percentage differences for all countries for all years (with the lower differences treated as negative) are presented in Chart 8.2, grouped into ranges of 10 percent each on both sides of zero. All observations where the percentage difference cannot be computed

Table 8.3 -- Countries in the 30 to 40 Range of Positive Percentage Difference from the Basic Trend Estimate

(Method 5B)

Country	Trend (1990) (100,000 MT)	Difference Between Upper Limit and Trend (%)
Liberia	0.53	33.44
Guinea-Bissau	0.56	30.86
Botswana	1.24	32.29
Bolivia	1.99	34.85
Guatemala	2.50	34.93
Chad	2.53	35.50
Mali	5.91	33.13
Nepal	6.27	32.01
Malawi	6.54	30.55
Iraq	17.25	31.69
Morocco	35.25	39.33
Bangladesh	41.86	34.78

Chart 8.2 FREQUENCY DISTRIBUTION OF UPPER AND LOWER PERCENTAGE DIFFERENCES FROM TREND ESTIMATE (85 Countries, years 1985 through 1990) (5B)



because the trend food aid needs are nil are of course automatically excluded from the distribution. There are 230 such observations out of a total of 1,020 (85 x 6 x 2), divided equally between upper and lower differences. The frequency distribution, therefore, has 790 observations, also divided equally into 395 upper and 395 lower differences.

Amongst the lower differences, there are 79 cases showing a percentage difference of 100 percent. These are cases in which the lower limit for food aid is nil though the lower trend need is positive, so that the lower difference is exactly equal to the trend need. As already indicated, these cases arise because of the constraint that food aid needs (at any point) cannot be negative. Once these observations as well as the observations of 100 percent or above for the upper differences are excluded, i.e. when only those percentage differences falling in the range from 0 to just below 100 percent are considered, the distribution is quite symmetrical for the upper and lower differences. The peak on each side falls within the 10-40 percent range. For values of 100 percent and above in the upper differences, there is a long tail, with a few observations falling in various 10 percent ranges and some observations even being above 1,000 percent. The aggregate number of observations in this tail of upper differences is equal to the number of observations of 100 percent lower differences. The distribution is therefore basically symmetrical (subject to the effect of the constraint preventing food aid needs from ever being negative) and has two exactly equal peaks - one for the upper and one for the lower differences.

It may be observed that, for most countries, the percentage differences between upper limits and the trend estimates diminish over time. Of the 65 countries for which percentage differences are computable for all six years, only six -- Republic of Korea, Malaysia, Vietnam, Cyprus, Cameroon and El Salvador - have upper percentage differences increasing over time. This seems largely due to trend estimates of food aid requirements that decrease over time in those countries. In most cases, as can be expected, variation around the trend estimate is symmetrical. The exceptions to this occur when the lower limit encounters the zero food aid requirement constraint so that the lower percentage difference cannot rise over 100 percent. The nine countries in which the lower percentage difference is 100 percent in all six years are Republic of Korea, Vietnam, Tunisia, Ivory Coast, Niger, Senegal, Cameroon, El Salvador and Guyana.

9. VARIABILITY IN COUNTRY GROUPS

(a) CONCEPTS AND METHODS

The variation in the aggregate food aid needs of each group of countries (including the group of all countries) is of course not equal to the sum of the variations in the food aid needs of the countries (including all countries) in that group since the variations in production in different countries need not coincide in direction and magnitude. For each such group of countries, therefore, the likely variation in food aid needs has to be directly estimated from the variability in the aggregate production (and exports) of that group of countries.

A serious problem arises in doing this because of the treatment that is accorded to any negative estimates of individual country food aid needs and that must also be accorded to any negative upper or lower estimates of food aid needs. Such estimates, wherever they occur, are treated as nil on the ground that negative food aid needs of one country cannot offset the positive food aid needs of another. However, if such countries are included in any group whose aggregate production is examined for variations as a basis for estimating variations in food aid needs, their negative food aid requirements do in fact enter into the ultimate measure of the food aid needs of that group. There is no way in which these can then be disentangled to obtain a more acceptable estimate of the variations in the food aid

needs of that group of countries. On the other hand, it is not possible to simply exclude countries that show some possible negative food aid needs from the relevant group. It is possible that they may have some positive food aid needs in some years that ought not to be excluded.

The search for a solution to this problem, that would make it possible to obtain reasonable upper and lower estimates of food aid needs for various groups of countries (including the group of all countries), is assisted by classifying countries according to the positive or negative character of all three estimates of their individual food aid needs -- the upper limit, the trend or average, and the lower limit.

Table 9.1 shows how such a classification would work. Countries for which all three estimates of food aid needs are positive would form one class - A. Those for which the upper and trend estimates are positive but the lower are negative would form a second class - B. Those for which only the upper estimate is positive, while both trend and lower estimates are negative would form a third class - C. Countries for which all three estimates are negative would then fall into the fourth class - D. The class into which each country falls on the basis of the estimates of trend food aid needs and the upper and lower limits of such needs is shown in Table 9.2. There are 52 countries in class A, 13 in class B, 7 in class C and 13 in class D.

Two initial statements can be made.

