Global Food Balances and Individual Hunger: Three Themes in an Entitlements Based Approach*

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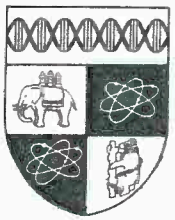

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1. Introduction

While there is considerable disagreement about the actual number of hungry people in the world today, there is almost universal agreement that the current situation is unacceptable. Too many individuals are subject to periodic reductions in their food intake - which leaves many dead - and even among those not subject to such transitory reductions, there is too low a level of average food intake. What is the role of global food balances in determining this pattern of individual hunger? The object of this paper is to introduce and elaborate upon three themes which emphasize the regional element in the link between global food balances and individual hunger in an entitlements based approach. The first of these themes is an extension of Sen's (1981) entitlements approach to hunger to the case of nation states in a global setting. The second theme is based around the nature of the world food market as an interlinked system of markets in internationally traded and non-traded food crops. The third and final theme emphasizes the essential and inherent conflict between net sellers and net buyers of food, in an international and national system of market based entitlements.

Sen (1981) has introduced us to the role of "entitlements" in determining the link between endowment and hunger. Alternative rules of social organization and exchange allow alternative linkages between endowment and command over food. In a market economy this link is simply the food purchasing power of the market value of the endowment at current prices. As Sen (1981) shows, individual hunger can occur at the same level of total food availability, if the market based entitlements change because of relative price changes. Viewing nation states as individual actors in a global setting, a similar entitlement based approach can be

applied to an analysis of global food balances and regional hunger. Hunger can occur in a country not only because of a decline in total world food availability, but also because of a drop in the value of goods the country has to sell in exchange for food. Although important to the hungry, food is only one part of the world economy, and the capacity of a nation to feed its hungry depends as much on developments in the non-food part of the world economy as on global food balances.

Returning to food, let us consider the impact of global food balances on hunger. In principle of course there need be no direct connection. If the world food market was segmented, with very little in the way of flows between the different sub-markets, then the total supply of food in the world could remain the same with individual sub-markets moving up and down. If the decline in supply occurred in markets where hunger was not a problem at all, then world hunger would not be affected significantly. At the other extreme, if the world market in food was essentially unified, then changes in the world supply or demand would feed through to price in every region of the world and affect hunger, unless counteracting measures were taken. In fact, the actual picture is somewhere in between these two extremes. Some food crops, like wheat, are traded goods in the world market and, despite various types of government intervention, changes in supply and demand do feed through to "the world price." Other food crops, like many root crops in Africa, are essentially non-traded so that supply and demand have to be looked at market by market. The situation is further complicated by the fact that the traded and non-traded crops are often substitutes in production and/or consumption, so that changes in the price of one do feed through to changes in the price of the other. The link between global food balances

and individual hunger is thus mediated by internationally traded and non-traded food crops, and any analysis of the problem should take these into account.

It is a fact of economic life that a change in the price of a commodity affects net buyers and net sellers in diametrically opposite ways. Thus an increase in the price of food, ceteris paribus, benefits net sellers of food at the expense of net buyers. A decrease in the price of food benefits net buyers at the expense of net sellers. But the hungry of the world consist of both net sellers and net buyers of food. Added to this is the complication that many of the net buyers of food rely on net sellers of food for employment. The relationship between the price of food and hunger is thus not as simple as it may seem. It is not clear that a secular decline in the world price of food will necessarily benefit all of the hungry in the world - or even most of them. What is certain is that in a system of market based entitlements it will disadvantage some of them, unless compensating measures are taken.

The plan of this paper is as follows. Section 2 of the paper begins the analysis with a review of current estimates and projections both of global food balances and of global hunger. Sections 3, 4 and 5 take up each of the three themes of this paper - nation states in a global setting, traded versus non-traded food crops and conflicts between net buyers and net sellers - in turn. Section 6 concludes the paper with a summary of the main policy implications, and a discussion of the pressing needs for further research.

2. Global Food Balances and Global Hunger

As a prelude to an analysis of the links between food balances at the global level and hunger, we will review the current evidence on food balances and on the extent of hunger in the world. Both areas of investigation are bedeviled by data problems and by conceptual problems. On the food balances side, there is the question of an appropriate framework for projection and the quality of the data base. On hunger, there is the question of the appropriate definition of minimal food requirements. We will deal with each of these in turn.

2.1 Global Food Balances

There are two major sources of data on food supplies at the world level: the Food and Agriculture Organization of the United Nations (FAO), and the United States Department of Agriculture (USDA). As documented by Paulino and Tseng (1980), there are significant differences in the coverage and collection of these data, and significant differences in the actual estimates of area under production, total output and trade for different crops. The country coverage of the two sources is different (USDA reports on fewer countries than FAO), as is the reference time period. It should be clear how the latter can give rise to major differences in estimates of output, particularly during periods in which production fluctuates dramatically or when a sharp shift occurs in trend. Paulino and Tseng (1980) carry out a comparison of production and trade data from the two sources for the years 1965, 1970 and 1975 and conclude that "as the major sources of international agricultural statistics, FAO and USDA should undertake more joint efforts to reconcile their data."

Paulino and Tseng's analysis is for production and trade a decade ago. To see if their suggestion was indeed taken up and reflected in the data, let us consider Tables 1 and 2, which present production and trade figures, for wheat and rice, for the latest year available. From Table 1 it can be seen that discrepancies in production figures are large for the largest producers. In comparison with USDA figures, FAO figures overstate production by 7 percent for the U.S. and for China, 8 percent for Argentina, and an extraordinary 32 percent for France. Similarly, FAO figures understate production by 12 percent for Brazil and 21 percent for Canada. In fact, the only country for which the discrepancy is under 5 percent is the Soviet Union. On the trade side, FAO figures overstate U.S. exports by 14 percent and French exports by 17 percent, while Soviet imports are overstated by over 26 percent.

The picture for rice is similar, but the discrepancies are lower. The production discrepancy for China, by far the world's largest producer, is 7 percent, and the large discrepancies are for the smaller producers - FAO figures understate Iraq's production by 52 percent. On the trade side, FAO figures overstate exports of the biggest exporter (Thailand) by 24 percent, and understate the exports of the second biggest exporter (U.S.) by 5 percent. The imports of Indonesia are understated by an enormous 64 percent, while the imports of Nigeria are understated by 35 percent. In fact, the discrepancies are such as to alter even the rankings of the countries by volume of imports: Indonesia, Nigeria, Iran, Saudi Arabia and Iraq according to USDA; Iran, Saudi Arabia, Iraq, Nigeria and Indonesia according to FAO.

