

**HUNGER: BEYOND THE REACH
OF THE INVISIBLE HAND**

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Preface

Many books about hunger have been published in recent years, reflecting the deep concern that people have for those who suffer from hunger. Many feel uneasy and diminished by the knowledge that in spite of the unprecedented progress in modern science and technology, hunger still persists. It also generates a sense of frustration that despite the global consensus on the need to eliminate hunger, and despite the actions of many well-meaning individuals, organizations, and governments we have been unable to solve such a basic problem.

What can one more book on hunger contribute? How is this report different from many that have been published? Here we report the findings of a research study addressed to understand the nature of the world food system and to explore policies that could make it work better. We have examined the issue, we hope, with academic objectivity and theoretical rigor in an empirically descriptive, quantitative way. The persistence of hunger amidst global and local abundance suggests that food and agricultural systems are hard to manage and that effective food policies are difficult to formulate. Better tools to analyze and evaluate national agricultural policies could help to improve them.

The work reported here differs from many others in that the analysis of policies is based on a common integrated framework. It shows why hunger persists, why many policies advanced in popular literature do not work, and what kind of policies can work. Although based on analyses using a quantitative, sophisticated system of models, the book is addressed to the nontechnical layman and to the general reader. Also, our arguments go beyond merely

economic and technical analysis. Hunger is not just an economic issue, it is also a political and a moral one.

We show that solutions that rely only on the market mechanism do not work to eliminate hunger rapidly enough. Hence, the title of this report. Adam Smith used the metaphor of the "invisible hand" that guides a competitive market to an equilibrium that cannot be changed without making someone in the economy worse off. The invisible hand is an efficient mechanism for allocating resources for economic activities. In fact, our analysis shows that even policies that try to intervene, modify, and distort the markets do not help to reduce hunger effectively if they rely on the market mechanism. A more accurate, but more technical and less evocative title would have been: "Hunger: Beyond the Reach of Market Interventions." Our analytical tool, a set of linked models, covers the world's agriculture. The model system, developed by the Food and Agriculture Program (FAP) of the International Institute for Applied Systems Analysis (IIASA) in cooperation with the Centre for World Food Studies (SOW) in Amsterdam, is called the Basic Linked System (BLS).

To be operationally useful in an international policy debate, a simulation model should reflect more explicitly the concerns of policy analysts in the countries involved. This led IIASA to establish the Food and Agriculture Program. The idea was that detailed national models be developed by teams in the countries themselves. IIASA provided the participating teams with a common framework, software, and system specifications that could eventually link the individual models. Each national team did most of the empirical work, leading to the development of a network of collaborating institutions. At the same time, the Centre for World Food Studies was set up in the Netherlands to pursue research concerning food policies at the national and international levels. IIASA and SOW agreed to cooperate in the formulation and elaboration of the common framework and software. Moreover, SOW would assist developing countries in building policy models that would eventually be linked. This cooperation resulted in the formulation and operational implementation of an applied general equilibrium (AGE) approach. In parallel, the international network was built and empirical elaboration of the national models initiated. This process started in 1976.

It was clear from the outset that not all the detailed national models would be operational at the same time. Moreover, network participants expressed the wish to receive a simplified version of the linked system of models that could serve as an international environment for their own detailed models. In response to this need, IIASA decided to develop simplified national models that could be built from internationally available statistics (from UN, FAO, and World Bank sources) and connected to constitute the Basic Linked System. Thus, the Basic Linked System was meant to contain detailed national models, as well as simplified ones, using the same methodology, to permit consistent linkage. In summary, three tasks were begun almost simultaneously: methodology and software development, the construction of detailed national models, and the construction of simplified national models.

The first and the third tasks proceeded well, and in 1979 the first results were presented from a system of linked simplified models. The development of detailed national models proceeded as planned for several countries, but some others were delayed. It was then decided to focus at IIASA on the upgrading of the simplified national models toward what was to become a Standard National Model.

The system was used to address two policy issues: the effectiveness of alternative policies to eliminate hunger and the potential impacts of agricultural trade liberalization. The notion of agricultural trade liberalization involved the removal of all border protection measures, such as tariffs and quotas. As is usual in policy analysis with models, the results of a scenario specifying a change in policy were compared with those of a reference scenario. Some of the highlights of our findings are as follows:

- (1) Existing national and international economic policies will not lead to the eradication of hunger and poverty in our lifetime, even if the world economy were to exhibit sustained growth over the coming decades. In fact, they will continue to leave large numbers of people suffering from chronic hunger well into the next century.
- (2) Some policy alternatives for developing countries could help to reduce hunger more rapidly, but these would either retard overall economic growth or require substantially larger

- external aid flows. Without such aid, progress in reducing hunger will remain slow, even if the governments of poor countries were to give priority to meeting food needs.
- (3) More liberal agricultural trade policies in developed countries with market economies alone would have only a marginal significance for the hunger problem and would have mixed effects on developing countries, actually increasing hunger in many food-importing developing countries.
 - (4) More liberal agricultural trade policies by the developing countries themselves will reduce hunger marginally, but will hurt the economies of some of those developing countries exporting agricultural products.
 - (5) Liberalized international movements of labor can drastically reduce hunger, but this is obviously not a realistic alternative in the present world. High-income countries maintain higher wages by restricting labor movements, and the poor countries have lower wage rates than would prevail were labor services to be freely traded in the world. This provides an argument for aid flows to compensate for the restriction of free trade of labor services.
 - (6) Additional aid by the developed countries to finance domestic redistributive programs by poor developing countries could virtually eradicate hunger by the end of this century.

Details of these findings can be found in two IIASA publications: *Toward Free Trade in Agriculture* (Parikh *et al.*, 1988), which is about trade liberalization in agriculture, and this report. Apart from its substantive applications for policy analysis, the development of the BLS generated a number of methodological contributions and innovations. These are reported in a third volume, *Linked National Models: A Tool for International Food Policy Analysis*.

The development of the BLS has involved many people in IIASA's Food and Agriculture Program and its network of collaborating institutions. As with any large project that takes many years, it is virtually impossible to give individual credit to all those who have contributed; yet one must try. The core group consisted of the following: Kirit Parikh (Program Leader 1980–1986), Ferenc Rabar (Program Leader 1976–1980, 1986–1987), Günther Fischer, Klaus Froberg, and Michiel Keyzer. The members of the program

core have been responsible for all aspects of model development and analysis. Conception of the system and development of the algorithms for the computation of national and international equilibria were done by Michiel Keyzer.

Other program participants who have contributed to the development of various aspects of the BLS are Michael Abkin, Tom Christensen, Csaba Csaki, Odd Gulbrandsen, Janos Hrabovszky, Gerhard Krömer, Bozena Lopuch, Douglas Maxwell, Donald Mitchell, Jan Morovic, Nanduri Narayana, Martha Neunteufel, Karl Ortner, Gerald Robertson, Ralph Seeley, Mahendra Shah, Ulrike Sichra, T.N. Srinivasan, Wouter Tims, Eric Wailes, David Watt, Chris Wolf, and Laszlo Zeold.

Many others were involved in the program, particularly for the development of detailed national policy analysis models for specific countries. Though several of these models have been used in a number of countries, not all of them are currently available as a part of the BLS. Naturally, the study has benefited from the country-specific knowledge and evaluations made by many researchers.

Other researchers have also commented constructively on various aspects of the system methodology and behavior. Among them are, in alphabetical order, the following: Reinaldo Adams, Harold Carter, Hartwig de Haen, Jerrie de Hoogh, Uwe Färber, Bruce Gardner, Erik Geyskens, John Graham, John Guise†, Werner GÜth, Bruce Huff, Vladimir Iakimets, Raul Jorge, Werner Kiene, Hans Linnemann, F. Desmond McCarthy, Constantine Meghir, Haruo Onishi, Brian Parmenter, Pierpaolo Pierani, Leon Podkaminer, Marcel Pommee, Todor Popov†, Alberto Portugal, Allan N. Rae, Bruno Raguet, Sudhaker Rao, E. George Rossmiller, Kozo Sasaki, Stephen Schmidt, Peter Michael Schmitz, Jörg-Volker Schrader, Taisto Sonnenson, Valter Jose Stülp, Stefan Tangermann, Robert Thompson, Anton Timman, Paul J.J. Veenendaal, Anton Visser, Matthias von Oppen, Jean Waelbroek, Anton Wagemeyer, and Cheryl Williamson. Several tables in this report were produced by Maarten van't Riet.

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CHAPTER 1

Hunger

1.1. Though No One Wants it, Hunger Persists

How can hunger be eliminated? Are there means to accelerate its eradication? Why does hunger persist in the midst of plenty? What can be done to eliminate hunger and unwanted surpluses in a reasonable time? These are the issues addressed in this book.

Everyone would like to eradicate hunger. All nations, at least those who have signed the UN charter, subscribe to the belief that all human beings have a right to food. Despite this, and the fact that globally, and even regionally, adequate food is produced, several hundred million people are suffering from chronic undernutrition, i.e., from hunger. Definitions vary and statistical measurements are far from satisfactory, but all indicators point toward the large extent of deprivation in terms of food, measured by the numbers of people affected. Moreover, their numbers are still increasing, even though their share in the populations of developing countries, and of the world, continues to decline. Women appear more affected than men; a large proportion are children. The Food and Agriculture Organization (FAO) estimates on the basis of calorie intake norms established jointly by the FAO and the WHO given in *Table 1.1* show the present situation.

Table 1.1. The undernourished.

Region	1969–1971		1979–1981		1983–1985	
	Num- bers (million)	% of popu- lation	Num- bers (million)	% of popu- lation	Num- bers (million)	% of popu- lation
Africa (sub-Saharan)	86	32.6	110	30.6	142	35.2
Near East/North Africa	41	22.9	25	10.8	24	9.1
Asia	281	28.7	288	23.5	291	21.8
Latin America	51	18.5	52	14.6	55	14.2
Total	459	27.0	475	21.8	512	21.5

Sources: FAO, 1987, 1988.

Human nutritional requirement norms are derived from the basal metabolic rate (BMR), which mainly depends on age, sex, body weight, and climatic conditions. (BMR is defined as the calories required by a person at rest, but awake.) It must be recognized that no agreement exists with respect to the norm below which a person can be said to be hungry, i.e., cannot undertake a reasonable amount of physical effort without loss of body weight. Disagreement here (see Kakwani 1986; McNeil and Payne, 1985; Srinivasan, 1980, 1983, 1987; Sukhatme and Margen, 1978; Sukhatme, 1982; WHO, 1985) is not surprising, since this norm indicates a cutoff point below which one can call the situation critical. Setting such a cutoff point is a political as well as a biomedical issue. How much physical effort should be considered reasonable? Should recreational activities be included, and if so, how much? On the other hand, the measurement of food consumption is also problematic. For a nation as a whole, estimates of food production may be obtained from measurements in the field and the net food inflow from customs records. This determines total food availability, but not its distribution. What happens to this food? Is it fed to animals and, to the extent that it does reach households, how is it distributed among and within households throughout the year? What is the role of disease and of ignorance of methods of food preparation to preserve nutritional benefits from available supplies?

Settling these issues to allow a more precise assessment are immense tasks, on which specialized organizations have spent considerable resources over the past decades. Significant advances have

been made, and this report could not have been written without them, yet by the nature of the issue itself, a high degree of imprecision is bound to remain.

Almost 60% of the world's malnourished peoples live in the Indian subcontinent: in Afghanistan, Bangladesh, Burma, India, Nepal, Pakistan, and Sri Lanka. In the 37 countries of sub-Saharan Africa the food situation has been deteriorating, and these countries now account for 20% of the hungry. The remaining 20% are diffused widely over several developing countries.

Globally, although as a percentage of population the numbers of hungry are decreasing, in absolute term they are increasing. Nearly 500 million people, or about 10% of the world's population, are suffering from hunger. Not that the remaining 90% all have ample food supplies all the time; many of them live at the limits of subsistence. Their diets are monotonous and lack variety so that, while not undernourished in terms of calorie intake, they are malnourished and are thus susceptible to diseases and infections. They maintain a precarious balance of food supplies at the margin of adequacy and need to be provided with additional food to give them a reasonable degree of food security.

The vulnerability of this balance to the vagaries of weather and to the risks of improper policies has been amply demonstrated over the past 25 years. In India, for example, successive years of unfavorable weather in the late 1960s and early 1970s required large imports of grain to counter a serious threat to food supplies for a major part of its population. More recently, Bangladesh, the Sahel, and East Africa have provided similar examples. In China, in the early 1960s, overambitious policies, a breakdown in communications, and serious production shortfalls due to weather combined to create a disastrous situation which probably caused the largest loss of life (estimates of deaths during the 1960-1962 famine vary from 16 million to 30 million) for one single calamity in all of the world's history.