First, it is clear that since all the estimates of class D countries are negative and are therefore to be treated as zero, they cannot affect the <u>real</u> or true variability of any group (including

Table 9.1 Basis of Classification of Countries According to the Positive or Negative Character of Their Food Aid Needs (Before Application of the Constraint on Negative Values)

	Estimate		
Class	Upper Limit	Average	Lower Limit
A	+	+	+
B	+	+	-
C	+	-	-
D	-	-	-

Table 9.2 - Country Classification of Food Aid Needs According to their Positive or Negative Character

Region/Subregion	Class A(52)	B(13)	C(7)	D(13)
ASIA				
South Asia	Bangladesh Bhutan Nepal	Sri Lanka		Pakistan
East Asia	Fiji Kampuchea Laos Malaysia	Korea Rep Vietnam	Burma	Indonesia Korea Rep Philippines Thailand
West Asia & North Africa				
West Asia	Cyprus Iraq Jordan Lebanon Yemen AR		Syria Turkey Yemen PDR	
North Africa	Egypt Morocco	Algeria Tunisia		Sudan
Sub-Saharan Africa				
West Africa	Benin Burkina Faso Chad Ghana Guinea Guinea-Bissau Liberia Mali Mauritania Togo	Ivory Coast Niger Senegal Sierra Leone		Gambia
Central Africa	Angola Burundi Congo Gabon Zaire	Cameroon		Central Afr. R Rwanda

Table 9.2 cont'd

Region/Subregion	A(52)	B(13)	C(7)	D(13)
East Africa	Botswana Ethiopia Kenya Lesotho Madagascar Malawi Mautitius Mozambique Somalia Swaziland Tanzania Uganda Zambia		Zimbabwe	
Latin America				
Central America/Caribbean	Dominican Rep Guatemana Haiti Honduras Jamaica Nicaragua	El Salvador	Trinidad & Tobago	Costa Rica Panama
South America	Bolivia Ecuador Peru Chile	Guyana Uruguay	Paraguay	Colombia Surinam

the group of all countries) of which they form a part. Incorporating their production in the aggregate production of any group would, however, affect the computed variability of that group, reducing both the upper and lower estimates of food aid needs around trend. These countries should therefore be excluded from any group to obtain a more reliable estimate of the upper and lower limits of the food aid needs of that group.

Second, since all the estimates of class A countries are positive, the estimates of the upper and lower limits of food aid needs estimated for the groups including only class A countries are entirely valid for those groups as far as they relate to that class of countries. However, there are two classes of countries -- B and C -- with some positive estimates of food aid needs, particularly at the upper end. Therefore, the estimates obtained by taking only class A countries are not likely to be valid for all classes of countries taken together at the upper end, though they may possibly indeed be the best estimate at the lower end in some cases.

Between these two conclusions applicable to class D and class A, there is an uncertain ground left for the results obtained for the sets of classes resulting from combining classes A and B, or classes A, B, and C.

If only the set of countries belonging to classes A and B are considered, the results obtained for various groups of countries are likely to be valid for those classes of countries at the upper limit of food aid needs, though they may be marginally smaller than the true upper limit because of possible negative effects from some class B countries in certain years. At the lower end, however, the results may be significantly lower than the true lower limit for these

countries because of the likely negative effect that class B countries are bound to exert here. In some cases, it may be that the estimated lower limit for classes A and B together is lower than the estimated lower limit for class A countries alone. In such cases, it is clear that the estimate for class A countries provides a better estimate of the lower limit for class A and class B countries together, though it may still be an underestimate.

When countries belonging to the set of three classes -- A, B and C -- are considered, the results obtained at the upper end may be better representative of the countries in this combined set for any particular regional group or all developing countries, but would probably again be lower than the true upper limit for this set of countries. At the lower end, the estimate would be clearly much too low because of the strong additional negative effect exercised by countries of class C. This negative effect may be so strong for some groups or in some years that the estimate of the lower limit for the three classes together may actually be lower than for the two classes A and B. Since additional countries cannot reduce the true lower limit of food aid needs given the assumption that any estimated negative food aid needs are treated as nil, the estimated lower limit for classes A and B must be a better measure of the true lower limit for classes A, B and C than the estimate obtained for those three classes.

Since class D countries are those where the average as well as both upper and lower limits of food aid needs are negative (but are then treated as nil), the addition of this class to the other classes can only reduce the estimated upper and lower limits though the true limits should not fall. Their exclusion in estimating upper and

lower limits, therefore, yields better results for groups of all classes of countries than their inclusion.

This discussion suggests that the best estimate of both upper and lower limits for any group consisting of all classes of countries (including the group of all countries) is the highest estimate for that group obtained by taking class A alone or either of the combinations -- classes A and B or classes A, B and C -- discussed above. Most of these results come from the combination of classes A and B, but there are some that are obtained by taking class A countries only and others that are obtained by taking classes A, B and C. These selected results are considered to be the best estimates of the results for any group and at the same time possibly to be underestimates of some degree because of the influence of negative values for the estimates of some countries.

(b) RESULTS

The estimates of variability in food aid needs for various subgroups (subregions) and groups (regions), including the group of all countries, are presented in Table 9.3. The table shows the estimates for the upper and lower limits together with the trend estimates. It also shows the positive and negative differences in both absolute and percentage terms.

It can be seen that for all 85 countries taken together, the upper limit of food aid needs comes to 23.94 million tons in 1985 (39.77 million tons in 1990) as compared with the trend estimate of 20.54 million tons (36.10 million tons). The positive difference thus comes to 3.40 million tons (3.66 million tons). As one would expect, these estimates are much smaller than the simple arithmetic

TABLE 9.3 FOOD AID REQUIREMENTS FOR 14 REGIONS: TREND, UPPER AND LOWER LIMITS OF VARIATION AS BASED ON METHOD 5B
(IMPORTS GROWING BY GROWTH RATE OF PER CAPITA GNP (WDR) AND EXPORTS AS A PROPORTION OF PRODUCTION (77-82 EXP/77-82 PROD)

Absolute Amounts
Row 1: FAR based on (prod - 1 S.D.)
Row 2: FAR based on trend production (5D)
Row 3: FAR based on (prod + 1 S.D.)