The overall conclusion must be that major discrepances remain between FAO and USDA data. It should be clear that without further

detailed work we cannot pronounce on which of the two data sets are "better" - the answer will probably be country specific. Such an agnostic conclusion is also reached by Paulino and Tseng. Bearing in mind these data problems, let us now consider different estimates and projections of food supplies per capita. A number of these estimates and projections are available, but we focus on three studies: (i) FAO's "Agriculture: Toward 2000", (ii) "The Global 2000 Report to the President," see Barney (1982) and (iii) the International Food Policy Research Institute (IFPRI) projections reported in Mellor and Johnston (1984). The most pessimistic of these is the report by Barney (1982), which sees demand outstripping supply over the years to the end of the century, and food prices rising dramatically. However, Johnson (1983) takes this report to task for making claims unsubstantiated by historical trends. Thus, for example, the study projects an increase in food prices at the rate of 2.25 percent per annum, when in actuality the trend price of food has remained constant or even declined slightly.

The projections reported by Mellor and Johnston (1984), which are based on a series of studies by the International Food Policy Research Institute (see IFPRI, 1977), rely on extrapolations of trends between 1961-1977. For the world as a whole during this period, staple food production stayed comfortably above population growth rate, so that per capita world food availability increased. However, there were substantial regional differences, with sub-Saharan Africa showing a dramatic gap of 15% between production growth and population growth. On the other hand, developed countries as a whole expanded their production more than two and a half times as fast as population growth rates (see Mellor and Johnston, 1984). It is not surprising, then, that the developed coun-

tries became net exporters of food staples and the developing countries became net importers of food staples, a state of affairs which is projected to intensify in the last two decades of this century.

The FAO's "Agriculture: Toward 2000" paints a similar picture, of gradually increasing per capita food supplies at the global level, with growing imports by developing countries and growing exports by developed countries. While expressing satisfaction with the overall trend in supplies, both the FAO and Mellor and Johnston (1984) express concern about growing imports by developing countries. It is not clear why this should cause concern, since the overall trend in supplies must mean lower prices in an integrated world market, unless the worry is that developing countries will not have enough foreign exchange either to sustain this trend level of imports or to insulate food consumption against periodic fluctuations. This latter issue will be taken up in Section 3.

2.2 Global Hunger

How many hungry people are there in the world? The answers to this question are many and varied. On the one hand we have the skepticism of Poleman (1983), that the question is unanswerable:

"Let me make clear at the outset that there is no way to specify with certainty the extent of world hunger."

On the other hand, we have the well known estimates of Reutlinger and Selowski (1976):

"Based on average calorie consumption data in the mid-1960's, it is estimated that 56 percent of the population in developing countries (some 840 million people) had calorie-deficient diets in excess of 250 calories

a day. Another 19 percent (some 290 million people) had deficits of less than 250 calories a day."

A recent World Bank (1985) estimate, based on the Reutlinger-Selowsky methodology, brings the figures up to date:

"In 1980, probably somewhere between 340 million and 730 million people in the developing countries (excluding China) did not have incomes which allowed them to obtain sufficient calories from their diet. The estimate of 340 million is based on a calorie requirement standard that would prevent serious health risks and stunted growth in children. If the standard is enough calories for an active working life, however, the estimate of those with chronically deficient diets rises to 730 million."

The Reutlinger-Selowsky methodology for estimating the numbers of the hungry involves several stages, each of which can be criticized. The first stage is the establishment of energy requirement standards. This they do by taking the FAO/WHO standards (see FAO, 1973), which are based on intake required for normal energy expenditure and for normal growth, and which are country specific to take account of demographic differences. The second stage is the estimation of a relationship between energy in the daily diet and income. The third stage is the estimation of income distribution in the year in question. The fourth and final stage is to read off, from the income distribution, the numbers with income below that level which, given the energy-income relationship, could not provide the minimum specified requirement of calories. Let us take each one of these stages in turn.

Poleman (1983) has criticized the minimum requirement standards used by Reutlinger and Selowsky (1976) as being too high, based as they were

on FAO/WHO standards. The World Bank (1985) study meets this criticism by setting the standard at either 90% of the FAO/WHO requirement, or at 80% of this requirement. Table 3 below reproduces their results at a regional level of disaggregation. As can be seen, overall the figures are lower than in Reutlinger-Selowsky (1976), and this is partly due to the lower standards used. What is interesting, however, is that the ranking of regions remains largely unchanged, in terms of percent of population hungry, when the different requirement levels are considered. Sub-Saharan African and South Asia change rankings, suggesting that extreme hunger is more of a problem in the former, but otherwise the relative positions remain unchanged. In terms of policy guidance as to which of the regions should be favored relative to the others, the use of different cut-offs makes only a small difference. A similar picture is seen when changes between 1970 and 1980 are considered. Table 4 shows that the rankings as between the five regions remain largely unchanged, except that Sub-Saharan Africa and South Asia change places as before. With the lower requirement, developments in Sub-Saharan Africa look worse.

Srinivasan (1981, 1983) has become a persistent critic of another aspect of the Reutlinger-Selowsky method, namely, the fact that the FAO/WHO requirements are average norms:

"Even if the energy requirements of a randomly chosen man from a population of reference men is a fixed number, since the published norms are the average norms of the individuals in the population, it is obvious that half of the population of healthy reference men will have intakes (which equal their requirements, since they are healthy) below the average." (Srinivasan, 1983; emphasis in original)

Such a criticism applies equally well to studies by Dandekar and Rath (1971), FAO (1977), Altimir (1982) and others. Given the lack of information on requirements by individuals, the use of average norms is something we may have to live with. Kakwani (1986) provides some estimates of how far wrong we can go in using such average norms. But there is a further point, of adjustment of individuals to low intake, which leads Srinivasan to argue against the notion of a nutritional "requirement" for individuals. The key question here is the time frame, and the severity of the adjustment. It is perhaps true that a slow and prolonged change in economic and dietary conditions will lead the body to adapt. But if such adaptation takes place relatively slowly - say over a period of decades - we still have to take into account the discomfort of prolonged hunger at a low level, or the short sharp shock of a famine. The body clearly cannot adapt fast enough to avoid death by starvation. Surely in such a case the notion of a minimum requirement makes sense - however low that standard is set. Difficulties in drawing a line based on nutritional standards should not engender a nihilistic attitude. A line has to be drawn, and sensitivity analysis should be carried out in testing how crucial the actual cut-off is for policy recommendations.