The persistence of hunger on this scale can be seen as a sign of the failure of humanity's development, but we may also look at the progress that has been made. Only a few centuries ago, hunger was a daily reality for the majority. Today a large part of the world's population enjoys secure and adequate food supplies. Progress in providing food security for a major part of a much larger world

population is one of the outstanding achievements of our times, and the situation is improving.

Other indicators also suggest an overall improvement in the human condition. Life expectancy at birth in developing countries has increased from less than 40 years to approximately 55 years over the last three decades. Several developing countries have joined the ranks of developed countries in this period. These long-term trends seem to justify a degree of optimism for the future: freedom from hunger appears to be a goal that is within the world's reach. The search for an answer as to how to achieve that goal is the theme of this book. But we must first try to understand why so many people are undernourished, or malnourished, while at the same time millions of others have more than plenty to eat. In other words, what is the nature of the hunger problem?

1.2. The Nature of the Hunger Problem

Underlying the problem of the chronic undernutrition is the problem of poverty. The chronically hungry are, by and large, people whose incomes are too low to allow them to buy all the food they need. Their incomes are low because they own too few productive resources of capital, land, and skills for production activities to generate incomes, which in turn are used to obtain a final consumption bundle of goods and services, including food items.

This implies that the poor are barely able to meet their food needs and when prices of what they buy increase relative to what they have to sell, their purchasing power is further reduced. The problem of poverty and malnutrition is perpetuated because the poor have no better place to go – there is today no New World to welcome them as migrants – so that the problem of poverty has to be resolved within their own country.

Thus, hunger is a normative concept that involves political issues and may play a role in politics. It is an indicator that can, if adequately measured, be used as a criterion to assess the performance of an economic system, be it at the level of a family, a village, a country, or the world as a whole. Yet hunger is absent from the sphere of economic exchange. That is precisely why a solution of the hunger problem through the working of the economic system

would be accidental and, as we shall argue, unlikely. The increased free play of economic forces may under certain conditions improve economic efficiency, but it does not ensure poverty alleviation. In the market, only the dissatisfaction of those who possess purchasing power matters. The suffering of the poor is irrelevant as long as the others do not care. When the silent operation of market forces cannot be expedited to solve this problem, the silence must be broken to bring the hunger issue to the top of the world's political agenda. At the same time it is not sufficient for researchers to say that hunger prevails and may persist in the future when only economic forces are taken into consideration. They should also explain why interventions from the political sphere such as development aid have been unable to resolve the problem.

1.3. Resolving the Hunger Problem

Suggestions of ways to end hunger have not been lacking and have been the topic of intense debate over a considerable time. Some are briefly presented here.

1.3.1. Some ways to deal with hunger

Redistribution through Revolution

Different views are expressed, sometimes forcefully, with respect to the causes of hunger and ways to overcome it. The defenders of those views often claim that other recipes will not work because they fail to recognize the basic nature of the problem. Some argue, for instance, that hunger is caused by the social system, and that only a redistribution of assets, possibly through revolutionary changes in government, will help. In the meantime, all foreign aid simply strengthens the position of the ruling elite and postpones the day of salvation. Aid reduces social unrest and thus the pace of social change.

There have been undeniable successes in several countries in reducing exploitation and removing other impediments to more equitable growth, such as the revolutions in France in the eighteenth

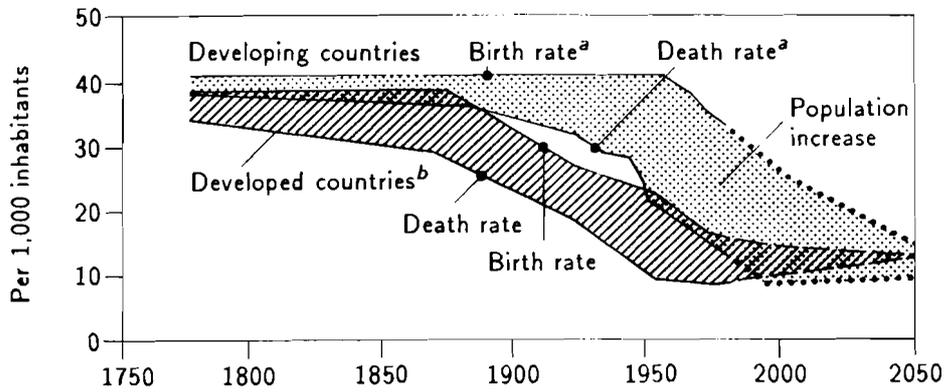
century or China in the twentieth. Nevertheless, the cost of revolutions in terms of human suffering cannot be overemphasized. The example of Ethiopia shows that more than a popular revolution is needed to resolve the problems of poverty and hunger. Whether redistribution of wealth will make the poor significantly better off will depend on the absolute level of the wealth of the rich. If they are only very few, redistribution may not achieve much. Moreover, the rich may perform important functions in commerce that would not be easily taken over by the revolutionaries. Thus, the view that hunger is a problem of income distribution that requires revolutions and is therefore better left alone to resolve itself is not really convincing.

Malthusianism: Will the Problem Take Care of Itself?

The Malthusian position also advocates nonintervention. In this view people will die when sufficient pressure is allowed to build up, allowing the food problem to be resolved by the natural biological mechanisms. Proponents of this view argue that the food problem is caused largely by population growth which became possible through improved health care, leading to a drop in death rates without a corresponding drop in birth rates (see *Figure 1.1* and *Table 1.2*). If one were to accept this argument, one would not help the poor but let them die today so that fewer people would suffer from poverty and hunger in the future. Although this view is in some sense tautological, because it resolves the hunger problem by allowing people to die, one might argue that it is better to let one person die today than hundreds in the next century.

Minimal Government: Do as Little as Possible

A third noninterventionist line argument is that hunger is caused by the failure of government policies. In this view governments distort the economic environment to the benefit of specific lobbies. Only a free market can get prices right. A first objection to this view, which is admittedly given here in an extreme form, is that government has to perform more tasks than price setting alone. Apart



Rate of population increase = birth rate - death rate

Figure 1.1. Trends in birth and death rates, 1775–2050 (births and deaths per 1000 inhabitants).

^aCrude birth and death rates. The increases projected in death rates after about 1980 reflect the rising proportion of older people in the population.

^bInclude industrialized countries, the USSR, and Eastern Europe.

Source: *World Development Report, 1980.*

Table 1.2. Demographic transition.

Type of economy	Percentage change in:			
	Crude birth rate	Crude death rate	Total fertility rate	
			1965–1987	1987 2000
Low-income economies	-26.2	-37.5	4.0	3.3
Middle-income economies	-21.1	-38.5	3.9	3.1
Industrial market economies	-26.3	-10.0	1.0	1.9

Source: *World Development Report 1989*, Indicators Table 27 “Demography and Fertility.”

from maintaining national defense, justice, and law and order, there is obviously also a role for government in providing education and infrastructure investments, such as public works in agriculture.

If government does not play an active role in developing agricultural infrastructure, agricultural output and incomes will remain low, often leading to hunger. However, in the absence of adequate influence of all those involved, a government may develop such infrastructure, an irrigation system here, a marketing system somewhere else, in such a way that only the richer and larger farmers reap their benefits, leading to greater inequity and maybe even increased hunger. The role of a minimal government is not obvious. We shall return to this later.

Individual farmers cannot set up irrigation systems easily. They may form collectives to arrange water distribution, but these collectives will have to negotiate with farmers upstream and downstream. Unfortunately these negotiations will tend to be uneven because the farmers downstream have little to offer. Moreover, as soon as one landowner refuses to have canals on his land, the system may fall apart. Clearly this type of infrastructure facility, involving large investments and requiring the consent and cooperation of many, would require a public body to manage it.

Land is often accepted as private property but a river is not, a lake again is but a sea is not. Thus it seems to be an inherent role of government to constrain the sphere in which private property may be bought and sold, while enforcing an equitable distribution of non-private property such as water. Even a minimal government should do this.

Vegetarianism: Reduce Consumption by the Rich

A simple way to reduce malnutrition would seem to be to reduce the demand for food by the rich. This demand is largely channeled through the intermediary of livestock production. Livestock eat fodder and feed, and the rich eat livestock products. Vegetarianism would reduce livestock production and would thus free land and farm labor resources for the production of other, staple crops for the poor. This would, in turn, reduce the prices of these staple crops to allow the poor to buy more food.

Here again there are several problems. Will the land no longer needed to produce animal feed be allocated to staple foods and, if so, will the poor benefit? If they live in rural areas, reduced prices may

be passed on to those who produce these staple foods themselves. Then, to the extent that they produce for the market, they will be affected negatively, and not at all if they meet their needs from their own production. Thus here again the outcome is not clear. Proponents of vegetarianism could argue that food aid could be given to compensate the losers and indeed, if the money not spent on meat could be used for aid, vast resources would become available for poverty alleviation. But does food aid help, or does it compete with local farm production? At a more general level, is increased aid desirable or does it create dependence and distortions?

Increase Production in Developed Countries

Rich countries tend to generate agricultural surpluses in the sense that they produce more than they consume and that they cannot easily find customers abroad who are willing to buy excess production at profitable prices. So, their governments subsidize exports, and this is a costly proposition. At the same time, yields continue to grow through advances in agricultural and processing technologies. To limit government budget outlays, acreage restrictions and production quotas are imposed. Would relaxation of these restrictions help the poor, allowing more food to be produced? Would technological advances, such as in the field of bioengineering help? The answer is the same as in the case of vegetarianism. It is hard to take a position without further analysis. The poor may not have sufficient purchasing power to "attract" the increased production. Large farmers may be helped more than the poor. Monocultures that cause environmental degradation may be favored. Countries may have to run into debt to finance the necessary investments, and farmers may become dependent on purchases of hybrid seeds and other inputs; some call this modernizing hunger (Raikes, 1988). Defenders of the view that technology can bring the solution could add that increased production would allow increased food aid, as with vegetarianism, but this case is weaker because it does not indicate the source of funds for the food aid.

Reduce Production in Developed Countries

Developed countries do not only incur costs from agricultural surpluses because their disposal is costly. Intensified agricultural and livestock production is also causing increasing environmental problems and may even contribute to climatic changes (see Brown, 1988). The circumstances under which animals are reared in developed countries are being increasingly criticized, and have led to calls for the further reduction of agricultural production, or at least of its growth, mainly through constraints on yields per hectare and the number of animals kept. After the discussion of the earlier cases it is not so clear that such a move would help the hungry elsewhere.

More Aid

To the extent hunger emanates from poverty, the most direct way to combat hunger in the short run would be to transfer income to the poor and, in the long run, to equip the poor with more personal and material endowments to enable them to earn higher incomes.

This is now a widely held opinion. It appears that even bumper crops may coincide with famines (Sen, 1981; Drèze, 1988) unless the income entitlements of the poor are maintained and protected. Giving food aid only, say grain, may in this connection be counterproductive because it may reduce purchases of food on the domestic grain market and thus reduce incomes and production incentives for the farmers (von Braun and Huddleston, 1988). Moreover, as food aid makes people less poor it will lead to increased purchases of other commodities as well, and these may to a certain extent have to be imported. Thus, food aid must be given as an income transfer to the poor and must be supplemented by balance of payments support (for some suggested schemes see Reutlinger, 1988; Peterson 1988). In reality, food aid is often used to pay civil servants or is sold on the open market to finance government expenditure. If the funds obtained in this way are used appropriately (such as for infrastructural investment), this is not objectionable, but there is only a thin line from there to pure corruption, where government officials appropriate foreign aid to supplement their own incomes. Thus, aid utilization needs to be carefully monitored and

food aid in particular given only on the condition that it is used well and accompanied by specified domestic reform (Srinivasan, 1989).

However, in specifying such conditions more is needed than a simple statement that the aid should not be misused. For aid to alleviate poverty in the long run, it must be invested well and this requires detailed knowledge of the economic environment of the country in which one is operating. The study reported here is far too crude to deliver such investment scenarios. All it can do is to assess the contribution that increased foreign aid can make to alleviate the hunger problem and point to findings of more detailed studies. The issue to be focused upon is whether solutions such as those listed above could work without increased foreign aid in the "trade not aid" tradition of Prebisch (1964) and, if this is not so, what broad levels of aid are required and what would be their impact on food and agricultural markets at large?