Difference from Basic Estimates (row 2)

Percentage Difference from Basic Estimates (row 2)

n.d. not defined

	Absolute Amounts 1985	1986	1987	1988	1989	1990	Difference 1985	1986	1987	1988	1989	1990	Percentage Difference 1985	1986	1987	1988	1989	1990
	(100,000 Metric Tons)																	
1 SOUTH ASIA	48.97	51.83	54.78	57.82	60.97	64.21	14.54	14.84	15.15	15.46	15.78	15.83	42.24%	40.14%	38.23%	36.49%	34.92%	32.73%
	34.43	36.99	39.63	42.36	45.19	48.38												
	20.02	22.30	24.65	27.50	30.49	33.59	14.41	14.69	14.98	14.86	14.70	14.79	41.85%	39.71%	37.80%	35.09%	32.53%	30.56%
2 EAST ASIA	35.36	35.48	35.49	35.38	35.13	34.73	13.61	13.86	14.13	14.41	14.68	14.96	62.55%	64.13%	66.15%	68.68%	71.80%	75.68%
	21.75	21.62	21.36	20.97	20.45	19.77												
	8.00	7.59	7.78	8.38	8.99	9.61	13.75	14.03	13.58	12.59	11.46	10.16	63.22%	64.89%	63.58%	60.05%	56.04%	51.39%
3 ASIA	71.76	74.49	77.20	79.87	82.50	85.08	15.58	15.89	16.21	16.53	16.86	16.94	27.73%	27.11%	26.58%	26.10%	25.69%	24.85%
	56.18	58.60	60.99	63.34	65.64	68.14												
	40.59	42.70	44.78	46.80	48.77	50.68	15.59	15.90	16.21	16.54	16.87	17.46	27.75%	27.14%	26.58%	26.11%	25.70%	25.63%
4 WEST ASIA	31.61	35.37	39.29	43.38	47.63	52.05	21.48	22.26	23.05	23.84	24.60	25.35	212.09%	169.85%	141.97%	122.02%	106.83%	94.95%
	10.13	13.11	16.24	19.54	23.03	26.70												
	5.17	8.15	11.28	14.57	18.03	21.67	4.96	4.96	4.96	4.97	5.00	5.03	48.96%	37.82%	30.53%	25.43%	21.71%	18.84%
5 NORTH AFRICA	62.42	68.92	75.73	82.88	90.36	98.21	20.76	21.06	21.36	21.68	21.99	22.31	49.82%	44.00%	39.29%	35.42%	32.16%	29.39%
	41.66	47.86	54.37	61.20	68.37	75.90												
	22.76	27.76	33.10	39.62	46.48	53.69	18.90	20.10	21.27	21.58	21.89	22.21	45.37%	42.00%	39.12%	35.26%	32.02%	29.26%
6 N AS & N AFR	82.13	92.03	102.39	113.22	124.55	136.40	30.34	31.06	31.78	32.48	33.15	33.80	58.57%	50.95%	45.01%	40.23%	36.26%	32.95%
	51.79	60.97	70.61	80.74	91.40	102.60												
	30.30	38.11	46.37	56.20	66.54	77.41	21.49	22.86	24.24	24.54	24.86	25.19	41.50%	37.49%	34.33%	30.39%	27.20%	24.55%
7 WEST AFRICA	29.41	33.06	36.86	40.80	44.89	49.13	9.36	9.49	9.64	9.79	9.93	10.08	46.68%	40.28%	35.42%	31.55%	28.42%	25.82%
	20.05	23.57	27.22	31.01	34.96	39.05												
	13.46	15.88	18.40	21.34	25.14	29.08	6.59	7.69	8.82	9.67	9.82	9.97	32.87%	32.62%	32.40%	31.19%	28.08%	25.53%
8 CENT AFRICA	11.88	13.62	15.44	17.32	19.29	21.34	3.03	3.09	3.16	3.21	3.28	3.35	34.20%	29.33%	25.72%	22.79%	20.52%	18.65%
	8.85	10.53	12.28	14.11	16.01	17.99												
	6.42	8.06	9.77	11.55	13.41	15.34	2.43	2.47	2.51	2.56	2.60	2.65	27.48%	23.47%	20.45%	18.11%	16.22%	14.71%
9 EAST AFRICA	57.53	66.25	75.39	84.96	94.98	105.46	10.15	10.53	10.94	11.36	11.80	12.26	21.43%	18.90%	16.97%	15.44%	14.19%	13.15%
	47.38	55.72	64.45	73.60	83.18	93.20												
	38.94	47.18	55.82	64.87	74.35	84.27	8.44	8.54	8.63	8.73	8.83	8.93	17.81%	15.32%	13.39%	11.86%	10.61%	9.58%