Of course, it goes without saying that discussion of poverty requires a cut-off - whether based on nutritional or other criteria. Indeed Sen (1981) codifies this requirement in his "focus axiom." Having rejected energy requirement as a basis for analysis of hunger and poverty, Srinivasan (1983) turns to what he terms a "pragmatic approach," as illustrated for India:

"It would appear that in rural areas a <u>sustained</u> decline in the share of food in total expenditure and the share of starchy staples in

calorie intake starts from a per capita monthly expenditure of 43 rupees (Rs.). In urban areas, the corresponding figure is Rs. 34. Interestingly, the rural cutoff point of Rs. 43 per capita per month happens to equal the official poverty expenditure of Rs. 15 per capita per month at 1960-61 prices - a poverty line that has gained authority through its use in several studies of rural poverty in India (Ahluwalia, 1978; Srinivasan and Bardhan, 1974). This pragmatic approach leads to classifying around 42 percent of rural households and a little over 9 percent of urban households as having inadequate food intakes to some degree. To avoid any misunderstanding, it should be emphasized that one should not infer that these proportions represent households whose members are malnourished in a clinical or biomedical sense. Inadequacy of food intake in this approach is as perceived by the household and reflected in its consumption pattern. In any case, almost by definition, inadequacy of food intake is associated with poverty." (emphasis in the original)

It is not clear what guidelines emerge from the above argument. Should the cut-off be chosen on the basis of the food consumption pattern, or on the basis of a poverty line that has gained authority (this latter line may itself have been defined with reference to some nutritional norms)? What happens if the authoritative line and the consumption pattern line conflict? The example illustrates the fact that the same cut-off can be justified on different grounds. There is an identification problem here - there clearly exists a fixed average energy requirement along FAO/WHO lines which would give the same number of people below the cutoff as Srinivasan's pragmatic line. Thus, while accepting his strictures against a precise, "pseudo-scientific," definition of hunger, it seems that the best defense is still to do sensitivity-

analysis using a range of cut-offs - some of which could be based on the FAO/WHO guidelines. Atkinson (1985) and Foster and Shorrocks (1985) have already made a start on the theory of rankings using a range of poverty lines.

The second stage of the Reutlinger-Selowsky methodology, the determination of a calorie consumption-income relationship, can be equally criticized for imposing an average relationship on the population in identifying those who fall below the cut-off. Given enough detailed information we can directly calculate the calorie intake of each household, and will not need the relationship to income. But in the absence of such information, at least for some countries, it is difficult to see an alternative to the Reutlinger-Selowsky method. The best we can do is to get an idea of the bias that can arise. The third stage of the calculation involves equally heroic assumptions regarding income distribution. In World Bank (1985), income distribution data were used directly for 35 countries. For these, the Reutlinger-Selowsky method is to apply the Kakwani-Podder (1976) technique of fitting a Lorenz Curve to available survey data. For the remaining countries, the percentages of population below the minimum requirement were extrapolated by first regressing this variable on per capita energy in diet and per capita energy requirement for the 35 countries, and then using this regression to arrive at the percentage of population below the requirement for other countries. There are clearly problems with such extrapolation and it may well be that these problems dominate the conceptual critique of average norms for calorie intake.

While the estimates of Reutlinger and Selowsky (1976) and The World Bank (1985) can be criticized on a number of grounds, it is not clear

how, given the information we have, they can be substantially bettered. Closer attention to econometric detail and procedure would help, as would an indication of the biases the method might entail under different statistical specifications. However, if we are in the game of linking global food balances and global hunger then per force we have to project food balances and hunger at the global level. The criticisms leveled against current methods should indicate caution rather than nihilism.

3. Nation States in a Global Setting: An Extension of the Entitlements Approach

Sen (1981) has introduced us to the simple yet powerful idea that hunger is caused not necessarily by there not being enough food to eat; it may also be caused by the fact that the existing social and economic conditions and institutions may not give an entitlement to an adequate amount of food:

"The entitlement approach to starvation and famines concentrates on the ability of people to command food through the legal means available in the society, including the use of production possibilities, trade opportunities, entitlements vis-a-vis the state, and other methods of acquiring food. A person starves either because he does not have the ability to command enough food, or because he does not use this ability to avoid starvation. The entitlement approach concentrates on the former, ignoring the latter possibility. Furthermore, it concentrates on those means of commanding food that are legitimized by the legal system in operation in that society. While it is an approach of some generality, it makes no attempt to include all possible influences that can in

principle cause starvation, for example illegal transfers (e.g. looting), and choice failures (e.g. owing to inflexible food habits)."

While in a subsistence economy entitlement to food is given by what one grows and by what one perhaps has customary rights over, and in a market economy it is given by what one can acquire through trade and exchange of one's endowments, in a mixed economy food entitlements depend both on market based exchange and on entitlements society has created through various means of social security. In most developing countries, the government can and does influence both market based entitlements, and direct entitlements to food. It is not surprising, therefore, that a major determinant of individuals' access to food in a national setting is their government's access to food in an international setting.

The entitlements approach to the relationship between a government and individuals in the country can be extended to nation states in a global setting. If we characterize each nation as having a certain "food requirement," we can consider how each government can set about meeting this requirement from the international market. What are a nation state's food entitlements? There are two main forms of entitlements under the current institutional setting. Firstly, the country can purchase food on international markets. Global food balances are clearly relevant here. If growth in world supply lags behind world demand, there will be a general increase in the price of food and, ceteris paribus, a decline in the country's food entitlement. However, the value of what a country sells in order to purchase food is also important. Secondly, the country may have access to food on concessional terms - the various food aid provisions relate to this.

Given the value of its "endowment" on world markets - essentially the foreign exchange that it can earn by selling other, non-food, goods to the world - the country's access to food is determined by the international price of food and by the extent of food aid available. A decline in its endowment value, an increase in the world price of food or a decrease in food aid will increase the degree of food deprivation in the country if internal policy is unchanged. This tells us why forecasts of a static or declining trend in the world food price do not offer grounds for complacency. Many developing countries are facing severe declines in the value of the goods they can sell abroad, compounded by the tightness of borrowing conditions on world markets. Food aid is tied up to surplus disposal in developed countries, and there are pressures (budgetary or otherwise) to reduce farm surpluses in these countries. Such a reduction would at the same reduce appropriations available for food aid shipments, and reduce market supplies - thereby leading to an increase in world price. On the demand side, the growing prosperity of middle-income developing countries increases effective demand - which increases the temptation among developed countries to sell their stocks at market prices rather than supply at concessionary prices, and also generally tightens the market for food at the international level. This increases the burden on the poorest of the poor.