Aid in Cash and Kind to Target Groups

Hunger does not always stem from insufficient income. Low standards of hygiene and traditional attitudes toward women or children may result in hunger even when purchasing power is increased (see Payne, 1985; Pinstруп-Andersen, 1988). It then becomes imperative to monitor where hunger actually occurs and why. Recent empirical evidence suggests that for the very poor (i.e., those who receive less than 80% of their caloric requirements and who spend more than 80% of their incomes on food), calorie intakes may not improve very much with increased incomes (Behrman, 1988; Lipton, 1988). This may be due in part to adaptive behavior; the very poor may work less hard and need fewer calories as they receive more income, or they may assign higher priority to other needs such as shelter or clothing. At any rate, if the hungry spend a large part of their extra incomes on nonfood items, as appears to be the case, it may become quite expensive for the aid donors to improve nutrition via higher income transfers. Thus targeted measures to increase the nutritional intakes of only those who need them – such as price subsidies on the foods that only the poor consume or school meal programs – may be more cost-effective than global economic measures. Nutritionists often take such a curative view and indeed, if scarce aid

funds can be used to relieve the hungry, this view has important merits. It can yield concrete action with clearly visible results, and can proceed in a piecemeal way without having to wait for general policy reform at the national and international levels. Nevertheless, many “doctors” and monitoring agencies will be needed to identify the hungry and to implement programs without leakages, although this may also generate a significant degree of paternalistic intervention into hungry people’s daily lives. Moreover, increased targeted aid may have significant consequences for the economy as a whole and may even aggravate the hunger problem if it leads to serious deterioration of farm prices.

This problematique is generally recognized, that overall economic interventions do not pay sufficient attention to the particulars of weak groups in society and the targeted and curative interventions neglect the overall causes and impacts. This dialectic tension between two approaches is natural, and possibly healthy, and will never be overcome in a completely satisfactory way.

1.3.2. The need for an integrated analysis of policy options

These suggestions have several elements in common: they have some intuitive appeal; they have been voiced in the media; and they each contain convincing elements. At the same time, they are contradictory and only speak about the poor who might gain, and not about the poor who might lose.

It may be true that suggestions have to be simple to be implementable. Simple messages are not only useful in communication through the mass media; they can also oil the workings of the bureaucracies that will have to implement them. Still, the analysis underlying such suggestions may not be simplistic. The interests at stake are too important for that.

An integrated view is required, pointing to the relative merits and weaknesses of the various opinions. Such a view needs a common framework of analysis with which to evaluate the various suggestions, and it needs to bring in as many considerations and effects, both main and side effects, that are relevant to the analysis. It also needs to have more than just rhetorical power. If the integrated view has firm theoretical and empirical foundations, i.e.,

the assumed relationships are in accordance with accepted theory and are inferred from observations of reality, the rhetorical power may be added to it by some of its readers. The analyst is happy if his arguments are convincing, but it must be more important for him to be right. It is from that perspective that this study has been written. Fortunately, an economic theory that provides an integrating framework is available. It provides an overall approach to the problem which, when given sufficient empirical elaboration, allows positive conclusions to be drawn. These conclusions may not necessarily be right; they merely follow logically from clearly stated premises, according to rules that are not convincingly rejected by the empirical evidence. This falsifiability principle has guided the research reported here.

The work has been performed out of the conviction that this model-building approach is the scientifically valid way to proceed, since it enables statistical data to be integrated with economic theory, the relative merits of solutions to be tested, and new suggestions to be made. It would be too ambitious to claim that this study provides a complete integration of the many aspects of policy analysis for alleviating hunger. Many dimensions of the evaluation of suggested solutions to the hunger problem, such as political acceptability, administrative feasibility, or sociological suitability, have to be judged outside the analytical framework that has been used here.

1.3.3. The effective use of good intentions

At this point it may be useful to ask what we actually mean by a solution. Each policy suggestion is actually a call for change and leads to the question of how to realize this change. For this engineers may look to economists, economists to political scientists, and political scientists to media experts who then sell the message. This is not the line taken here. In our view, the good intentions and moral values of individuals both on the receiving end and on the giving end are the key agents in resolving the hunger problem. These intentions should be served well. Scientific research that provides insight into what helps, what is counterproductive, and what is ineffective is conducive to putting good intentions to better use.

Most of the suggestions presented in this section stem from good intentions. Some may show parallel lines of interest between a particular lobby and the poor, but the fact that such parallel interests are used explicitly by many lobbies proves that the fate of the poor does carry political weight. However, conflicting views that stem from good intentions can be inhibiting to the point of paralyzing change. This is why an integrated approach to policy evaluation is of more than research interest.

1.4. Plan of the Book

In Chapter 2 we attempt to provide broad historical and descriptive perspectives to the current problem of poverty and hunger. In Chapter 3 the current functioning of the world food system is sketched. Chapter 4 introduces the main features of the Basic Linked System, an economic simulation model of the world food system. Using this model, scenario simulations were performed to test suggestions for alleviating hunger. Those that are meaningful without being able to resolve the hunger problem are presented in Chapter 5. Chapter 6 presents the more promising alternatives, which appear to involve increased flows of international aid, followed by a discussion on whether such increased aid flows can realistically be expected to occur. Chapter 7 provides a summary and conclusions.

The purpose of this report is to convey our main findings and ideas. The technical details of the simulation tools used have been documented elsewhere (Fischer *et al.*, 1988), as have the main findings in the area of trade policy (Parikh *et al.*, 1988). This is a global study and, as such, it can be expected to be rather crude and at times superficial on specific details. The practical implementation of policy suggestions cannot be derived from it, nor can commodity-market forecasts be obtained. More detailed studies at country or commodity level are bound to receive the criticism of being partial. This report builds upon such studies and recognizes their value in an attempt to provide an understandable, global picture.

CHAPTER 2

Characterization of the Food Problem

2.1. Historical Retrospective

In searching for the causes of the hunger problem, if one focuses on economic statistics one is often restricted to time series going back at most 30 years. By comparing some of these statistical levels and trends one may find significant differences, some of which can be attributable to processes that took place within that 30-year period, but many others that can only be understood by going back much further. More important, to understand why some population groups today are consistently vulnerable to deprivation one must identify not only the forces that account for change but also those that conserve and maintain the status quo. For this reason we start with a historical account, although this can only be cursor and is bound to be biased and impressionistic at best, and with which many historians may disagree. All we will do here is to draw some lines from the past to the present, referring the reader for details to the literature, such as *The Geography of Hunger* (Josué de Castro, 1954) and *A Study of History* (one-volume edition, Toynbee, 1972).

The history of humanity has been successful in the sense that population numbers have multiplied at an increasing rate (see *Table 2.1*). Developments in technology have made it possible for

Table 2.1. The doubling time of world population.

Year	Population (million)	Growth rate (%)	Doubling time (years)
8000 BC	5	0.14	500
1650	470	0.35	200
1850	1,000	0.87	80
1930	2,000	1.55	45
1975	4,000	2.00	35
1980	4,437	2.10	33
1985	4,840	1.75	40
1988	5,272	1.72	41

Sources: Ehrlich, 1972; Kuznetz, 1965; and World Bank, 1988.

humanity to survive in ever-growing numbers. In the early days new defense techniques made it possible for the physically relatively weak *Homo sapiens* to hunt rather than to be prey. Fire kept predators away and made it possible for humans to survive in cold regions. Eventually, the domestication of animals enabled them to live in larger concentrations allowing for better defense and division of labor, but also for wars among tribes and the development of slavery.

Throughout history technological breakthroughs have found applications in the military as well as in the productive spheres. This in turn has generated new scarcities and resources that could be owned and accumulated, either privately or publicly. This is shown in *Table 2.2*. World history cannot be summarized in one table; all that we can do is indicate tendencies. The dates may be different in various regions of the world but the table nevertheless conveys some trends, of which a few may be highlighted.

Before 1850

In the course of history, improved technology in agricultural production, storage, and transportation have allowed an increasing number of people to abstain from work on the land for at least part of the year. The newly gained free time was spent only to a small extent on cultural activities; most of it was used in military operations. Wars were usually followed by the annexation of the resources of the conquered peoples, so that larger, hierarchically structured societies

emerged. However, the size of these societies was limited by the scope of control of the conquerors and also simply by the limited populations in the conquered territories. Some small societies were able to survive in silence on the sidelines, but the larger empires were highly visible. They were based on sedentary agriculture and as such were vulnerable to attacks by nomads; their continued existence depended on their capacity to produce or extract food surpluses to feed their armies. They weakened when the surpluses declined due to population growth and the absence of technical progress in agriculture, or when farmers rebelled against extortionary policies. Each time the sedentary farmers' empires lost their defensive strength, the nomads who largely depended on the extensive livestock grazing were able to tear down fences around the empires, invade, and take over the government. However, their limited experience in administration forced them either to rely on existing elites or to assimilate gradually, and this in turn made them vulnerable to new invasions. Such a process of invasion and assimilation (or occasionally expulsion) of invaders followed by new invasions has occurred in most of the deltaic regions and plains of the world – in China, India, Russia, Western Europe, the Middle East, or South America.

The process of recurrent invasions lasted until the greater richness of the sedentary population allowed them to develop artillery that was heavy enough to withstand attacks and to decimate the nomads' light cavalry; in Europe this occurred during the Renaissance. This technological breakthrough thus enabled the farmers to take the initiative. Land development and the improvement of infrastructure, leading to higher agricultural productivity, could take place behind more secure borders and enhanced financial means to support government and armies. Wars were no longer fought against invaders but between sedentary societies to conquer more land and to expand access to financial means. This competition gradually led to the emergence of nation-states. In the European Middle Ages the lack of opportunity for migration forged strong ties between farmers and their land, but a national consciousness did not yet exist. Languages varied widely within kingdoms; it took in Europe until about the nineteenth century to produce a strong sense of nationalism, after more struggles between rulers and resulting transfers of territories. Until about that time people felt more

Table 2.2. Inventions and their consequences in Europe.

Period ^a	Food technology	Military technology
500000 BC		Stone/use of fire
40000		Fire making
7000	Livestock keeping	Horses/dogs
6000	Domestication of cereals	
4000	Irrigation works, draft animals	Copper utensils, wheel, mills, script, infrastructural works
750		
AD 450		Improved cavalry and navy
1000		Medieval fortresses
1400	Tea, spices, tobacco	Improved navigation techniques (maps, compass)
1500	New varieties: maize and potato in Europe; wheat in America	Heavy artillery
1850	Tractors, fertilizers	
1900	Refrigeration	Tanks, trucks, airplanes, machine guns
1950	High-yield varieties pesticides	Nuclear weapons, rockets
1980	Biotechnology	

^aThe dates are only rough approximations.

Sources: Compiled mainly from Langer 1972; *An Encyclopedia of World History*, and *Grote Spectrum Encyclopedie*, 1977.

Table 2.2. Continued.

Other technology	Social consequences	New resources
	Defense and hunting	Labor
	Access to cold areas, survival during cold periods, food preparation and conservation	
	Stock accumulation, need for larger communities	Livestock-grazing lands
Pots, textiles	Storage and transportation, townships with specialization: farmers, artisans, and soldiers; first taxes on farmers	Land
	Cities, standing armies to protect against nomads and other cities	Access to irrigation buildings
Literature and law, money	Founding of large empires with internal trade; colonies finance, government, army; army maintains unity	Money
	Intrusion into Europe by Arabs, Huns, Normans; great migration, disintegration of Roman Empire	
Printing	Small units led by feudal landlords; no migration	
	Great discoveries, new consumption habits	
Renaissance in arts and science	Increase in agricultural surplus, migration	
Industrial revolution, steam engines (railroads, ships) vaccinations, hygienic improvements	Less need for labor and horses on farm leading to increased farm surplus and labor availability, increased demand for fuels and minerals (wood & coal), industrial inputs such as cotton from colonies, more education for industrial workers in Europe, backwardness in colonies	Machines, mines, markets, land in the colonies
Mass production	World Wars I & II, freezing natural borders, decolonization, strengthening of police force inside state	
Telecommunications, computers	Frozen international system, multinationals, development aid	Patents for high technology

closely associated with cities or regions than with nation-states. National passports or visas were nonexistent, and migration was possible for those who had the money to move. It took the invention of so-called hereditary enemies to give the notion of the nation-state a more concrete content.

In other parts of the world similar processes took place at different times. For many centuries China was able to secure its borders against most invasions by northern nomads and to strengthen its national cohesion for long periods. From the seventeenth century, however, European developments became dominant worldwide with the expansion of their nation-states into colonial empires and the progressive subjection of other sedentary societies.

Political and military developments continuously affected demography, the supply of farm labor, the availability of rural infrastructure, resource distribution, etc. Countries with severe food-supply problems tended to be conquered or to conquer their neighbors. It may be argued that starvation was to a large extent mitigated by the military system, since the poor could enlist as mercenaries. The starving could also emigrate, as did the Irish from 1846 to 1851 to escape the famine caused by a potato blight. The famine killed about a million people, and some 2 million others sought refuge in emigration, particularly to the United States and Canada. Foreign aid was nonexistent; emigration was the only way out. But such an option is not open today to those who are facing starvation in many developing countries.