10 S SAH AFRICA	91.13	105.13	119.79	135.08	151.05	167.73	14.85	15.32	15.84	16.36	16.91	17.49	19.47%	17.05%	15.24%	13.78%	12.61%	11.64%
	76.28	89.81	103.95	118.72	134.14	150.24	12.76	13.15	13.34	13.53	13.72	13.92	16.73%	14.65%	12.83%	11.39%	10.23%	9.26%
	63.52	76.66	90.61	105.19	120.42	136.32	2.18	2.22	2.27	2.35	2.40	2.44	23.40%	21.25%	19.40%	18.13%	16.76%	15.55%
11 CENT AMERICA	11.47	12.69	13.95	15.30	16.71	18.17	2.23	2.29	2.34	2.38	2.43	2.49	24.04%	21.84%	20.06%	18.39%	16.99%	15.80%
	9.29	10.47	11.68	12.95	14.31	15.73	3.25	3.03	2.89	2.86	2.82	2.83	27.41%	21.45%	17.50%	15.05%	13.07%	11.60%
	7.06	8.18	9.34	10.57	11.88	13.24	3.69	3.62	3.54	3.46	3.39	3.41	31.19%	25.56%	21.39%	18.18%	15.67%	13.98%
12 SOUTH AMERIC	15.09	17.18	19.43	21.88	24.43	27.23	3.47	3.28	3.29	3.34	3.33	3.22	16.42%	13.32%	11.66%	10.45%	9.28%	8.04%
	11.84	14.15	16.54	19.02	21.61	24.40	4.25	4.31	4.37	4.44	4.56	4.79	20.10%	17.52%	15.48%	13.89%	12.69%	11.93%
	8.15	10.53	13.00	15.56	18.22	20.99	34.03	34.62	35.24	35.85	36.42	36.61	16.57%	14.80%	13.36%	12.16%	11.13%	10.14%
13 LATIN AMERIC	24.61	27.89	31.51	35.31	39.25	43.35	34.60	35.12	35.64	36.19	36.82	37.84	16.85%	15.01%	13.51%	12.28%	11.26%	10.48%
	21.14	24.61	28.22	31.97	35.92	40.13												
	16.89	20.30	23.85	27.53	31.36	35.34												
14 TOTAL	239.42	268.62	299.01	330.62	363.51	397.71												
	205.39	234.00	263.77	294.77	327.09	361.10												
	170.79	198.88	228.13	258.58	290.27	323.26												

sums of the individual country variations (Table 9.4). These amount to 38.00 million tons in 1985 (53.93 million tons in 1990) for the upper limits. The positive differences obtained from the simple sums amount to 17.46 million tons in 1985 (17.82 million tons in 1990).

The lower limit for all 85 countries is 17.08 million tons in 1985 (32.33 million tons in 1990), yielding a difference of 3.46 million tons (3.78 million tons). In comparison with the simple sums of the individual country estimates, the lower limit is now higher than that aggregate of 10.56 million tons in 1985 (25.37 million tons in 1990). It follows that the difference with respect to the lower limit is smaller in absolute terms than the difference with respect to the simple sums.

Both upper and lower differences obtained in our estimates are therefore smaller in absolute terms than the differences obtained by simple summing of individual country results. This holds also for each group and subgroup of countries, as one would expect.

The differences between the estimates of food aid needs for various regions and subregions and the simple sums of the estimates for the individual countries in those regions and subregions are due, as explained earlier, to the fact that the variations in production in different countries may differ in magnitude or even in direction in any given year. This is reflected in the fact that the coefficients of variation for production in various subgroups and groups of countries (including all countries) are in general lower than for the individual countries included in them. Table 9.5 shows the production levels and the percentage coefficients of variation for the groups while the

FOOD AID REQUIREMENTS FOR 14 REGIONS: SUMMATIONS OF TRENDS AND VARIATIONS OF INDIVIDUAL COUNTRIES AS BASED ON METHOD 5B
(IMPORTS GROWING BY GROWTH RATE OF PER CAPITA GNP (WDR) AND EXPORTS AS A PROPORTION OF PRODUCTION (77-82 EXP/77-82 PROD))

Absolute Amounts
Row 1: FAR based on (prod - 1 S.D.)
Row 2: FAR based on trend production (5D)
Row 3: FAR based on (prod + 1 S.D.)

(100,000 Metric Tons)

	1985	1986	1987	1988	1989	1990
1 SOUTH ASIA	59.99	59.51	58.85	60.45	63.66	66.96
	34.43	36.99	39.63	42.36	45.19	48.38
	17.63	20.25	22.97	25.81	28.75	31.80
2 EAST ASIA	51.19	49.17	48.99	48.66	48.18	47.53
	21.75	21.62	21.36	20.97	20.45	19.77
	5.13	5.73	6.34	6.96	7.60	8.25
3 ASIA	111.18	108.68	107.84	109.12	111.84	114.49
	56.18	58.60	60.99	63.34	65.64	68.14
	22.76	25.98	29.32	32.77	36.35	40.05
4 WEST ASIA	48.20	52.80	57.61	62.65	67.92	73.44
	10.13	13.11	16.24	19.54	23.03	26.70
	3.15	5.67	8.80	12.09	15.55	19.18
5 NORTH AFRICA	68.22	73.65	79.57	86.77	94.31	102.21
	41.66	47.86	54.37	61.20	68.37	75.90
	22.31	27.15	32.22	37.53	44.39	51.60
6 W AS & N AFR	116.42	126.45	137.19	149.42	162.23	175.65
	51.79	60.97	70.61	80.74	91.40	102.60
	25.46	32.82	41.02	49.62	59.94	70.78
7 WEST AFRICA	36.92	40.62	44.47	48.46	52.60	56.89
	20.05	23.57	27.22	31.01	34.96	39.05
	9.54	11.82	14.25	16.82	19.50	22.30
8 CENT AFRICA	13.18	14.94	16.78	18.70	20.71	22.79
	8.85	10.53	12.28	14.11	16.01	17.99
	5.60	7.23	8.93	10.70	12.55	14.48
9 EAST AFRICA	67.29	76.20	85.53	95.30	105.52	116.22
	47.38	55.72	64.45	73.60	83.18	93.20
	31.18	39.32	47.85	56.79	66.16	75.98