The gap between a country's entitlements and its requirements will eventually be translated into hunger for at least some of its citizens. However, this calculation can be turned on its head and we can estimate what the entitlements will have to be to meet the requirements. This is the basic approach followed, although with some differences, by USDA

(1982, 1983), IFPRI (1983) and FAO (1983a) in forecasting food aid requirements of developing countries.

The USDA analysis is short term in nature and provides estimates of food aid requirements for the coming season by forecasting import requirements and the ability to import. Import requirements are derived as the difference between food production and the aggregate food consumption which would (i) meet recent per capita calorie intake or (ii) meet the FAO/WHO nutritional standards for the population as a whole. Not surprisingly, the latter method gives a higher figure for consumption requirement. Given the import requirement, the next step is to ascertain how much the country could import to meet the gap. This is a difficult calculation not only because the foreign exchange earnings of a country have to be forecast, but also because the proportion of this allocated to food imports is a policy choice variable. USDA assume that to be a fixed ratio, based on the recent experience. In 1983/84, for a total of 67 countries, the higher estimate of cereal import requirements was 48.5 million tons of which the food aid requirement was estimated to be 33 million tons.

IFPRI (1983), while recognizing the importance of foreign exchange availability in meeting food import requirements, simply assumed a figure of 2 percent (and 5 percent) as the fraction of export earnings that would be allocated to cereal imports. On this basis, their forecast of food aid requirements in 1990 for 57 countries came to 35.4 million tons if the objective was to meet the FAO/WHO standard. The differences between the IFPRI and USDA findings lie not only in different country coverage and the different time periods considered, but also in the method of calculating foreign exchange available for cereal imports.

FAO (1983a) further criticized both of these studies in not disaggregating between different categories of food aid: project aid, non-project aid and emergency aid. However, it did not provide an alternative methodology for assessing project aid requirements (but see WFP (1979).

In the FAO (1983a) study, the non-project aid requirement was estimated essentially along the USDA/IFPRI lines. But an "effective demand" approach was taken in deriving consumption requirements - translating projections of private consumption expenditure into demand for food using elasticities estimated from household expenditure surveys. (While this may seem to be different from using the FAO/WHO minimum standard, in some cases "account was taken of known targets of national development plans in developing countries," which may of course reflect the minimum standard). A similar market orientation is seen in their calculation of commercial cereal imports - this was done by estimating elasticities of commercial cereal import demand with respect to export earnings for 1970 to 1981. On this basis the cereals food aid requirement in 1985, for 111 countries, was estimated to be 14.2 million tons. The major reason for the large difference between the FAO estimates on the one hand and the USDA and IFPRI estimates on the other are of course that FAO uses "effective demand" as the basis of consumption requirement while USDA and IFPRI have used "minimum nutritional standard" requirement. When IFPRI used the effective demand method, their forecast of food aid requirement came to 16.6 million tons in 1990.

To these studies we should add the projections in World Bank (1985). For seven countries (Bangladesh, Burkina Faso, Ethiopia, Mali, Nepal, Tanzania and Uganda) for which even equal distribution of per capita energy intake would be insufficient to satisfy 90% of FAO/WHO

requirements, this study forecast cereal imports on the basis of meeting the FAO/WHO requirements in full. These imports were compared to projected export earnings in 1990, and the ratios ranged from 0.19 to Burkina Faso, through 0.86 for Ethiopia and 1.27 for Bangladesh. In other words, Bangladesh cannot, in the foreseeable future, meet its food requirements on the basis of market forces. Even if one revises the standard downwards dramatically, allowing for inequality of food consumption will tend to restore these high figures. Added to this is the fact that food production has been assumed to grow in these countries at the optimistic rate of 3 percent per annum.

However, projections for 31 other countries reveal a less pessimistic future. For these countries required food imports are projected to be less than 10 percent of export earnings. The crucial factors explaining this difference are (i) lower population growth and (ii) better prospects for export earnings. These comparisons highlight the strong regional/national element in the link between global food balances and hunger. The current precarious balance at the global level does <u>not</u> mean an even handed distribution of hunger across the developing world. Some countries can afford to pay for their food, others cannot. For these countries, market based entitlements can only lead to greater hunger. If the trend value of their "endowments" - the goods they sell - is not to be improved, then their only other entitlement to food is on a non-market, concessionary basis. This must be one of the strongest arguments for maintaining and expanding current levels of food aid commitments by the rich countries.

Alongside the trend movements of market and non-market entitlements, we also see, from time to time, sharp fluctuations in global economic

conditions and hence in these entitlements. What is important to realize is that a sharp drop in food entitlements can occur not necessarily because of developments in the food market, but by developments in the non-food markets as well. Sharp declines in the value of non-food exports can equally well cause starvation in a country - this is the central message of the entitlements approach. FAO (1983a), calculated emergency food aid requirements by stipulating a shortfall of cereal production below trend which would be classed as an emergency and hence be eligible for emergency food aid. The critical shortfall specified varied from 10 percent for middle income countries and 5 percent for low-income countries. These were then applied to the 12 year period 1970 to 1981 and an annual average of emergency requirements in this period was calculated. Table 5 reproduces the FAO results. The 3 million tons of cereals required, on average every year, is to be added to the 14.2 million tons for trend food aid. As can be seen, there is once again considerable regional variation in both the absolute level of emergency aid requirements, and its relation to non-emergency aid requirements.

The most striking feature of the FAO (1983a) calculation of emergency aid, at least from the point of view of the entitlements approach, is its narrow focus on variations in food supplies. This is particularly surprising given that the trend calculations of food aid do go beyond this and take into account the capacity of the country to purchase food. A similar concentration on the food import bill is to be found in WFC/FAO (1973), which argues for special balance of payments support to finance temporary increases in the food import bill. But exactly the same situation can arise with fluctuations in prices of export commodities and hence export earnings. Given current capital market constraints,

temporary shortfalls in export earnings are bound to be reflected in reduced food imports by the poorest developing countries. Simple as it is, this insight of the entitlements approach sheds new light on international commodity price stabilization schemes. These have been criticized by Newbery and Stiglitz (1981) - but see Kanbur (1984, 1986b) - as being inefficient ways of improving consumer and producer welfare. The food security view would be one line of argument against their conclusions. More generally, equal attention must be paid to export prospects in the battery of indicators that FAO (1983b) suggests as signals of acute and large-scale food shortages, and as part of its global early warning system.