1850-1945

After 1850 there was a rise in labor productivity in agriculture and a dramatic fall in death rates. This can in part be attributed to increased food supplies and to improved hygiene and medical care. The increased labor force was largely absorbed in the still highly labor-intensive manufacturing sector. Improved transportation using steam power had shortened the lines of communication between the colonies and their motherlands. Until that time, the colonies had largely been used as sources of high-value products such as precious metals, spices, and slaves; in effect, they were used as trading posts, mines, and plantations. The indigenous populations of the colonies were largely excluded from the process. To

supply the raw materials for the newly emerging industrial powers in Europe, this strategy had to change; the local peoples had to be incorporated into the colonial process, and the colonies administered more effectively and protected from invasions by jealous competitors. This was a hard task for the colonial powers. Nations without colonies abroad, such as Germany[1] and Japan, could develop quickly under the prevailing regime of international free trade. Such nations became a permanent threat to the empires of Britain, France, the Netherlands, and Portugal, whose colonies were far away and had a wealth of resources to offer. Two world wars established that the system was nonviable. A period of frozen borders and inward-looking policies followed upon World War I, and by the end of World War II all of the old colonial empires were in the process of collapsing.

1945–Present

The victorious powers of World War II – the United States and the Soviet Union – had the strongest voice in deciding the the fate of colonies; they had gained the authority to redraw the political map of the world. The USSR (more accurately Russia) had experience with administration of adjacent lands in the south and the east in a colonial fashion and, it may be fair to say, chose such an option in Eastern Europe also.

The US was left with the main responsibility for the organization of the rest of the world. Its military successes in the field and its use of the atomic bomb had made clear to the world that US power was pervasive. However, the US had little experience in the formal administration of colonies, although its relations with Latin America and the Philippines showed many colonial traits. Moreover, the majority of Americans felt that it had itself been oppressed by colonialism in the past (although Native Americans obviously view this somewhat differently). Thus the US called for decolonization. Previously colonized territories were cut loose from their motherlands at an accelerated pace. Power was handed over to representatives of local independence movements, who had often spent a large part of their lives in prison. Colonial armies that had largely performed a role of police and administrators were withdrawn in haste. The task thrown upon the new postcolonial

governments was difficult, or even impossible in some cases. The legacy inherited by these new governments consisted of:

- Frontiers that had been drawn by outsiders on the basis of old colonial boundaries. Guaranteed borders under the newly created United Nations made these arbitrary frontiers virtually immutable, even when they were drawn deliberately to create weak nations. Only in few cases were new nations the result of long struggles.
- Ethnically diverse populations which happened to live inside the borders at the time of independence, often without a common history or a joint struggle for independence, so that a sense of national identity had insufficient time to develop.
- Little or no experience in self-administration, obstructing the way toward nation building and economic development.
- Economic structures geared to the supply of raw materials for the former motherlands.
- National integrity that could only be maintained through arms purchases abroad. The weapons mainly served to maintain law and order domestically, and also established the military as the strongest player in the nation in the political arena.
- The principle of national sovereignty over their own populations and territory, which blocked traditional migration across the new borders and obstructed international capital flows.

After 1945 nearly all world resources had been assigned to their new owners, the nation-states. Only Antarctica, the oceans, and outer space had not been allocated. How these new nations would fare was considered to be first of all their own responsibility. The old colonial powers were preoccupied with their own postwar reconstruction and with new crises, this time in the East–West relationships.

The magnitude of the problems thrust upon the new countries became clear only slowly. Development assistance began in the 1960s, but was initially seen as a temporary transitional feature of international relations. The plight of newly independent Africa gradually changed this view, but development assistance has always been plagued by doubt about its effectiveness and the dominance of donors' other concerns in setting their global priorities. No doubt,

the media have helped to increase popular awareness of mass poverty and starvation, but it has done little to increase development assistance. Increased awareness of hunger and poverty tends to translate into aversion toward nondemocratic regimes in poor countries, which seem to care more for themselves than for the hungry within their borders. Also, the apparent success stories in development seem to relate more to those countries' own efforts than to the flow of development assistance and thus add little incentive for more aid.

In the race for development the former colonies face many handicaps. Some can thus perform vastly better than others, particularly when they are small and well-located. No doubt, policies can help if there are resources to be allocated; in that sense aid can help too. But for the superficial observer relying on the media, actual performance and achievement count, not constraints and lack of resources. And the success stories of Pakistan in the 1960s, Taiwan and South Korea in the 1970s, and Ghana or Turkey in the 1980s are held up as examples to be followed. Unfortunately, much of what can be learned from those cases has little to do with the stubborn problems of development nor of external assistance.

The Right to Food

In recent years there has been growing awareness of the stubbornness of hunger in many parts of the world and a perception that effective measures are available with which to eradicate it. It has been observed (see Grigg, 1985) that the hunger problem only began to be labeled the "world food problem" after 1945; since then it has been seen as a problem in (and of) some countries, rather than as a global social problem.

Nevertheless, the international order envisaged at the start of the race for development did recognize poverty and hunger as a social problem. This is reflected in the Universal Declaration of Human Rights, which was adopted and proclaimed on 10 December 1948 by the General Assembly of the United Nations. Article 25(1) of that Declaration reads:

Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.

The Declaration further demands that member nations should, “by progressive measures, national and international, ... secure their universal and effective recognition and observance” (see Omavale, 1984).

Since 1948 generations of legal experts have further interpreted this Declaration. Conventions have been signed by states and details have been worked out (see Eide *et al.*, 1984), but these conventions do not provide for economic resources with which to execute them. The main contribution of the Declaration has been to outline what is considered to be just. To turn the aspiration of the right to food into an effective instrument, resources must be allocated. In turn, this depends on international cooperation to give shape and content to human solidarity, or may even be based on the perceived self-interest of the rich. Individuals may occasionally appeal to the Declaration and, more importantly, governments cannot openly reject it. The Declaration increases rulers’ accountability to the public at large. Nevertheless, for a long time as far as poverty is concerned it has been no more than a declaration of intent that is alien to day-to-day contracts and exchanges.

In recognition of the right to food, and realizing that insufficient progress can be reported with regard to the hunger problem, numerous nongovernmental organizations have been set up over the last two decades. Their common objective is to help alleviate hunger, but it is difficult to measure what impact they have had on the developing world.

2.2. Current Food Supplies and Distribution

When countries start with widely different resource endowments, it is only natural to expect widely different levels of per capita food availability. Beyond that, the record of improvements during the

past 30 to 40 years shows expectedly wide disparities among countries. Development policies pursued during those years can only to a limited extent explain the broad range of performance.

By the early 1960s, when decolonization was largely complete, the world had been divided into what became known as developed and developing countries. Neither the former nor the latter were homogeneous groupings, as gradually became recognized by the international organizations that collect and disseminate worldwide statistics. In a world consisting of about 170 countries and territories, there is a need to aggregate statistical data and for that purpose several different classifications have been made. Over time countries can move from one group to another, and this reduces the value of comparisons by country groups over time. Also, at a higher level of aggregation, statistics can provide only a cursory view of world food and agriculture. Country aggregates also have the disadvantage of not being representative of the economic and political bodies that act as players on the global stage. The aggregations presented in *Table 2.3* are based on those used by the World Bank and FAO, with some slight adaptations.

On average, people in developed countries have higher incomes, eat more, and generate agricultural output with fewer people working on the land and tending livestock than in developing countries. Within the latter group there are considerable differences between country groups, depending on income levels and geographic location. Over time, differences appear to have grown except for food intake levels, which improved in most developing regions, with low-income Africa and India as the clear exception.

Improvement of the food situation in many parts of the world is remarkable when noting the rapid growth of population. Food production stayed ahead of increasing populations over the past 20 years in the developing countries at least in the aggregate, but also for the largest ones (particularly China) and for broad groupings of the others (see *Table 2.4*).

People in developed countries, and to a lesser extent also in middle-income developing countries, not only eat significantly more than those in the low-income countries, but also enjoy more varied diets. *Table 2.5* shows, for the main country groups, the composition of food intakes. It demonstrates the predominance of cereals in the diet of the developing countries, which together account for

Table 2.3. Main characteristics of world food and agriculture, 1965 and 1985.

Country group	Population (million)		Daily kcal per capita		Per capita income (\$)		% of labor in agriculture	
	1965	1985	1965	1985	1965	1985	1965	1985
World	3,310	4,794	2,400	2,675	605	2,699	58	52
Developed market economies and Eastern Europe	693	818	3,120	3,402	2,073	11,167	16	9
Developed centrally planned economies	333	392	3,221	3,388	–	–	41	26
Low-income developing countries ^a	1,716	2,633	1,973	2,312	90	308	77	71
China	717	1,040	1,932	2,569	90	320	81	74
India	495	759	2,100	2,132	100	290	73	70
Other Asia	329	528	1,816	2,192	65	360	72	62
Africa	175	306	2,072	2,092	94	236	84	78
Middle-income developing countries	532	882	2,337	2,758	299	1,612	56	44
Asia and Pacific	123	197	2,166	2,609	188	1,414	62	51
Middle East	75	120	2,470	3,191	202	953	64	50
Other Africa	92	170	2,109	2,347	153	1,078	69	60
Latin America	242	395	2,461	2,732	437	1,771	45	32
Major oil-producing countries	36	69	2,388	3,588	544	8,529	55	36

^aIncome less than US \$500 per capita in 1985.

Sources: World Bank, 1988; and FAO, AGROSTAT, 1988.

Table 2.4. Population growth and food supplies, 1965–1985, in developing countries.

Country group	Population growth (%/year)	Food production per capita (%/year)
All developing countries	2.2	0.8
China	2.0	2.6
India	2.3	0.4
Other low-income countries	2.7	0.3
Middle-income countries	2.4	0.7

Source: FAO Production Yearbook, various years.

more than three-quarters of the world's population. Yet they produce less than half of the world's grain output. This reflects not only their lower per capita food intake, but also the high proportion of grains fed to animals in developed countries. In addition, it makes clear why developing countries have become major net grain importers. Through imports they have been able to increase domestic food supplies or at least have avoided further deterioration in the face of rapid population growth (see *Table 2.6*).

The high intake of animal products in developed countries – in terms of calories, particularly protein – indicates the substantial use of grain for livestock feed: in other words, the indirect consumption of grains by humans. At the world level, close to 50% of all grains are consumed by livestock, indicating the importance of indirect grain demand.

The developing countries started out as exporters of agricultural products, which had a share of almost 80% in their own sales abroad and of 45% in world agricultural trade (both excluding oil). In recent years, however, their agricultural imports have caught up with sluggish export growth, causing their agricultural trade balances to move close to deficit. Food imports, particularly grains, have increased rapidly. Grain balances and use are shown in *Table 2.7*, where the role of the industrial market economies as the largest suppliers of grains to the world market can be noted.

North America, Oceania, the EC (mainly France and the United Kingdom), and South America (mainly Argentina and Uruguay) are the main grain-exporting regions. Some exporting countries such as Thailand are located in other regions, but by and large the important grain exporters have one feature in common: they are either European countries or former European colonies in temperate zones with fertile land and relatively low population densities, largely of European origin. Although we only present data for grains, for other food commodities the picture is quite similar. North America, the EC, and Oceania virtually monopolize the export markets for dairy products. With regard to meat and sugar Latin America is important as well. Asian and African countries are poorly represented in the lists of large food exporters, with Thailand as an exception.

Table 2.5. Relative contributions of commodity groups in nutrition, 1983–1985 average.

Country group	Cereals	Other veg. products	Animal products
	<i>% of calories</i>		
Developed market economies	26.1	42.2	31.7
Developed centrally planned economies and Eastern Europe	36.7	35.9	27.4
Low-income developing countries ^a	67.6	25.6	6.8
Middle-income developing countries	49.5	38.0	12.5
	<i>% of protein</i>		
Developed market economies	24.9	14.5	60.6
Developed centrally planned economies and Eastern Europe	36.8	12.4	51.7
Low-income developing countries ^a	64.1	20.5	15.4
Middle-income developing countries	48.6	19.4	32.0

^aIncome less than US \$500 per capita in 1985.

Source: FAO, AGROSTAT, 1988.

Table 2.6. Per capita changes in staple food production, imports, and consumption in developing countries, 1970–1986.

Country group	Production (%/year)	Imports (%/year)	Consumption (%/year)
Developing countries	0.71	4.32	1.24
Low-income food-deficit countries ^a	0.81	2.89	1.39
Africa	-1.25	4.82	0.37
Near East	-1.23	7.87	0.78
Far East	1.22	0.75	1.59
Latin America	-0.66	3.53	0.88

^aSixty-nine countries with GNP per capita of less than US \$940 in 1987, net cereal importers on average from 1983–1984 to 1987–1988.

Source: FAO, AGROSTAT.