Difference from Basic Estimates (row 2)

	1985	1986	1987	1988	1989	1990
1 SOUTH ASIA	25.56	22.52	19.22	18.09	18.47	18.58
	16.80	16.73	16.66	16.56	16.44	16.57
2 EAST ASIA	29.43	27.56	27.63	27.69	27.73	27.76
	16.62	15.89	15.02	14.01	12.85	11.52
3 ASIA	55.00	50.07	46.85	45.78	46.20	46.35
	33.42	32.62	31.68	30.57	29.29	28.09
4 WEST ASIA	38.07	39.69	41.38	43.11	44.89	46.74
	6.98	7.44	7.44	7.45	7.48	7.52
5 NORTH AFRICA	26.56	25.79	25.20	25.57	25.94	26.31
	19.35	20.71	22.15	23.67	23.99	24.30
6 W AS & N AFR	64.63	65.48	66.58	68.68	70.83	73.05
	26.33	28.15	29.58	31.12	31.47	31.82
7 WEST AFRICA	16.87	17.05	17.25	17.44	17.64	17.84
	10.51	11.75	12.97	14.19	15.45	16.75
8 CENT AFRICA	4.33	4.41	4.50	4.60	4.70	4.80
	3.25	3.30	3.35	3.40	3.46	3.51
9 EAST AFRICA	19.91	20.48	21.08	21.70	22.35	23.02
	16.20	16.40	16.60	16.81	17.01	17.23

Percentage Difference from Basic Estimates (row 2)

n.d. not defined

	1985	1986	1987	1988	1989	1990
1 SOUTH ASIA	74.25%	60.89%	48.51%	42.70%	40.87%	38.42%
	48.78%	45.25%	42.03%	39.09%	36.38%	34.25%
2 EAST ASIA	135.31%	127.47%	129.34%	132.00%	135.62%	140.43%
	76.41%	73.49%	70.31%	66.80%	62.84%	58.28%
3 ASIA	97.89%	85.45%	76.82%	72.28%	70.39%	68.01%
	59.48%	55.67%	51.93%	48.26%	44.62%	41.23%
4 WEST ASIA	375.89%	302.83%	254.81%	220.66%	194.94%	175.06%
	68.94%	56.75%	45.81%	38.12%	32.48%	28.15%
5 NORTH AFRICA	63.74%	53.89%	46.36%	41.77%	37.93%	34.67%
	46.44%	43.27%	40.73%	38.68%	35.08%	32.02%
6 W AS & N AFR	124.79%	107.40%	94.29%	85.06%	77.49%	71.20%
	50.84%	46.16%	41.90%	38.54%	34.43%	31.01%
7 WEST AFRICA	84.11%	72.36%	63.36%	56.24%	50.47%	45.70%
	52.40%	49.84%	47.67%	45.76%	44.20%	42.90%
8 CENT AFRICA	48.90%	41.85%	36.66%	32.61%	29.36%	26.70%
	36.73%	31.35%	27.29%	24.13%	21.59%	19.51%
9 EAST AFRICA	42.03%	36.76%	32.71%	29.49%	26.87%	24.70%
	34.20%	29.43%	25.76%	22.83%	20.46%	18.48%

Table 9.4 con't

10 S.S. AFRICA	117.39	131.76	146.78	162.46	178.82	195.90	41.11	41.94	42.83	43.74	44.69	45.67	53.89%	46.70%	41.20%	36.85%	33.32%	30.40%
	76.28	89.81	103.95	118.72	134.14	150.24												
	46.32	58.37	71.02	84.32	98.21	112.75	29.96	31.45	32.93	34.40	35.92	37.49	39.28%	35.01%	31.68%	28.98%	26.78%	24.95%
11 CENT AMERICA	13.32	14.58	15.89	17.25	18.67	20.19	4.02	4.11	4.21	4.30	4.36	4.46	43.27%	39.30%	36.00%	33.20%	30.48%	28.39%
	9.29	10.47	11.68	12.95	14.31	15.73												
	5.47	6.55	7.74	9.02	10.35	11.75	3.83	3.91	3.94	3.93	3.96	3.98	41.18%	37.39%	33.76%	30.38%	27.66%	25.31%
12 SOUTH AMERIC	21.73	23.36	25.67	28.06	30.53	33.08	9.89	9.21	9.13	9.04	8.92	8.68	83.48%	65.10%	55.21%	47.52%	41.29%	35.57%
	11.84	14.15	16.54	19.02	21.61	24.40												
	5.54	7.91	10.37	12.93	15.58	18.34	6.31	6.24	6.16	6.09	6.02	6.06	53.24%	44.09%	37.28%	32.02%	27.88%	24.84%
13 LATIN AMERIC	35.05	37.93	41.56	45.31	49.20	53.27	13.91	13.32	13.34	13.34	13.28	13.14	65.80%	54.13%	47.26%	41.72%	36.98%	32.76%
	21.14	24.61	28.22	31.97	35.92	40.13												
	11.01	14.46	18.11	21.94	25.93	30.09	10.13	10.15	10.11	10.03	9.98	10.04	47.94%	41.24%	35.82%	31.36%	27.79%	25.02%
14 TOTAL	380.04	404.82	433.36	466.30	502.09	539.31	174.64	170.82	169.59	171.54	175.00	178.21	85.03%	73.00%	64.30%	58.19%	53.50%	49.35%
	205.39	234.00	263.77	294.77	327.09	361.10												
	105.55	131.64	159.47	188.65	220.43	253.67	99.84	102.36	104.30	106.11	106.66	107.44	48.61%	43.75%	39.54%	36.00%	32.61%	29.75%