4. Traded and Non-Traded Food Crops

In a world without government intervention, the pattern of transport costs and comparative advantage would determine which commodities were traded across national boundaries and which were not. The significance of this distinction between traded and non-traded goods lies in the implications of global food balances for regional hunger. If the market for a particular food crop were integrated on a world wide level, so that it was a traded good for all countries, then it would have a single world price which responded to the global food balance. To the extent that the world market was segmented at the regional and national levels, the extreme of which is that the food crop was a non-traded good for each country, then there would be an array of prices responding to the regional or national food balance, with the global picture having little or no effect.

Government intervention alters this neat distinction between "naturally" traded and non-traded goods. Whether such intervention is optimal or not can be analysed using standard welfare economics. For a small open economy which takes world prices as given and which has competitive markets in those goods which are not "naturally" traded, we know that free trade will achieve a Pareto efficient outcome in a world of certainty. However, it is well known that in a second best world, where some markets do not satisfy the competitive requirements, intervention in the form of trade taxes which reduce trade may well be optimal. Intervention may also be optimal if the government cares about distribution but does not have the lump sum instruments to alter the distribution in a non-distortionary manner. The same arguments hold in a world of uncertainty where individuals do not have access to insurance markets. In such situations governments can, and do, insulate domestic food markets from global changes for commodities which are "traded." They do this by interventions which divorce domestic supplies from international supply conditions - by discouraging exports in a period of global shortage and high prices, to maintain domestic supplies and low domestic prices, or by discouraging cheap imports in a period of global excess supply and low prices, to protect the incomes of farmers. The presence of a government also means that effectively there is no such thing as a non-traded good - imports or exports of the good can always be subsidized and encouraged. The cost of turning a non-traded good into a traded good, and vice versa, is borne by the exchequer, and it is the budgetary costs of food intervention that has been causing concern during the last decade (see, for example, Scobie, 1983). In a world where national governments pursue active policies designed to protect national food intake, global

conditions affect not necessarily the consumption of the poor, but the budget of governments - which then have to make adjustments in other parts of the economy to compensate (e.g. cutting down on public investments).

Table 6 presents figures for net exports (including processed trade) as a percentage of domestic production for selected commodities and countries. The figures are 1979-81 averages taken from the FAO's Food Balance Sheets. Six cereal crops and four root crops are chosen, and five countries each from Asia, Latin America and Africa have been selected. A * indicates that total domestic supply was less than 500 metric tons i.e. that the commodity is basically irrelevant to the country under consideration. As can be seen, the fewest *'s appear among the cereal crops while most appear among root crops. However, what is also interesting is how many zeros appear in the root crop columns - a zero indicates significant domestic production but no exports or imports. Out of the sixty possible cells in the root crop categories, there are fourteen *'s, and of the remaining forty-six cells no fewer than twenty-two have zeros. Out of the ninety cells in the cereals categories, seven are *'s, and of the remaining eighty-three only seven have zeros.

Overall, out of the one hundred and twenty-nine significant cells, twenty-nine (i.e. around 20%) are non-traded in the sense that they have significant domestic production but no exports or imports. If we extend the category to include not only zeros but absolute values of less than 1, then the percentage of non-traded significant cells rises to 70% among root crops, 19% among cereals, and 37% overall.

Table 6 is a first attempt at providing a breakdown of food crops by country according to the traded/non-traded category. It shows that, if

we take the broader definition of "non-traded," then around two-fifths of the commodity/country cells in Table 6 represent non-traded goods. Of course, there are problems with this representation. The cells are not weighted in any sense. It would, for example, be interesting to compute what fraction of a nation's total calorie intake was accounted for by non-traded goods. The last column in Table 6 does just this. It calculates the total calories provided by the cells with a net exports to production ratio of less than one percent and takes this as a ratio of total calorie supply. It can be seen that there is considerable variation across countries. The Latin American countries all have dependence on non-traded food of less than 10 percent, while the four sub-Saharan African countries (Nigeria, Tanzania, Kenya and Senegal) have a large dependence on non-traded food and this is largely due to their dependence on root crops. In Asia the picture for any country is influenced greatly by rice. China depends for a large fraction of its calories on rice which is non-traded. Using our criterion, India and Bangladesh are just on the boundary of having rice classified as a non-traded commodity. If rice was included in this category for these commodities, they would show substantial non-traded food dependence for calories.

There is of course the problem that, in using the extended definition of 'non-traded,' we have neglected the fact that a very small level of exports or imports could still be consistent with domestic prices being determined internationally and hence by global balances in that food crop. This leads us to the observation that the natural test for non-tradedness is the relative independence of domestic price from international price. Policy interventions notwithstanding, the collection and analysis of such data would enhance our appreciation of the extent

to which calorie intake - particularly of the poor - was vulnerable to global balances even after allowing for non-traded foods.

Despite these caveats, Table 6 does represent a start in formulating the implications of the traded/non-traded distinction for the links between global food balances and regional hunger. Wheat is seen as being largely a traded food crop for the fifteen countries considered (representing the bulk of the developing world's population). Root crops are predominantly non-traded, while cereals like millet show a mixed picture. In the absence of policy intervention, changes in the global balances of wheat would feed through fairly quickly into domestic price changes for all of these countries. Put another way, if there was to be policy intervention to insulate the domestic price of wheat, the budgetary consequences for developing country governments of a change in the global balance would be significant. However, changes in the global balance of root crop production and consumption would not feed through directly to the regional or national level. A substantial part of the calorie supply in sub-Saharan countries is thus insulated from direct effects of global food supply conditions.

However, this is not to say that indirect linkages between traded and non-traded food crops do not exist. If the food crops are substitutes in consumption (which they are at the national level) and/or substitutes in production, then global changes in traded good conditions can feed through to the non-traded sector. Such interlinkages are explored by Braverman and Hammer (1984) in their "multi-market" approach to agricultural pricing (see Bravèrman and Kanbur (1985), for an analysis of the implications of such linkages for shadow pricing of agricultural projects). Let us take the case of Senegal, shown in Table 6 and also

considered by Braverman and Hammer (1984). As is seen from the table, Senegal is an importer of rice, but millet is largely domestically produced and consumed. In fact, from the Senegal table in FAO (1984) it is clear that out of the total calorie supply in Senegal of 2,346 calories per capita per day, 624 calories came from rice and 605 from millet. An increase in the world price of rice, if not counteracted by policy, will feed through to the domestic price of rice in Senegal. However, rice and millet are substitutes in consumption. Thus there will be significant shift of demand into millet consumption and the price of millet will rise. This will encourage extra production of millet till a new equilibrium is established with a higher price of millet than ruled previously. Thus the increase in world price of rice (brought about by changes in global balances in this food crop) has fed through to the price of a commodity which is not traded on world markets, but which is nevertheless as important as rice in the calorie supply of Senegal. Under specific conditions, in particular countries, there could be further chain effects of commodities that were, for example, substitutes in production for millet. Any analysis of the implications of global food balances for regional, national and individual hunger that does not take into account the disaggregation between traded and non-traded goods could, therefore, turn out to be seriously misleading.