We now examine the situation from the import side. *Table 2.7* also indicates that for grains the Soviet Union and Eastern Europe are the largest importers (40%) followed by the major oil-producing countries (16%), Africa (16%), and Asia and the Pacific (15%). Except for Eastern Europe, the large food grain importers are the oil-exporting countries in arid zones, city-states (Hong Kong,

Singapore), and heavily industrialized countries in Asia (Japan, South Korea). The case of the Soviet Union and Eastern Europe is somewhat different. Although rapid government-induced industrialization in the previous century had led to some neglect of food production, food deficits today are largely due to economic policies which since the 1920s have failed to promote food production.

Developing countries that have experienced food problems over the past decades do appear on the list of food importers although their role is not predominant. India and China, for example, have remained only modest importers. They have deliberately refrained from importing more, partly to preserve their foreign exchange for capital goods and energy imports, partly to protect their own farmers, and partly to maintain national security. We shall return to this in Chapter 6. Even if these policies had not prevailed, China and India would not have had the financial means to import amounts of food that would be significant on a per capita basis, and this also holds for most of the other countries with food problems.

The identification of the world's major food importers raises the issue of national agricultural policies. It would be simplistic to relate food imports directly to the failure of agricultural policies. Hong Kong, for example, can afford and can be expected to import food, but for less developed countries the need to import food has often been regarded as a sign of failure because, with populations largely dependent upon agriculture for their livelihoods, it would seem that the agricultural surpluses should be sufficient to feed the nonfarm sector. However, when the agricultural sector is heavily involved in the production of nonfood crops such as cotton or coffee for export, this is not obvious, nor is it evident that the land resources are necessarily sufficient to feed the population (see FAO, 1984).

2.3. Recent Trends

A look at recent trends in world food production permits further differentiation among regions. The clear deterioration in the situation in Africa is the main unfavorable development since the mid-1970s. Grain yields are low and stagnating (see *Table 2.8*) while populations are growing rapidly, at around 3% per year, and are

Table 2.7. The world grain market, 1983–1985 average.

Country group	Production (mln tonnes)	% of world production	Net imports (mln tonnes)
World	1,598	100.0	(-11.5) ^d
Developed market economies	553	34.6	-113.2
Developed centrally planned economies and Eastern Europe	257	16.1	41.5
Low-income developing countries ^a	578	36.2	16.6
China	301	18.9	5.9
India	146	9.1	1.2
Other Asia	102	6.4	2.8
Africa	29	1.8	6.7
Middle-income developing countries	198	12.4	27.0
Asia and Pacific	46	2.9	5.5
Middle East	35	2.2	11.4
Africa	19	1.2	9.7
Latin America	98	6.1	0.4
Major oil-producing countries	12	0.7	16.6

^aIncome less than US \$500 in 1985.

^bDemand equals production plus net imports; it includes food, feed, seed, industrial use, waste, and stock mutations.

showing no sign of stabilization. In the Far East grain yields have increased substantially, largely due to the expansion of irrigated areas under high-yield varieties. The population growth rate is about 2.2% per year and is slowly falling. In China the increase in grain yields has been accompanied by a significant reduction in birth rates, leading to a population growth rate of about 1.2%. As a consequence, per capita food supplies are now adequate. In Latin America, where population increases are about 2.3% as opposed to 2.5% in the 1970s, land resources are often abundant and it is the uneven access to these resources of different population groups that has created problems.

Thus, it seems that some large areas in the world are struggling their way out of the most critical situations, although the race between food production and population has not been won by production as yet. Per capita food consumption in 105 developing countries increased on average by only 0.6% per year between 1961

Table 2.7. Continued.

Demand ^b (mln tonnes)	% of world demand	% of feed in demand	Production (kg/capita)	Demand (kg/capita)	Self- sufficiency ratio ^c
1,585	100.0	46.0	339 ^d	337 ^d	100
440	27.7	75.1	681	542	126
298	18.8	64.7	659	766	86
595	37.6	18.1	224	230	97
307	19.4	26.3	293	299	98
147	9.3	8.2	196	197	99
105	6.6	10.6	198	204	97
36	2.3	11.0	98	121	81
224	14.1	38.8	226	273	83
51	3.2	32.9	237	266	89
46	2.9	35.1	300	398	75
28	1.8	20.0	114	172	66
99	6.2	48.5	254	255	100
28	1.8	40.3	175	422	42

^cDefined as production as percentage of demand.

^dImport-export gap in data source caused by statistical discrepancies and delivery lags.

and 1983. Population growth absorbed 80% of the increase in food supplies, and 77 countries had lower than average growth in consumption per capita, and of these 40 had even negative trends (IFPRI, 1988).

It is of little help to say, however rightly, that there is more than enough food in the world to feed everyone. This has been the case over the past two decades (in the years 1983-1985 average consumption was 2665 calories per person per day, compared with an estimated average need of 2380). Even if this had not been true one could still refer to the fact that 46% of grains were consumed by livestock. From this point of view, the world today already produces enough to feed more than twice its current population, although the diets would be less diverse. Many developed countries have problems in containing farm production rather than in expanding it. There is nothing new about this. It has been known for

Table 2.8. Some recent trends.

Country group	Index of food production per capita (1979–1981 = 100)		Grain yield (tonnes per hectare harvested)	
	1976– 1978	1983– 1985	1969– 1971	1983– 1985
World	99	103	1.81	2.44
Developed market economies	96	101	2.88	3.58
Developed centrally planned economies and Eastern Europe	108	107	1.65	1.95
Africa	104	94	0.80	0.85
Latin America	99	99	1.48	2.03
Middle East	101	98	1.21	1.46
Far Eastern market economies	99	107	1.33	1.87
Asia centrally planned	92	117	2.08	3.71

Source: FAO, 1985 (statistics for the world as a whole only become available with a two- to three-year delay).

many years that malnutrition results from poverty, and that poverty results from lack of access to productive resources.

2.4. The Occurrence of Hunger

Trends do not show the most dramatic occurrences of hunger – famine. A famine may be viewed as a sudden, epidemic spread of hunger, which is such that the population not only functions badly due to inadequate diets, but actually dies in large numbers. Famine is the less silent form of hunger. Chronic hunger as opposed to famine increases infant mortality rates and adult morbidity, but it does not necessarily kill and if it does, it is often indirectly through related diseases. It maims, physically and mentally. *Table 2.9* lists the main causes of recent famines. It also shows that government policy was related to its causes in only a few cases.

When a famine is caused by drought or floods, one may speak of it as a natural disaster, but it would be too easy to say that natural disasters cannot be avoided. For example, in 1987 major floods occurred in Bangladesh and a major drought in India, neither of which resulted in famines. When food stocks are adequate and

Table 2.9. Major famines since 1960.

Period	Country/ Region	Main causes	Estimated deaths (million)
1959–1961	China	Policy, weather	25.00 ^a
1967–1970	Nigeria	Civil war	2.50 ^b
1971–1972	Bangladesh	War	0.43 ^c
1972	India	Drought	0.83 ^c
1973	Sahel	Drought	0.10 ^c
1972–1974	Ethiopia	Drought	0.20 ^c
1974	Bangladesh	Flood	1.50 ^d
1979	Cambodia	Policy, war	0.45 ^c
1979–1981	Uganda	Civil war, drought	0.25 ^b
1983–1985	Ethiopia	Policy, civil war, drought	1.20 ^e
1988	Sudan	Civil war	0.25 ^f

^aErhun, 1989. In different sources, mortality estimates that differ by wide margins – in part due to variations in the number of years included – are also available. In Brown *et al.*, 1984, an estimate of 8,890,000 is given for the period 1960–1961.

^bGrolier Academic Encyclopedia, 1983.

^cBrown *et al.*, 1984.

^dAlamgir, 1980.

^eGiorgis, 1989. However, widely divergent mortality estimates also exist for this famine; Brown *et al.*, 1984, give an estimate of 30,000 for 1983.

^fAfrica South of the Sahara 1990 (p. 959).

are securely stored for emergencies such as floods, public distribution systems may greatly help to avoid famine and foreign aid can be used to supplement and replenish the stocks.

Droughts and floods are often caused by long-term environmental degradation such as deforestation, which is caused by human intervention. Also, even when rainfall or the flow of a river cannot be controlled, dams, ponds, pumps, and canals can help stabilize water supply throughout the year. Famines are caused by variability in food production and real incomes. Buffer stocks and water basins are appropriate ways to stabilize food supplies. More pervasive than famines and more stubborn also is chronic malnutrition (see *Tables 1.1, 2.10, 2.11, and 2.12*).

The data consistently show that sub-Saharan Africa and south Asia (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka) are the most worrisome cases – Africa because the situation is deteriorating so rapidly, and south Asia because the scale of the

Table 2.10 Prevalence of energy-deficient diets in 87 developing countries, 1980.

Country group or region ^a	Insufficient calories for an active working life (below 90% of FAO/WHO requirements) ^b		Insufficient calories to prevent stunted growth and serious health risks (below 80% of FAO/ WHO requirements) ^c	
	Share in population (%)	Population (million)	Share in population (%)	Population (million)
Developing countries (87)	34	730	16	340
Low-income (30) ^d	51	590	23	270
Middle-income (57) ^d	14	140	7	70
Sub-Saharan Africa (37)	44	150	25	90
East Asia and Pacific (8)	14	40	7	20
South Asia (7)	50	470	21	200
Middle East and North Africa (11)	10	20	4	10
Latin America and the Caribbean (24)	13	50	6	20

^aThe 87 countries represent 92% of the population in developing countries in 1980, excluding China. Numbers in parentheses are the number of countries in the sample.

^bIntake at this standard is sufficient for a person to function at full capacity in all daily activities.

^cIntake at this standard is sufficient to prevent high health risks and retardation in children.

^dThe low-income countries had per capita incomes of less than US \$400 in 1983; the middle-income countries had per capita incomes above US \$400 in 1983.

Source: World Bank, 1986. As the World Bank uses different assumptions in relation to income distribution than the FAO, the data shown here give larger numbers of undernourished people than *Table 1.1*.

problem does not seem to be lessening with time. To explain these developments an in-depth analysis is required, but for now we propose the following characterization of countries where hunger can be found:

- (1) Poor countries with poor land (e.g., the Sahel) and poor countries with good land, yet high population density, few mineral resources, and an agriculture-based industry or a government-

Table 2.11. Changes in the prevalence of energy-deficient diets in 87 developing countries, 1970–1980.

Country group or region	Insufficient calories for an active working life (below 90% of FAO/WHO requirements)		Insufficient calories to prevent stunted growth and serious health risks (below 80% of FAO/ WHO requirements)	
	Change in share of popu- lation	% change in number of people	Change in share of popu- lation	% change in number of people
Developing countries (87)	-0.06	+10	-0.02	+14
Low-income (30)	+0.04	+41	+0.03	+54
Middle-income (57)	-0.18	-43	-0.09	-44
Sub-Saharan Africa (37)	+0.01	+30	+0.04	+49
East Asia and Pacific (8)	-0.27	-57	-0.14	-57
South Asia (7)	+0.03	+38	+0.02	+47
Middle East and North Africa (11)	-0.25	-62	-0.14	-68
Latin America and the Caribbean (24)	-0.07	-15	-0.04	-21

See the footnotes to *Table 2.10*.
Source: World Bank, 1986.

Table 2.12. Protein-energy malnutrition among children under the age of five in developing countries.

Country group or region	Number of children (million)			Percentage of age group		
	1975	1980	1984	1975	1980	1984
Sub-Saharan Africa	14.8	16.1	19.5	24.7	23.6	25.3
Near East/North Africa	4.3	3.4	3.2	17.1	12.3	10.2
South Asia	89.3	93.8	97.7	73.9	70.0	66.7
Southeast Asia	16.1	16.4	17.5	37.1	34.0	32.7
China	20.6	19.0	16.0	25.8	22.1	17.9
Latin America/Caribbean	4.2	3.8	4.0	9.4	7.8	7.3
Developing countries	149.3	152.5	157.9	40.0	36.9	34.8

Source: World Food Council, 1988.

- controlled internationally weakly competitive manufacturing industry (India).
- (2) Countries with adequate resource endowments, but rapid population growth rates, inefficient agricultural technology, and (frequent) wars and civil unrest (e.g., Southern and East Africa).
 - (3) Countries with ample resource endowments, yet unevenly distributed access to land and education (e.g., Brazil and Colombia).

It would be premature to derive policy conclusions from such a rough classification, but it seems that for countries in category (1) the problems are most clearly economic in nature, relating to efficient factor accumulation and allocation, and to poverty alleviation programs. To resolve these problems, technical and economic assistance may help not only in making efficient choices but also in showing the world how difficult the problems are and that vast amounts of foreign aid may be required to overcome them.

For many countries in category (2), wars will have to end before any significant improvements can occur. It makes no sense to build dams or roads that may subsequently be blasted away. Efforts to improve education are also disrupted by warfare. On the other hand, peace may not ensure freedom from hunger or oppression. We have seen earlier that wars have been conducive to creating viable political units, allowing for migration and reallocation of land. It is hard to believe that this is a historical necessity today; it should be possible to obtain viable units by less harmful means.