Table 9.5 COEFFICIENTS OF VARIATION OF PAST PRODUCTION FOR GROUPS OF COUNTRIES AND PROJECTED PRODUCTION

All Countries	Coefficients of Variation Past Production a/ %	Projected Production 1985	1986	1987	1988	1989	1990
		(in 100,000 Metric Tons)					
South Asia	4.973	466.08	481.19	496.89	513.20	530.15	547.76
East Asia	3.070	1283.89	1332.24	1382.59	1435.03	1489.63	1546.50
Asia	2.916	1749.96	1813.43	1879.49	1948.23	2019.78	2094.26
West Asia	9.129	394.56	409.24	424.55	440.52	457.20	474.60
North Africa	9.141	237.28	243.27	249.51	255.99	262.75	269.78
W Asia& N Afr	7.232	631.84	652.51	674.05	696.52	719.94	744.38
West Africa	5.941	157.46	159.77	162.13	164.53	166.99	169.51
Cent Africa	2.135	142.86	146.18	149.59	153.10	156.70	160.40
East Africa	4.421	283.77	287.68	291.67	295.74	299.88	304.10
S.Sah. Africa	2.962	584.09	593.64	603.40	613.37	623.57	634.01
Cent America	3.564	65.43	66.94	68.51	70.13	71.80	73.53
South Americ	2.914	164.44	169.42	174.64	180.09	185.81	191.79
Latin Americ	2.057	229.87	236.37	243.15	250.22	257.61	265.32
Total	2.117	3195.76	3295.95	3400.08	3508.34	3620.91	3737.96
A+B+C Countries							
South Asia	5.823	249.37	254.37	259.49	264.72	270.07	275.55
East Asia	3.261	371.83	380.55	389.50	398.69	408.13	417.82
Asia	3.097	621.19	634.92	648.98	663.41	678.20	693.37
West Asia	9.129	394.56	409.24	424.55	440.52	457.20	474.60
North Africa	11.751	177.77	180.35	182.96	185.62	188.32	191.07
W Asia& N Afr	7.855	572.34	589.58	607.51	626.14	645.52	665.67
West Africa	6.004	155.48	157.79	160.14	162.55	165.01	167.52
Cent Africa	2.554	119.06	121.53	124.07	126.67	129.34	132.06
East Africa	4.421	283.77	287.68	291.67	295.74	299.88	304.10
S.Sah. Africa	3.042	558.30	567.01	575.89	584.96	594.23	603.68
Cent America	4.174	53.11	54.24	55.41	56.62	57.86	59.15
South Americ	4.080	96.93	98.44	100.01	101.62	103.30	105.04
Latin Americ	2.788	150.04	152.68	155.42	158.24	161.16	164.18
Total	2.837	1901.88	1944.19	1987.80	2032.75	2079.11	2126.91
A+B Countries							
South Asia	5.823	249.37	254.37	259.49	264.72	270.07	275.55
East Asia	5.393	254.47	259.43	264.50	269.68	274.99	280.42
Asia	3.104	503.83	513.79	523.98	534.40	545.06	555.97
West Asia	16.729	31.05	31.05	31.05	31.05	31.05	31.05
North Africa	11.751	177.77	180.35	182.96	185.62	188.32	191.07
W Asia& N Afr	11.589	208.82	211.39	214.01	216.67	219.37	222.12
West Africa	6.004	155.48	157.79	160.14	162.55	165.01	167.52
Cent Africa	2.554	119.06	121.53	124.07	126.67	129.34	132.06
East Africa	3.286	256.39	259.58	262.83	266.14	269.50	272.92
S.Sah. Africa	2.469	530.92	538.91	547.05	555.36	563.85	572.51
Cent America	4.230	52.61	53.71	54.84	56.02	57.23	58.48
South Americ	4.415	80.28	81.01	81.74	82.50	83.27	84.05
Latin Americ	2.900	132.89	134.71	136.59	138.51	140.49	142.53
Total	2.514	1376.47	1398.81	1421.63	1444.95	1468.78	1493.13

Table 9.5 con't

Countries							
ɔuth Asia	6.063	225.39	229.45	233.59	237.80	242.10	246.47
ast Asia	12.352	42.32	43.19	44.07	44.99	45.93	46.90
sia	5.766	267.72	272.64	277.66	282.79	288.03	293.37
st Asia	16.729	31.05	31.05	31.05	31.05	31.05	31.05
ɔrth Africa	11.069	141.33	143.06	144.82	146.59	148.39	150.21
Asia& N Afr	10.841	172.38	174.11	175.86	177.64	179.44	181.26
est Africa	4.188	91.86	93.03	94.22	95.43	96.67	97.92
ent Africa	2.037	92.57	94.23	95.91	97.64	99.40	101.19
ast Africa	3.286	256.39	259.58	262.83	266.14	269.50	272.92
Sah. Africa	2.164	440.82	446.84	452.97	459.21	465.56	472.03
ent America	4.294	42.81	43.48	44.17	44.88	45.61	46.35
ɔuth Americ	4.572	66.52	66.92	67.32	67.73	68.15	68.58
atin Americ	3.187	109.33	110.40	111.50	112.62	113.76	114.93
ɔtal	2.856	990.24	1003.98	1017.99	1032.25	1046.79	1061.60

a/ Based on past production years 1966-1980

individual country percentage coefficients of variation are contained in Table 8.2.