5. Food Prices and Conflicts: Net Sellers versus Net Buyers

What would be the consequences of lower food prices as the result of a change in global food balances? We will look at this question first of all from the point of view of poverty, and then from the point of view of hunger. It is sometimes argued that lower food prices would be good for

the poor, and the argument does make some sense. But it should be obvious that this line of argument focuses solely on net buyers of food and ignores net sellers. It is a characteristic feature of market based entitlements that it gives net sellers and net buyers of a commodity diametrically opposed interests. Any decrease in the price of a commodity benefits net buyers of the commodity. But it must, ceteris paribus, hurt net sellers. At the national level, it should be clear from Tables 1 and 2 that Argentina and Brazil would have very different views about the price of wheat, and that Thailand and Nigeria would have opposed interests with regard to the price of rice. The relationship of global balances to the conflicting interests of selling and buying nations translates itself into the relationship of national balances to the conflicting interests of net sellers and net buyers of food within a country. The argument that high food prices at the national level might actually help the poor has some support in the African context where net food sellers are typically smallholders in the rural sector, while net food buyers are mainly urban sector dwellers.

One way of formulating and quantifying this conflict is to consider explicitly the effect on a poverty index of a change in the price of a particular food commodity. This is done in Besley and Kanbur (1986), using the Foster, Greer and Thorbecke (1984) measure of poverty defined on the equivalent income of net sellers and net purchasers. If f(y) is the frequency density of "income" y and the poverty line is z, then the FGT measure is:

$$P_\alpha = \int_y^z \left(\frac{z-y}{z}\right)^\alpha f(y)dy$$

where $\underline{y}$ is the lowest value of y and α is a parameter which defines members of this class of measures. The measure is essentially a summation of normalized poverty gaps $(z-y)/z$, each raised to the power α. When $\alpha=0$ the measure becomes the head count ratio; when $\alpha=1$ it is simply the normalized poverty gap; and when α is greater than one the measure is "transfer sensitive" to the appropriate order (see Foster, Greer and Thorbecke, 1984). From our point of view the usefulness of this measure lies in the fact that it is decomposable across population subgroups. Thus if the population can be divided into 2 mutually exclusive and exhaustive subgroups of net sellers and net producers of food then we can write

$$P_\alpha = \lambda_1 P_{1,\alpha} + \lambda_2 P_{2,\alpha}$$

where λ_i is the proportion of population in group i ($\lambda_1 + \lambda_2 = 1$) and $P_{i,\alpha}$ is the P_α measure for group i alone. While there are other poverty measures in the literature (the most famous of which is the Sen (1976) measure), the usefulness of the FGT measure lies in its flexibility and its decomposability, which allows us to aggregate subgroup poverty effects up to the national level.

It is shown in Besley and Kanbur (1986) that the effect of a small change in the price of food, q, is given by:

$$\frac{dP_\alpha}{dq} = \lambda_1 \frac{\alpha}{z} \int_0^z \left(\frac{z-y}{z}\right)^{\alpha-1} x f_1 dy$$

$$+ \lambda_1 \frac{\alpha}{z} \int_0^z \left(\frac{z-y}{z}\right)^{\alpha-1} [-n] f_2 dy$$

where f_i is the frequency density of income in group i, x represents net consumption of different consumers and n the net supply of different producers. The two components of the expression reflect the conflicting forces in play. If $\alpha=1$, then:

$$\frac{dP_1}{dq} = \frac{1}{z} [\lambda_1 H_1 \bar{x}^P - \lambda_2 H_2 \bar{n}^P]$$

where H_i is the incidence of poverty in group i and $\bar{x}^P$ and $\bar{n}^P$ are mean net consumption of the poor and mean net supply of the poor. Ceteris paribus, the greater the incidence of poverty among net producers the more likely it is that poverty will increase when food is made cheaper.

The expressions derived above and in Kanbur (1985, 1986a) provide a way of quantifying the essential conflict between food producers and food consumers in a market based system of entitlements. The disaggregation can be as detailed as the data allow, and other effects can be modeled as well. It provides a method whereby income distribution data disaggregated by producer and consumer type can be used to follow through the impact of global balances on individual poverty, via the interventions of policy at the national level.

Binswanger and Quizon (1984) have built and simulated a general equilibrium model of the effects increasing food supplies in the Indian context. The results are summarized in World Bank (1985):

"An increase of wheat imports equal to 10 percent of the existing supply led to price declines in domestic foods: wheat went down 15 percent; rice 6 percent; and coarse grains 5 percent. There was also a 5 percent drop in wheat production and a slight increase in rice and coarse grains production. As a result, for the lowest quartile in the

urban population, real income and cereal consumption rose about 5 percent. For the lowest quartile of the rural population, the net effect on the real income and cereal consumption was also positive, though much less so. Significantly, the lower food prices more than compensated the poorest rural group for the drop in employment and wages. The second quartile in the rural population neither gained nor lost."

Although the Binswanger-Quizon (1984) exercise does not start from a change in global wheat balances, it should be clear that their analysis would be equally applicable in this case. In fact, one scenario which might allow an increase in wheat imports with a given government budget constraint is precisely a fall in world wheat prices as the results of a change in global balances. In any event, their argument illustrates the difference between the Asian context and the African one, because of the presence in the former of the large landless class in the rural area. These benefit directly from lower wheat prices, but suffer indirectly as the result of reduction of employment and wages in the wheat production sector. In an African context, with predominantly smallholder agriculture and a small landless rural class, the conclusions would be different. The Latin American case, with higher degrees of urbanization and substantial landless labor, would approximate the Asian case better.