Countries in category (3) do not suffer from wars. They have ample means but lack adequate social security systems that can act as safety nets for people in need. There, as elsewhere, the need to respect national sovereignty creates dilemmas; is it acceptable for the developed countries to exert political pressure on a government or a ruling elite simply because they believe their policies to be unacceptable? Would this be moral imperialism, ethnocentrism, etc., or simply moral behavior? However relevant this question may be, further discussion would mean that we would prejudge the case by taking it for a fact that the hunger problem often stems from a lack of fair national policies.

2.5. Aid and Aid Requirements: Some Back-of-the Envelope Calculations

If all hungry people were living in one single place without any rich around them, it would barely take US \$21 billion annually to provide them with sufficient food.[2] This would amount to a contribution of US \$20 per capita, or just 0.2% of the total incomes of the developed market and centrally planned economies. This is a modest amount. If, more realistically, it is a matter of supplementing an inadequate diet, for example, to the tune of one-quarter or one-third of what is deemed adequate, the cost would be reduced to some US \$5 to 7 billion, which is almost shamefully modest.

Unfortunately, the poor are not so easy to reach. As a consequence, the cost may be considerably higher when attempting to meet their food needs. They are widely spread throughout the world, and the aid given to them also leaks on to richer segments of the population unless it is adequately targeted. For example, low food prices benefit the rich also; the benefits of improved irrigation systems accrue in the first place to those who possess land; producer subsidies go to those who have the capacity to produce. In short, it is difficult and costly to design and implement measures that would mainly benefit the hungry. Higher levels of aid are needed to compensate for this "loss factor," which is unfortunate because a higher loss factor may reduce donors' willingness to give.

However, there also seems to exist a misunderstanding in this respect, in that the rich may also gain from a specific measure, and this fact is not in itself an indicator of a loss. Aid means that goods are to be purchased and in some way channeled to the poor. Someone has to sell the goods and services involved; otherwise aid would have no cost. Those who sell may gain from it, but, if the prices and the quality of those goods are appropriate, there is no loss involved.

Nevertheless, a loss factor remains. But even if we suppose that only one-tenth of the given aid reaches the poor, the amount required remains modest. It is only when we take into consideration that aid cannot continue to be given indefinitely, and that investments are needed that will enable the poor to become self-reliant in the future, that the amount really becomes large, because then it has to be multiplied again by a factor of anywhere from 4 to 10. On the other hand, future generations of rich people could be asked to

contribute as well, implying recourse to capital markets for a significant part of the funds, this time with donor governments as borrowers rather than the recipients, who would receive the amounts borrowed as grants.

These back-of-the-envelope calculations may give some indications of the magnitude of the level of aid involved. Currently, the rich give very little to resolve the hunger problem. The rich cannot expect this level of aid to resolve the issue, nor can they expect the developing countries to resolve all problems by themselves. They could give more without impoverishing themselves. We return to the question of why the rich should give aid to the poor in Chapter 6.

Notes

- [1] Germany became a colonial power relatively late and lost her colonies after World War I.
- [2] Assuming that they had no food before, which is pessimistic, but that they would be fed with commodities which are priced and have a calorie content of wheat (130 million tonnes of wheat priced at US \$160 per tonnes c.i.f. Asian/African ports. This would give 2400 kcal per day to the 512 million people estimated by FAO to be hungry in 1983–1985, assuming an energy content of 3450 kcal/kg of wheat). It may be observed that FAO finds a maximal amount of 260 million tonnes after more elaborate calculations that take into account a leakage to the nonfood-deficit population, the current level of nutrition and the specific requirements of the population in each country (FAO, 1985).

CHAPTER 3

Functioning of Food Systems

3.1. Introduction

Hunger in the sense that it is a world food problem and a universal concern is a recent phenomenon, even though hunger has been with humanity throughout its history. This change in the awareness and perception of hunger probably has as much to do with the growth of communications in the last decades, as with the thought of many that it should be possible to do something against it or even to eradicate it. Surpluses produced in the developed countries which go to waste or are fed to animals lead simply and directly to the question why simultaneous chronic hunger elsewhere should be tolerated.

The factors that account for disparities in access to food were given a historical setting in Chapter 2; understanding why such a situation of global inequity in food distribution has arisen over the course of the centuries is, however, only the first step. The next step concerns the question of how the system functions within this setting. The inheritance handed to present generations and to their governments circumscribes the progress that could (and can) be made. One should not underestimate the achievements of some countries, nor the worldwide ability to meet the food needs of most of the people that have been added to our global numbers. Nevertheless, the numbers of chronically hungry have risen, slowly but steadily, and have accelerated in times of economic distress.

To understand the operation of the barriers that stand in the way of reaching the hungry, we now describe the system that determines food demands and supplies, and which creates hunger and gluts simultaneously. The system that causes food demand to differ as much as it does, between countries and between people, is also capable of shipping large quantities of food across the globe, but apparently little to those in most need. Within this system governments operate, changing by their policies the availability and allocation of food, sometimes outside as well as within their own borders. Before suggestions can be given for policy changes that may benefit the hungry, even before analytical tools can be usefully built to study policy alternatives, one first needs to understand the operation of the food system. In the context of this report, views on its operation guided the formulation of the analytical tools described in Chapter 4 and applied in Chapter 5.

No attempt is made at this point to give value judgments and moral imperatives, yet it is difficult to avoid indignation when describing the inequity with regard to food, or to refrain from expressing preferences for some policies and dislike of others, for other than purely economic reasons. Nevertheless, that is what this chapter will attempt to do, leaving a discussion of relevant moral arguments to Chapter 6.

What constitutes a food system? In an economy where food is both produced and consumed, the term conjures up a picture of the many activities that make both of these activities possible and in fact integrates them. Obviously, transporting, storing, and processing are part of any food system, but so also are the production and acquisition of the implements and inputs for the production and the processing of the food itself.

The traditional rural subsistence household that produces all the food it needs, plus a bit more to pay for other needs, thus qualifies for the definition of a food system virtually by itself. Isolated rural villages qualify even more so, as inputs external to the household – for production and processing, the hoe and the cooking pot – are locally produced in exchange for locally produced food. This type of local food system stands in sharp contrast to food systems in the industrial countries where local self-sufficiency is no longer the aim, nor the imperative. The link between production and consumption has become a long and distant one, the producer

no longer knows who consumes his or her output and the consumer usually has no information about the origin of what is being eaten.

Nevertheless, a food system exists; for many people, but not for all, it has become a world food system, production and consumption interacting through worldwide markets. Not so for all, as in many developing countries significant parts of production serve to meet village or local food demand. And even for those subject to the interaction of global markets, most of their food originates within their own national boundaries. Out of the total world food production, only about 15% crosses national borders. Within the world food system not all people are equally subject to global interaction. For some – a declining part – the economic costs of participating in wider markets are too high due to distance and an inefficient infrastructure. For others – the major part – unhampered participation is limited because of government regulation.

There is also another door through which governments enter the scene. Neither the need for food nor its production are static over time, as populations and incomes grow, new technologies are adopted, and market integration proceeds inside the developing countries. Investments are needed to change the world food system over time. Many of the services required for agricultural development can only be provided sensibly by collective action, such as agricultural research, infrastructure improvements, and education. Particularly important are investments in land improvement such as leveling and terracing, drainage and flood control, and irrigation. Thus, both private and public sectors play a significant role in a dynamic world food system.

Apart from the fact that government efforts in these areas determine to a large extent the future growth of agricultural supplies, such investments also entail a cost to the government, adding to those already to be incurred for maintaining national security and domestic law and order. These costs need to be recovered and constitute the justification for taxation. In countries with diversified economies the tax burden can be spread over a broad array of collection points, but in many developing countries their dominant agricultural sector is bound to pay a significant part, if not all of it. Leaving out the role of governments from a definition of the world food system, therefore, appears to be an impermissible omission.

As a major part of activity and interaction takes place at the national level, food systems are first discussed at that level (Section 3.2), after which the international food economy is addressed in Section 3.3. In each section it is asked what people can or cannot do for themselves to gain access to the food they need, and what scope exists for governments to influence food availability and its distribution.

3.2. National Food Economies

National economies can be as different in their food systems as in any other economic and social dimensions. Efforts to classify countries are the pastime of many analysts. Rather than submit to any such rigor, we attempt here to describe some of the general features, some major differences, and some options usually considered by governments in the formulation of their policies. For specific typologies or country references we use the material of Chapter 2.

In this section we address, in turn, the main economic actors in any system, including the food system. First, the determinants of food demand are discussed, followed by those pertaining to supply; we conclude with a review of the role and objectives of national governments. International trade is referred to only in passing, since most of that topic comes under the subsequent discussion of the international food economy (Section 3.3).

3.2.1. Food demand

Incomes

Food is a basic human need that is indispensable at some minimum level for survival. Poor households may, therefore, need to spend 80% or more of their incomes to obtain a minimum intake of the cheapest available foods. With rising incomes their levels of food intake will change, initially by increasing the quantity consumed of their usual fare but subsequently by adding to the variety of the diet and the addition of more expensive food items. Thus, total expenditures on food tend to rise with incomes, but the share of food in

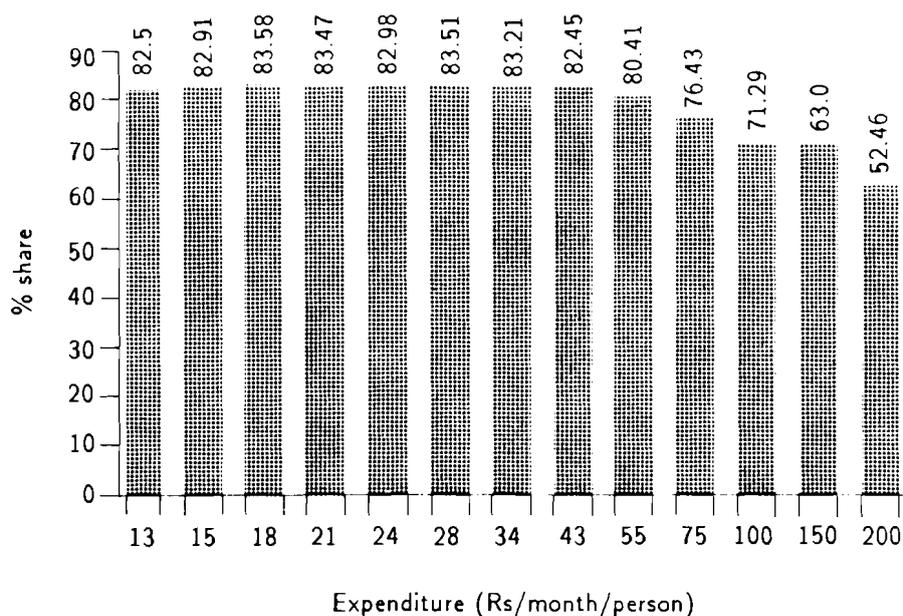


Figure 3.1. Perceived adequacy of calorie intake: share of total income spent on food in India.

total expenditures declines at the same time, except at very low levels of income. In India, for example, it is possible from detailed consumer and household income surveys to determine the income level at which food expenditures begin to show a significant and steady decline as a percentage of income. Once people raise their incomes above that level, apparently the worst of their food shortage is passed and they are in a position to spend an increasing share of their higher income on nonfood items (see Parikh and Tims, 1988, and *Figure 3.1*). Although each demarcation line for hunger or for poverty is by nature arbitrary, the inflection point in the line representing the share of total income spent on food is probably one of the best, with people and households with incomes below that point being clearly in a position where food shortage is the overriding concern.

With further increases in incomes the demand for staple foods increases only modestly and soon reaches a saturation level. In developing countries the income elasticity of items like rice or sorghum thus declines with rising incomes. Elasticities larger than

one initially, but also declining with higher incomes, are observed for the “preferred” foods such as meat, dairy products, and fruits and vegetables (see *Table 3.1*), yet there are significant differences between countries, depending on traditional food habits. In the Indian subcontinent the consumption of milk is high, even at low levels of income and therefore the income elasticity for dairy products is found to be low. In contrast, the population of China is only recently beginning to consume significant quantities of milk, thus exhibiting a high income elasticity for dairy products at rather high income levels.

Table 3.1. Selected income elasticities for basic food staples and meat at different income levels, 1980.

Country	Per capita income (\$)	Basic food staples	Meat
Ethiopia	140	0.33	0.87
India	240	0.27	1.13
Indonesia	430	-0.14	1.27
Egypt	580	0.05	0.89
Nigeria	1,010	0.08	1.01
Mexico	2,090	-0.07	0.57
Venezuela	3,630	0.13	0.43

Source: FAO, 1979.