Among the main regions, the largest amount of food aid needs at the upper limit is found for sub-Saharan Africa -- 9.11 million tons in 1985 and 16.77 million tons in 1990. This is consistent, however, with the trend estimates which are the highest for this region at 7.63 million tons in 1985 and 15.02 million tons in 1990, reflecting the large number of countries in the region. The largest upper difference among the main regions is found in the West Asia and North Africa region -- 3.03 million tons in 1985 and 3.38 million tons in 1990. The percentage upper difference is also highest in West Asia and North Africa -- 58.57 percent in 1985 and 32.95 percent in 1990.

Amongst subregions, the largest amount of food aid needs at the upper limit in 1985 is found for North Africa -- (6.24 million tons) and in 1990 for East Africa (10.55 million tons). Again, this is consistent with the trend estimates. The largest upper difference among the subregions is found in West Asia -- 2.15 million tons in 1985 and 2.54 million tons in 1990. Among the subregions, percentage variability is highest in West Asia -- 212.09 percent in 1985 and 94.95 percent in 1990.

In relation to the lower limit among regions, the largest absolute difference is found in West Asia and North Africa -- 2.15 million tons in 1985 and 2.52 million tons in 1990. The largest percentage difference at the lower limit in 1985 is also for this region at 41.50 percent, but for 1990 it is for Asia at 25.63 percent.

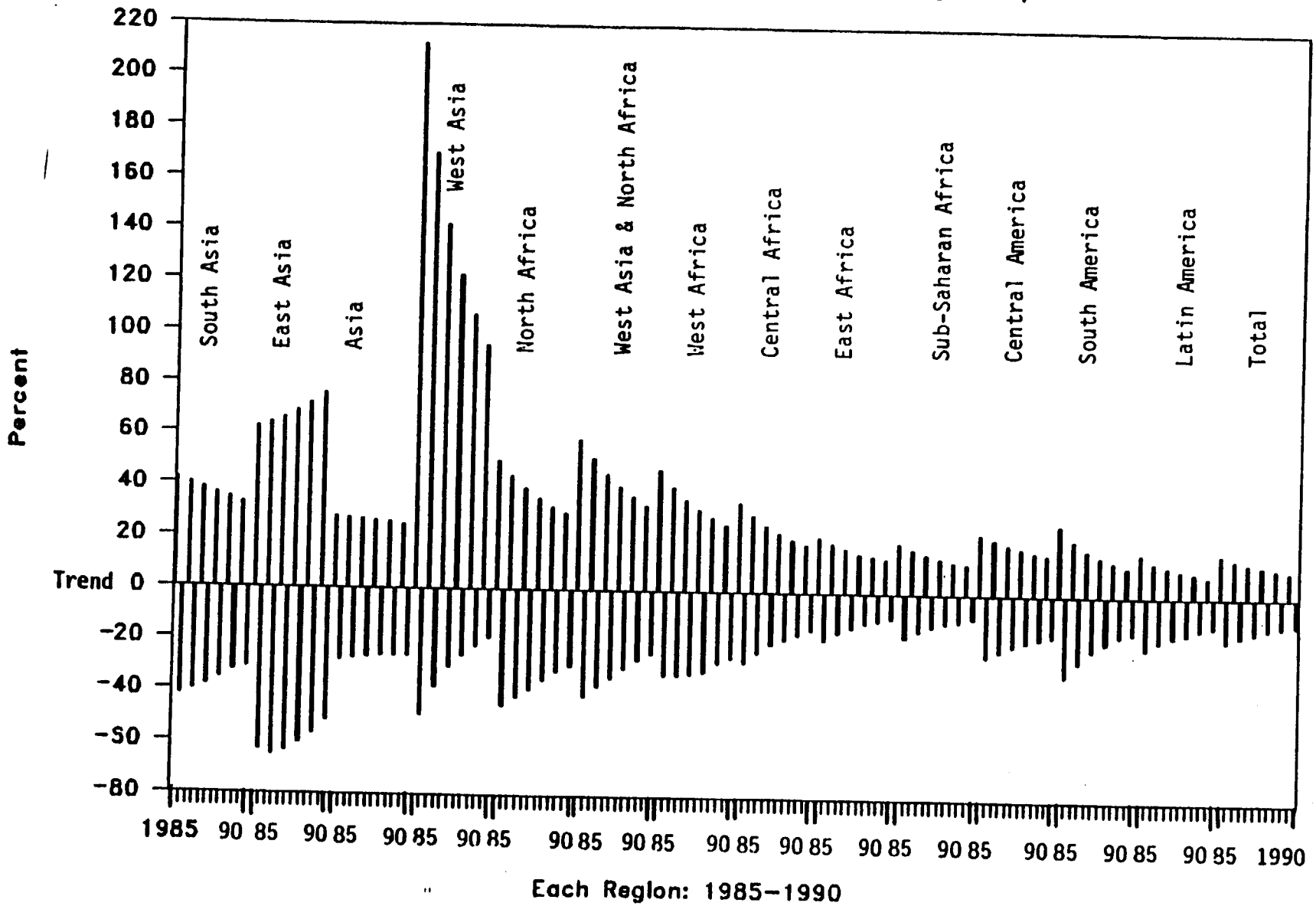
Among subregions, the largest absolute difference in relation to the lower limit is found in North Africa at 1.89 million tons in 1985

and at 2.22 million tons in 1990. The largest percentage difference at the lower limit is in East Asia at 63.22 percent in 1985 and 51.39 percent in 1990.