We have so far concentrated on the effects of food prices on poverty. How is the analysis altered if our interest is in food deprivation rather than general poverty? In this case there seems to be a basic soundness to the view that lower food prices are good. Net buyers of food benefit in terms of their overall welfare and, if food is not a Giffen good, their consumption of food will increase. Even with net sellers, although a fall in the price of food reduces their overall

welfare since they can now buy less in exchange than they previously could, so long as food is a single commodity and is not a Giffen good they too will increase their consumption of food. If the focus is on food intake then clearly an improvement in global food balances which lowers the price of food is a good thing.

However, there are several ways in which this conventional wisdom may need to be modified. In the first instance many of the net buyers of food may depend on net sellers for employment. At the theoretical level, Drèze and Stern (1986) have argued that in a wide class of models the impact of a change in the price of a commodity on social welfare can be represented as the difference between the "distributional characteristic" of the commodity, which captures how society views the effects on different individuals, and the "index of fictitious discouragement", which essentially captures the general equilibrium feedback effects. In fact, in our earlier discussion we derived the distributional characteristic of food for the particular, poverty oriented, social welfare function we were using. As already seen, Binswanger and Quizon (1984) show that general equilibrium feedbacks are unlikely to overturn the first round effects. While the simulation analysis of Binswanger and Quizon, and the theoretical argument of Drèze and Stern, relates to welfare in general, it is clear that similar conclusions would follow for food deprivation in particular.

Intertemporal considerations may force further modifications to the conventional wisdom on low food prices and hunger. Recall that our objective is to trace through the implications of a change in global food balances which lower the price of food to a country which has no market power and takes this price as given. But if there are year to year

fluctuations in the output of individual peasants in this country a low price of food in a normal year will lower income and hence the ability to save enough to withstand a possible downturn in production next year. Even from the point of view of food deprivation, therefore, there appears to be a conflict between encouraging food consumption among poor net buyers through lower prices and increasing the income of net sellers sufficiently to allow them to build a cushion against food deprivation in drought years. The line of argument here is the same as the case where the commodity sold by net sellers is not the sole source of nutrition for them. Then a fall in the price of the food commodity they sell will reduce their income, which will feed through to lower consumption of other foods and hence lower nutritional intake on this account. Improved global food balances for particular commodities need not, therefore, improve the nutritional intake of all individuals.

There is another argument which we need to take into account. This is that high food prices are good because they encourage more food production and hence lower food prices in the future. It is clear that the argument relies on a general equilibrium feedback at the global level - it cannot apply to a price taking small open economy. Even at the global level, the argument must rely on high prices today enabling various production, technology and credit constraints to be overcome. But why will these constraints not reappear once the current expansion leads to lower prices in the future? We seem to have the making of a cycle here, and even if it is accurate as a description of global food balances, it seems unlikely that we can base the normative case in favour of high food prices on these arguments (which in any case depend on high food prices leading to low food prices!).

To conclude, then, an "improvement" in global food balances may well be a mixed blessing. At the national level, food exporters would lose out, and to the extent that the poor live in such regions and countries, their position is made more vulnerable. If the price effects of global changes are allowed to feed through to the economy, then again it is not clear that a food price decline is necessarily a good thing for all. Some are bound to lose, and at the very least policy makers should be aware of this fact and be able to quantify the extent of loss. The next step might be to target expenditures towards losers so as to compensate them for these losses. In fact, the price of food is one instrument for targeting the poor. While within the consuming group it is a good instrument because of Engel's law (see Besley and Kanbur, 1986), like all prices it has the property that it has opposite effects on producers and consumers. It follows that its efficacy will depend on the characteristics of these groups, and that its use as a targeting instrument should be conditioned by this information.

6. Conclusions and Further Research

The suggestions for further research follow directly from the main conclusions of this paper:

(i) Major data discrepancies still exist between USDA and FAO publications. In the absence of a program of reconciliation, which would in itself be a major task, one area of further research is appropriate sensitivity analysis on the effects of using the two data sources for global projections. However, the data problems do give support to those who would suggest a redirection of interest away from aggregate food supply

accounting towards more microeconomic variables such as the local price and the local wage in terms of food.

(ii) The much maligned nutrition based measures of poverty still have their uses. In particular, it is not clear what better alternatives exist, and insofar as all criteria are eventually translated into income and expenditure requirements so that the extent of food poverty can be read off from the income distribution, there exists an identification problem - different methods can give the same cutoff in income or expenditure space. In such a situation the appropriate procedure is to do sensitivity analysis using different cutoffs - it is a little premature to jettison the nutrition based analyses altogether.

(iii) The entitlements approach to food deprivation draws our attention to how much food an individual has entitlement to, from market or non-market sources. In the specification of market based food entitlements, one should look not only at the price of food being purchased, but at the price of commodities the individual has to sell. The entitlements approach can be fruitfully extended to the context of nation states in a global setting. An immediate, and obvious, implication is the importance of non-market based entitlements to food in preventing transitory food deprivation, and the availability of food aid is crucial for at least some countries even over the secular time horizon. A less obvious implication of the entitlements approach is that in constructing early warning systems of approaching food problems, it is as important to focus on the prices of non-food exports of a country. A sharp decline in the value of these can bring on food deprivation without any essential change in global food balances. The elaboration and implementation of this argument is an important area for further research.

(iv) At least for some countries, a significant portion of nutrition supply is accounted for by non-traded food crops i.e. crops whose domestic prices are not affected directly by global food balances. However, there can be significant indirect effects if (as is usually the case), various traded and non-traded food crops are substitutes in production and/or in consumption. Then the prices of basic staples, like root crops in Africa, can be influenced by global changes in the price of traded food crops. Further research could usefully focus on the quantification of these links.

(v) A fall in the price of food is a mixed blessing. In a system of market based entitlements, when the price of a commodity falls, net buyers gain and net sellers lose. The overall outcome in terms of aggregate poverty depends on how poverty is distributed between net food sellers and net food buyers. This is an empirical question, and demands further research. While recently suggested decomposable measures of poverty can help by providing a convenient framework of analysis, there is no substitute for a detailed investigation of the distribution of income disaggregated by producers and consumers of different types of food. Only then will we be able to forge a direct and quantifiable link between global food balances and hunger.