The Composition of Food Demand

With further increases in income, saturation becomes the main feature of a larger number of food items. The quantity of food a human being needs has both upper and lower boundaries, neither sharply defined nor generally valid around the world, but which are nevertheless clearly discernible. Minimum food intake is usually found at 1400–1600 kcal per person per day, for slightly built people in warm climates. An upper boundary is about 3500 kcal per person per day for sturdily built people in cold or temperate climates. Expenditures are found to shift with further income increases to more expensive and processed foods for the same or only marginally higher amounts of calories. With higher incomes animal protein tends to be substituted for plant protein (see *Figure 3.2*).

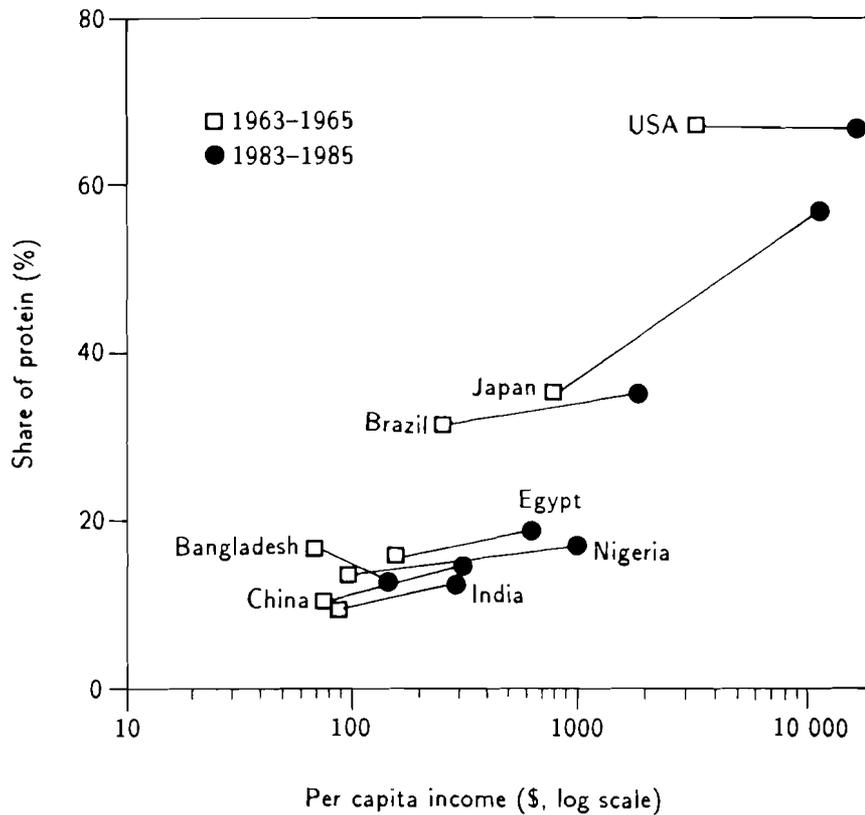


Figure 3.2. Relation between per capita income and share of animal protein in total protein, 1963-1965 and 1983-1985 averages. Sources: FAO, 1988; World Bank, 1988.

This shift to more expensive food takes two forms. One is the substitution of expensive items for cheaper items; the other is by way of further processing outside the consuming household, lengthening the chain from the agricultural producer to the consumer, and providing the latter with an ever-increasing range of "convenience" foods. Eating out in restaurants can also be included in this category. Both the shift to more expensive foods and the growth of processing imply that high-income consumers spend a much larger proportion of available income on food than is strictly necessary for an adequate diet. Nevertheless, that proportion may in fact be only some 20% of income in many industrial countries, or even less. Japan is an exception to that rule - at comparable

income levels Japanese consumers spend close to 30% of their incomes on food. One reason may be the high relative prices of food due to the high protection provided to Japanese farmers, particularly for rice and meat; another reason is the strong preference for quality food. It is interesting to note in this respect the relatively low nutrient intake in Japan in comparison with other industrial countries.

Demand for Crop Products at High Income Levels

Saturation of demand per capita for an increasing range of food items implies that at higher income levels the direct demand for food represents a weakening market for unprocessed agricultural products. At the same time, more processing does channel a growing part of the consumer's food expenditure to the processing sectors, rather than to farmers. However, it is unlikely that the agricultural sector will be brought to stagnation due to saturation of consumer demand for food, at least as long as population grows. The demand for preferred foods such as meat and dairy products may, in the early stages of a country's development, still be met by animals which get the bulk of their feed from grazing and from crop sector by-products. But these feed sources are limited in most countries and are not necessarily the most nutritious. The demand for animal products may soon set in motion a process to increase reliance on cultivated fodder and grain for animal feed, thus creating additional demand for the crop sector. The growth of demand for animal products thus creates new demand for grain for feed when direct consumer demand for grain is already saturated. As stated earlier, 46% of all grain produced worldwide are currently fed to animals.

Food Demand and Nutrition

The role of nutrition as part of food consumption is only one of the elements in the food equation. No doubt, at low income levels the search will be for commodities that provide a maximum of calories for a given amount of money, or even for expansion foods which make the consumer feel saturated (Tabor, 1989). But even in those situations detailed nutrition studies (Pinstrup-Andersen, 1988) indicate that improvements might have been possible for the same

expenditure. As mentioned in Chapter 1, even at low income levels the link between calorie intake and income is not straightforward. With higher incomes, the turn toward more expensive or processed foods may to some extent also serve the purpose of enriching diets in beneficial ways, but food traditions, tastes, and the desire to reflect status through the foods being eaten play an increasingly important role. It would therefore be wrong to equate the utility of food consumption with the nutritional qualities of the food purchased. The utility embraces a much broader range of qualities than only nutritive values. Particularly – but not only – at higher income levels both the quantities and the nutritional values of much of the food eaten may even have a negative correspondence with human health and an appropriate diet.

Other Factors

The demand for food depends to a large extent on incomes, but prices also play a role. We noted above that to some extent patterns of food consumption and calorie intake in Japan may reflect relatively high food prices. The relatively low cost of meat in some Latin American countries entails high meat consumption for given income levels. Price policies and their effects are discussed in Sections 3.2.3 and 3.3.2.

The most powerful engine of world food demand growth is increasing population. Compared with food production growth over the past 25 to 30 years of about 2.6% per year, population rose by 2.2% per year and thus absorbed virtually all additional supplies, leaving only a small margin for the expansion of demand associated with income growth.

A main feature of the food system as seen from the demand side is that at high income levels there is food saturation on a per capita basis. As population growth generally falls with higher incomes, the demand for agricultural products stagnates. More production will then put pressure on agricultural prices, and the terms of trade for farmers tend to worsen in the process. Demand adjustments to lower prices will be marginal as consumers will not spend more on food but will instead use their gain in purchasing power to increase their demand for nonagricultural goods and services, including further processing of their food.

At the other extreme, in poor developing countries, population growth and increased food demand due to increasing incomes may together easily exceed the capacity of the agricultural sector to produce sufficient quantities. Price increases may result, which may be exacerbated in years of unfavorable weather or floods. Price increases are particularly harmful for those among the poor who must obtain most or all of their food from the market, thus reducing their access to food. Price stability and timely access to imports are therefore high priorities for most developing country governments.

Hunger, Again

The characterization of countries in which chronic hunger occurs (see Section 2.4) showed that they vary considerably. Some are faced with constraints of arable land due to poor natural resources or population pressure. In others, farmers are constrained by a lack of technology, low levels of land and infrastructural development, or restricted access to land due to an inequitable distribution of ownership. Under these circumstances, we now examine the means by which the poorest households manage to obtain the minimal amounts of food necessary for survival.

At this point we must recognize that it is easier to characterize the poor in this way than to explain why others with similar initial conditions have been able to overcome their handicap. Also, there undoubtedly exists something like good or bad luck. Pests, natural disasters, and wars often strike individuals at random and spare others. Such random events can have lasting consequences and one should avoid rationalizing these, or attributing skills or other resources to those who are better-off. Although at the national level chance can perhaps be expected to play a lesser role, differences remain. Nevertheless, a few characteristics can be listed here with some degree of discrimination between the major regions where the hungry are most numerous. In large parts of Africa there is no immediate land scarcity but the levels of land development and technology are such that yields of staple crops are low and production is limited for each household by the amount of labor available during the main seasons when the land is worked (see, for example, Mellor and Johnston, 1984). Traditional farmers are mostly poor, and most of the poor are farmers, although this should not obscure

increasing landlessness in parts of Africa today. Strategies to improve the food situation in Africa will therefore focus to a large extent on improving the opportunities for agricultural development, which has been neglected for too long.

In Latin America the rural poor have been barred from benefiting because land ownership is highly skewed. Many have given up and moved to the poverty belts of the cities where 70% to 85% of the population now resides. Most have no permanent employment and are part of the informal urban sector (see, for example, the discussion on Brazil in Martine, 1988). For them, agricultural development and employment is a passed station; they now need skills and urban jobs.

The largest number of the hungry live in South Asia where the population pressure on limited land resources is high, even though major efforts have been made to improve the physical base of agriculture. *Figure 3.3* shows the prevailing situation in Bangladesh, by categorizing households according to main occupations, residence, and size of agricultural assets. In a situation of extreme resource scarcity three-quarters of all households cannot meet their minimum food needs; even medium-sized farmers who own land fall into this category.

The largest and worst-fed groups, however, are not farmers but either landless farm laborers or other rural dwellers who earn their income in the transportation sector as cart-pullers or carriers, road workers, and the like. They constitute virtually one-third of all households and survive (or not) on about 1500 kcal per day, almost all from rice. Again, attention is drawn to the observation that food intake levels differ considerably at similar income levels; those associated with farm activities appear to eat more than those outside agriculture. At the same time, agricultural workers may use more energy and so in fact may not be better-off.

Agricultural development in this situation derives its importance from the need to increase food supplies ahead of population growth, but it is unlikely to provide the jobs needed to earn more adequate incomes. Employment must be found elsewhere – but preferably still in the countryside – which puts a premium on education and training. The need to create jobs outside agriculture acquires even more strategic importance when development succeeds in raising incomes of the population generally. The demand for food

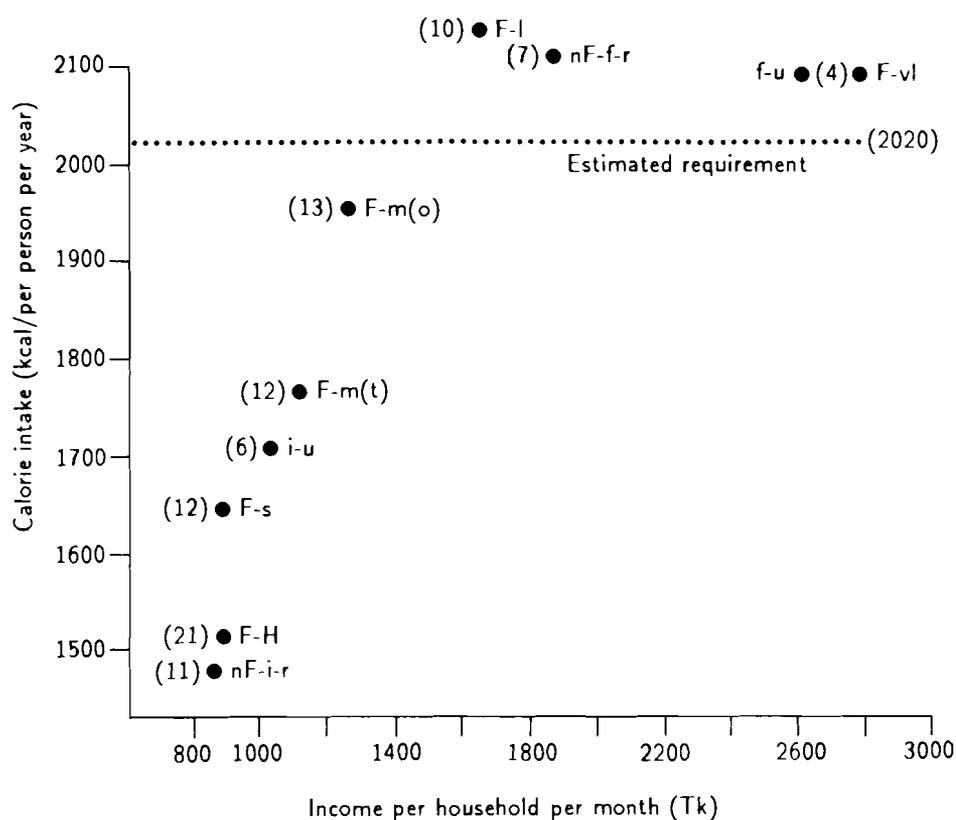


Figure 3.3. Income and calorie intake in Bangladesh by socioeconomic group, 1976–1977. F = farmers, divided into landless workers (ll), small farmers (s), medium farmers/tenants [m(t)], medium farmers/owners [m(o)], large (l), and very large farmers (vl); nF = nonfarmers, in rural areas (r) divided into formal (f) and informal (i) employment outside agriculture; i-u and f-u = urban dwellers with informal (i) and formal (f) employment. The six groups below estimated requirements make up 75% of the population. The exchange rate is Tk15 per US \$1 in 1976–1977. Source: World Bank, 1985.