The results at the lower limits are thus not the exact counterpart of the results at the upper limits. There is also some tendency for the results to differ between 1985 and 1990 because of differences in the rates at which the different variables change over the period.

An examination of the upper and lower limits as these change from 1985 to 1990 brings out some interesting features (Chart 9.1). If the positive and negative percentage differences for each group in each year are added together without regard to sign, this sum, with one exception, diminishes for all groups and subgroups. In other words, the upper and lower limits expressed as percentages of the trend estimates -- or the percentage upper and lower differences from the trend estimates -- converge. Further, all the upper percentage differences, except one, and all the lower percentage differences diminish over the period. The exception is provided by East Asia where the sum of the upper and lower percentage differences increases at first and then decreases again, remaining higher in 1990 than in 1985. It is the only area in which the upper percentage difference increases over the period. The decrease in the lower percentage difference is not sufficient to offset the increase in the upper percentage difference.

Chart 9.1 PERCENTAGE DIFFERENCES OF UPPER AND LOWER LIMITS OF FOOD AID REQUIREMENTS FROM BASIC TREND ESTIMATES FOR REGIONS AND SUB-REGIONS
(Trend based on Method 5B, For all years: 1985 through 1990)



APPENDIX - METHODOLOGICAL NOTE

BASIC EQUATION

Food Aid Needs (1985-1990) = Total Domestic Use (major staples) - Domestic Production (major staples) - Commercial Imports (cereals).

Total Domestic Use: Projections acquired from Leonardo Paulino of the Trends Program at IFPRI.

Domestic Production: Projections made from past production (1966-80).

Commercial Imports: Different measures are used in different methods. The basic figures are taken from FAO Trade Yearbooks (different issues) and Food Aid in Figures (FAO, 1984).

METHOD 1A

Food Aid Needs = Total Domestic Use - Domestic Production - Net Commercial Imports.

Net Commercial Imports = 1977-82 Average (Imports - Exports - Food Aid).

This measure of commercial imports remains constant for all future years (1985-1990).

METHOD 1B

Food Aid Needs = Total Domestic Use - Domestic Production - Gross Commercial Imports.

Gross Commercial Imports = 1977-82 Average (Imports - Food Aid).

This measure of commercial imports remains constant for all future years (1985-1990).

METHOD 2A

Same as Method 1A, except that

Net Commercial Imports = 1972-1977 Average (Imports - Exports - Food Aid).

METHOD 2B

Same as Method 1B, except that

Gross Commercial Imports = 1972-1977 Average (Imports - Food Aid).

METHOD 3A

Same as Method 1A, except that

Net Commercial Imports = Maximum (Average used in 1A, Average used in 2A).

METHOD 3B

Same as Method 1B, except that

Net Commercial Imports = Maximum (Average used in 1B, Average used in 2B).

DEFINITIONS PERTINENT TO METHODS 4A-5B

GNP/NGR = Growth Rate of Per Capita GNP

GNPGR = Growth Rate of Aggregate GNP

n = Number of years from end year of base period, 1982.

It is assumed that past per capita GNP growth rates will continue into the future. Per capita GNP growth rates are adjusted on the basis of a general constraint -- maximum = 6.0 percent, minimum = 0.5 percent -- and with consideration for particularly disturbed conditions in some countries.

Growth rates of aggregate GNP are approximated by summing the adjusted growth rates of per capita GNP with projected population growth rates. The population growth rates are average annual growth rates for the period 1982-1990, based on UN 1983 Assessment figures (medium variant).

M.T. - MEDIUM TERM

Used with reference to aggregate GNP and per capita GNP growth rates derived from figures taken from the World Bank Atlas (different issues). Most of the figures are drawn from the World Bank Atlas, 1985. Where figures were not available in the 1985 issue, they were

drawn from earlier issues. Most of the rates from the 1985 issue are based on the period 1973-1982.

L.T. - LONG TERM

Used with reference to aggregate GNP and per capita GNP growth rates derived from figures taken from the World Development Report (different issues). Most of the figures are drawn from the World Development Report, 1985. Where figures were not available in the 1985 issue, they were drawn from earlier issues. Most of the rates from the 1985 issue are based on the period 1965-1983.

EXPROP = Proportion of cereal exports to total staple production, over the period 1977-1982 = (1977-82 Cereal Exports)/(1977-82 Domestic Production).

METHOD 4A

Food Aid Needs = Total Domestic Use - Domestic Production + (Domestic Production * EXPROP) - (1972-82 Gross Commercial Imports * $(1 + \text{M.T.GNPGR})^n$)

METHOD 4B

Food Aid Needs = Total Domestic Use - Domestic Production + (Domestic Production * EXPROP) - (1977-82 Gross Commercial Imports * $(1 + \text{L.T.GNPGR})^n$)

METHOD 5A

Food Aid Needs = Total Domestic Use - Domestic Production + (Domestic Production * EXPROP) - (1977-82 Gross Commercial Imports * $(1 + M.T.GNP/NGR)^n$)

METHOD 5B

Food Aid Needs = Total Domestic Use - Domestic Production + (Domestic Production * EXPROP) - (1977-82 Gross Commercial Imports * $(1 + L.T.GNP/NGR)^n$)

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