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Table 1

Wheat: Production and Trade[1], 1984[2]

Selected Countries

Countries	Production 1000 Metric Tons USDA	FAO	Net Exports (+) or Net Imports (-) 1000 Metric Tons USDA	FAO
United States	66,009	70,638	(+) 38,018	(+) 43,515
Canada	26,914	21,199	(+) 20,500	(+) 21,623
France	24,785	32,884	(+) 12,980	(+) 15,272
Australia	22,000	18,580	(+) 12,000	(+) 10,631
Argentina	12,000	13,000	(+) 9,500	(+) 7,406
Soviet Union	78,000	76,000	(-) 20,000	(-) 25,348
China	81,390	87,682	(-) 10,000	(-) 10,955
Egypt	1,996	1,815	(-) 6,800	(-) 7,034
Japan	695	741	(-) 5,300	(-) 5,643
Brazil	2,100	1,830	(-) 4,400	(-) 4,868

Notes: 1. Production refers to wheat only, while Trade refers to Wheat and Flour (in grain equivalent).

2. FAO data refer to the calendar year. USDA trade data refer to the 12 months following July 1, 1983. USDA production data refer to the season 1983/84.

Table 2

Rice: Production and Trade[1], 1984[2]

Selected Countries

Countries	Production 1000 Metric Tons USDA	FAO	Net Exports (+) or Net Imports (-) 1000 Metric Tons USDA	FAO
Thailand	18,000	19,200	(+) 3,700	(+) 4,619
United States	4,523	6,216	(+) 2,230	(+) 2,113
Pakistan	5,210	5,009	(+) 1,299	(+) 1,265
Burma	14,800	14,500	(+) 750	(+) 721
China	168,870	181,028	(+) 475	(+) 1,107
Indonesia	34,503	37,500	(-) 1,175	(-) 414
Nigeria	1,280	1,100	(-) 701	(-) 450
Iran	1,400	1,230	(-) 680	(-) 710
Saudi Arabia	3	0	(-) 500	(-) 490
Iraq	200	95	(-) 473	(-) 487

Notes: 1. USDA Trade Figures include milled, semi-milled, broken, and rough rice in terms of milled equivalent. FAO's Commodity Notes indicate that Trade Figures are also in converted milled equivalent units. Production data is for rough rice.

2. FAO and USDA trade data refer to calendar years. For production, FAO data refer to calendar years "in which the entire harvest or the bulk of it took place," while USDA data refer to crop year beginning Aug. 1, 1983.

Table 3

Share and Size of Population with

Energy-Deficient Diets, 1980

Region[a]	Population with energy deficient diets			
	Below 90% of FAO/WHO requirement		Below 80% of FAO/WHO requirement	
	Share in population (percent)	Population (millions)	Share in population (percent)	Population (millions)
All developing countries (87)[b]	34	730	16	340
Sub-Saharan Africa (37)	44	150	25	90
East Asia and Pacific (8)	14	40	7	20
South Asia (7)	50	470	21	200
Latin America & Caribbean (24)	13	50	6	20
Middle East & North Africa (11)	10	20	4	10

Source: The World Bank (1985); Table 1.1.

[a]The eighty-seven countries had 92 percent of the population in developing countries in 1980, excluding China.

[b]Numbers in parenthesis are the number of countries in the sample.

Table 4

Changes Between 1970 and 1980 in the Share and Size of the Population with Energy-Deficient Diets

	Below 90% of FAO/WHO Requirement		Below 80% of FAO/WHO Requirement	
	Change in share of population	Percentage change in number of people	Change in share of population	Percentage change in number of people
All developing countries (87)	-.06	+10	-.02	+14
Sub-Saharan Africa (37)	+.01	+30	+.04	+49
East Asia & Pacific (8)	-.27	-57	-.14	-57
South Asia (7)	+.03	+38	+.02	+47
Latin America & Caribbean (24)	-.07	-15	-.04	-21
Middle East & North Africa (11)	-.25	-62	-.14	-68

Source: The World Bank (1985); Table 1.2

Table 5

Emergency and Non-Emergency Food Aid Requirements in 1985

Region	Emergency Aid (million tons)	Non-Emergency Aid (million tons)	Emergency/ Non-Emergency %
All food aid recipient countries	3.0	14.2	21.1
North Africa/Near East	1.1	4.3	26.6
Sub-Saharan Africa	0.5	3.1	16.1
Asia/Pacific	1.0	4.3	23.3
Latin America/Caribbean	0.35	0.3	116.7
Others	0.05	-	-
Low-income food-deficit countries	1.4	12.0	11.7
Other food aid recipients countries	1.6	2.2	72.7

Source: FAO (1983a), Table 1 and Table 3

Table 6

Net Exports as a Percentage of Production: 1979-81 Average for Selected Commodities and Countries

Crop/ Country	Wheat	Paddy Rice	Barley	Maize	Millet	Sorghum	Cassava	Sweet Potatoes	Potatoes	Yams	Non-Traded Calories as Percentage of Total
China	- 18.3	0.8	- 1.9	- 2.8	0.2	- 0.1	31.0	0	0.9	*	50.2
India	- 1.4	1.1	0.7	- 0.1	0	0	0	0	0.2	*	16.9
Indonesia	- ∞	-7.1	- ∞	-0.8	*	*	14.4	0	- 0.5	*	9.6
Pakistan	- 9.8	34.1	30.2	- 0.3	0	5.1	- ∞	0	5.1	*	4.5
Bangladesh	-142.6	-1.6	-16.7	0	*	- ∞	- ∞	0	- 0.2	*	2.0
Brazil	-162.6	- 6.0	-386.2	- 6.9	- ∞	2.3	0.1	0	- 0.8	2.8	8.3
Mexico	- 36.9	- 18.6	- 20.1	-21.2	*	-42.7	0	-2.0	- 0.3	*	0.8
Argentina	53.4	54.2	36.7	66.3	45.7	62.0	0	0	- 2.6	*	1.0
Chile	-108.2	- 21.6	28.2	-67.1	*	- ∞	*	0	- 0.2	*	3.4
Colombia	-874.0	2.0	- 52.5	-12.8	*	-13.3	0	*	0.2	4.4	9.1
Nigeria	-4945.8	- 76.5	- ∞	-10.8	- 0.9	- 0.1	0	0	0	0	49.0
Egypt	-280.8	5.8	- 10.4	-28.8	0	*	*	4.3	8.0	*	1.1
Tanzania	- 64.8	- 41.5	-250.0	-17.0	10.3	7.7	0.7	0	2.1	0	30.5
Kenya	- 18.4	- 33.3	1.3	- 4.9	0	0	0	0	0	*	14.6
Senegal	- ∞	-547.7	- ∞	-31.7	0.3	- ∞	13.6	0	-220.0	*	25.9

Source: FAO (1984), calculated from individual country tables.

Key: *information not reported because domestic supply does not exceed 500 metric tons.
-∞ finite net imports with zero production.