– though not necessarily for all agricultural products – grows more slowly than that for most other goods and services, and rising agricultural productivity squeezes out labor from the food-producing primary sector. The transition to an economy that depends increasingly on output and employment outside the food-producing sector continues to require a flourishing agricultural sector to contain

problems of severe unemployment. The focus shifts, however, to opportunities for producing nonfood agricultural products and to the processing of agricultural products. These issues belong, however, to the discussion of supply.

3.2.2. Food supply

Supply Fluctuations

The instability of food markets can be traced largely to the production side and to the effects of weather variations, floods, and droughts. No country is immune to these influences and their impacts on food markets. Between countries there are significant differences in the variability of agricultural output due to weather. Relatively stable and reliable climates prevail in parts of Western Europe, North America, and parts of the tropics. The monsoon-affected countries such as India, or countries depending on the spate of the rivers such as Bangladesh and some West African regions, can be harmed by both too little or too much water arriving either too early or too late. Irrigation systems, to which we return, can reduce vulnerability to weather but cannot eliminate it entirely.

The Role of Agriculture in Development

After World War II and up to 1960 when the decolonization process took place, most observers of the developing world expressed limited faith in the potential of the agricultural sector to contribute to economic development (Leibenstein, 1962; Rosenstein-Rodan, 1961; Mahalanobis, 1961). The sector was viewed as traditionalist, unmotivated toward innovation, and at best capable of producing only a small proportion of the additional food needs associated with development and modernization in the urban centers. Some countries wanted to rely for urban food supplies on modern (sometimes expatriate) farmers or on state farms. In many countries price policies for crops centered on the production of export crops, both to earn foreign exchange and to generate government revenues. To achieve the latter, governments strongly intervened in the export crop trade and drove wedges between world market prices and

prices paid to farmers. In order not to distort the relative earnings of domestic versus export crops, intervention in food crop markets was needed. Low food prices benefit all those who buy part of their food in the market, but particularly the urban populations. This pattern of thought and of policy action has, unfortunately in hindsight, significantly influenced the development strategies of many countries. It has contributed to growing dependence, coinciding with the then prevailing view in North America that the disastrous developments in agriculture during the 1920s and 1930s should not be allowed to recur. Policies were therefore designed to ensure access to growing world markets for the staple products that they could supply competitively. At that early stage food aid was already one instrument, but not the only one, used to pursue this objective. For the United States, the creation of the FAO was also an element of the same world view (see Hambidge, 1955).

In developing countries perceptions have since changed considerably, particularly since the mid-1960s when it became clear what these strategies led to, and in which respects they were ill-conceived. One of these concerns the slow growth, price vulnerability, and more recently world surpluses of most developing country export crops. Another is that most of the Asian countries (except China, which followed an entirely different course) became dependent on grain imports, not only in years of disappointing harvests, but also in the best years. Although food aid did to some extent lighten the burden, the quantities of imports required exceeded food aid available to them and necessitated larger commercial imports. Food aid was also seen as a threat to independence. It is to be noted, however, that this perception concerning import dependence frequently tended to see food aid and food prices in world markets as the main cause. But in fact there are several examples, starting from the days of the Marshall Plan, and followed by a number of countries in the Mediterranean area and in Asia, which show that food aid can go hand in hand with a thriving agricultural sector. The neglect of agriculture by developing countries themselves has in most cases been the source of domestic imbalances, rising foreign exchange costs of imports and increasing dependence on food aid.

The need to reappraise agricultural strategies coincided with new opportunities to develop agriculture. In the mid-1960s new varieties of wheat and later of rice were developed which promised

significantly higher yields when accompanied by prescribed dosages of fertilizers and adequate and timely water supplies. The response of farmers to the new technology, particularly in irrigated areas, exceeded expectations and in turn necessitated a reassessment of views held about the responsiveness of farmers to economic incentives. Although in most Asian countries it has taken many years to shift policies toward a more favorable stance regarding agriculture, in most of them some sensible balance has been achieved over time in their development strategies.

In Africa agricultural policies similar to those that had prevailed in Asia have persisted longer and are now in the process of being adjusted. The need to do so is increasingly, but still reluctantly, recognized by African governments in the wake of a disastrous period when the long-term trend of agricultural production lagged significantly behind population growth. But what appears to be missing is the coincident opportunity, as improved technologies have limited scope for application due to a weak infrastructure of transport, organized markets, adaptive research, and extension, combined with the virtual absence of water control and usually unreliable weather conditions. The African problem is further aggravated by very large urban-rural income differentials and the power of urban populations to pressure their governments to maintain low food prices.

Physical Resources

Land is the basic resource for all agricultural production, but not all of the land is equally suitable for cropping or livestock grazing. Only a small part of all the world's land is suitable for either; cropland currently utilized covers 11% of all land and requires large investments to be extended.

The extent and quality of the land resources in the developing world is shown in *Table 3.2*; climatic suitability for rainfed agriculture is addressed in *Table 3.3*. The FAO/UNFPA/IIASA study was a global one, and by its comprehensiveness involved many assumptions. The assessment may therefore involve large margins of errors. According to this assessment only about one-fifth of the soils in the developing world do not suffer from some kind of inherent fertility limitation. There are considerable variations in regional soil

Table 3.2. Dominant regional soils in the developing world in million hectares.

Soil type	Africa	SW Asia	South America	Central America	SE ^a Asia	Total
Soils with no inherent fertility limitations	535.2 (18.6)	51.5 (7.6)	359.8 (20.3)	118.9 (43.8)	324.4 (36.2)	1 389.8 (21.3)
Soils with severe fertility limitations	419.1 (14.6)	2.1 (0.3)	722.3 (40.8)	16.2 (6.0)	219.9 (24.5)	1 379.6 (21.5)
Heavy cracking clay soils	98.8 (3.4)	5.7 (0.8)	24.9 (1.4)	13.2 (4.9)	57.9 (6.5)	200.5 (3.0)
Salt-affected soils	64.3 (2.2)	53.2 (7.9)	56.5 (3.2)	2.3 (0.8)	20.0 (2.2)	196.3 (2.9)
Poorly drained soils	152.9 (5.3)	2.6 (0.4)	179.9 (10.2)	12.7 (4.7)	75.8 (8.4)	423.9 (6.5)
Shallow soils	376.3 (13.1)	180.4 (26.6)	193.6 (10.9)	60.6 (22.3)	98.7 (11.0)	909.6 (14.0)
Coarse-textured soils	567.5 (19.7)	126.9 (18.7)	132.4 (7.5)	15.9 (5.8)	52.3 (5.8)	895.0 (13.9)
Semidesert and desert soils	459.2 (16.0)	230.9 (34.1)	93.9 (5.3)	31.8 (11.7)	42.7 (4.8)	858.5 (13.2)
Miscellaneous	204.8 (7.1)	24.1 (3.6)	6.9 (0.4)	-	5.9 (0.6)	241.7 (3.7)
Total	2 878.1	677.4	1 770.2	271.6	897.6	6 494.9

^aExcluding China.

Notes: Figures in parentheses are percentages of totals. Some soils exhibit several of the characteristics listed and only the main limitation has been considered in the generalized interpretation.

Source: FAO/UNFPA/IIASA, 1983.

resource endowments; southwest Asia and Africa having the lowest percentage of soils without fertility limitations. *Table 3.4* compares potential arable land to estimated land utilized in 1982 to 1984.

Table 3.4 suggests that large reserves of arable land are still available to be converted to agricultural use. However, some two-thirds of the potential reserve is concentrated in eight of the 93 developing countries included in the data, the largest reserves being available in Brazil, Zaire, Angola, and Sudan. A major portion of the land reserve in these countries is currently covered by tropical forests and may cause severe environmental hazards if brought into

Table 3.3. Dominant regional climates in the developing world in million hectares.

Climate	Africa	SW Asia	South America	Central America	SE ^a Asia	Total
<i>Cold</i>						
Severe temperature constraints	9.1 (0.3)	113.7 (16.8)	60.8 (3.4)	0.7 (0.3)	47.7 (5.3)	232.0 (3.6)
<i>Warm/cool</i>						
No severe temperature constraints						
Dry (0 days)	846.7 (29.4)	369.7 (54.6)	81.2 (4.6)	35.6 (13.1)	39.2 (4.4)	1 372.4 (21.1)
Inadequate growing periods (1-74 days)	487.9 (17.0)	72.6 (10.7)	114.6 (6.5)	62.2 (22.9)	54.6 (6.1)	791.9 (12.2)
Short growing periods (75-179 days)	545.4 (19.0)	98.9 (14.6)	230.4 (13.0)	63.2 (23.3)	201.9 (22.5)	1 139.8 (17.5)
Long growing periods (180-365 days)	969.2 (33.6)	22.5 (3.3)	1 163.5 (65.7)	109.9 (40.4)	467.8 (52.1)	2 732.9 (42.1)
Year-round humidity	19.8 (0.7)	-	119.7 (6.8)	-	86.4 (9.6)	225.9 (3.5)
Total	2 878.1	677.4	1 770.2	271.6	897.6	6 494.9

^aExcluding China.

Note: Figures in parentheses are percentages of totals.

Source: FAO/UNFPA/IIASA, 1983.

agricultural production. Most cropland is found in the large deltaic regions of the world; most human concentrations are found there because historically they offered the best opportunities for long-term survival. These are the regions where many wars have been fought (see Chapter 2), but also where most of the investments in land improvement have been made to control floods, to drain excess water, to construct terraces, or to irrigate.

Technology

Agricultural production requires inputs of human labor and of capital in the form of implements and draft animals. The proportions differ according to place and time, and depend on the conditions of climate and soils, the crops to be grown, and the demands to be

Table 3.4. Potential arable land and land utilized in 1982–1984.

	Africa	SW Asia	South America	Central America	SE ^a Asia	Total
Potential arable land ^b	840	70	815	75	343	2 143
% suitable for rainfed crop production	97	70	99	48	58	89
Total use	225	68	160	35	280	768
% of potential	27	97	20	47	82	36
Rainfed use	217	53	152	29	206	657
Irrigated use	8	15	8	6	74	111

^aExcluding China.

^bPotential arable land is derived from Alexandratos (1988) and may somewhat underestimate regional potentials in some cases due to incomplete country coverage of the underlying FAO study.

Source: Alexandratos, 1988; and FAO, 1984b.

met. Local knowledge built up over centuries of experience tends to dominate farming methods in many parts of the developing world, permitting survival of households often under risky circumstances. The intricacies of cropping patterns, their links to livestock farming, and the ability to supply food, feed, energy, and building materials bear testimony to their long history.

New technologies enter particularly in those regions that already provide secure access throughout the year and a reasonable degree of water control. Such developments change the traditional factor proportions and production patterns, and open economic links through markets that may have been only marginal. Most of these regions in India, China, or Indonesia are characterized by land scarcity, and small farmers are the dominant category – at least by their numbers, though not always in terms of their share of the land. Growing landlessness in most countries of South Asia, including migration flows to the cities, indicates the oversupply of labor in the rural areas of that part of the world. In China, where radical land reforms took place in the 1950s, strict controls on urban migration left a growing labor surplus in the rural areas that became visible with the rural reforms in 1978 and became the source of much industrial growth, with limited capital or access to technology, in small towns and market centers. Earlier efforts to educate the rural

population were an important factor in this development. Africa cannot progress quickly in terms of farm technology due to low levels of land development and rural infrastructure.

Worldwide agricultural production has grown consistently for several decades at a rate exceeding that of population growth. More land has been brought under cultivation (including transitions to double or even triple cropping in newly irrigated areas) but the rate of expansion has clearly declined over time. Yield increases have gradually taken over as the main source of production growth, due to new technologies (seed, fertilizers, and pesticides in particular), better farming practices, and shifts to more rewarding crops. Agricultural growth has consequently become centered in those regions where conditions are relatively good and public investments have been made.

Although agricultural production has so far grown faster than population, the question arises as to how long can it continue to do so in the light of growing populations with rising incomes. Both the expansion of the area under agricultural use and production intensification pose environmental problems.

In the various scenarios to be presented in subsequent chapters one may note that the projections of global and national production levels are well below the global production potential, and they do not imply the use of chemical inputs and irrigation beyond reasonable levels. For example, in our reference scenario, fertilizer use in the developing countries is projected to increase by some 5% per year between 1980 and 2000. This is in line with projections used by FAO (1988, p. 137), where fertilizer use in those countries is expected to rise from 43 kilograms of nutrients per hectare in 1982 to 78 kilograms for each hectare in the year 2000, an annual increase in total use of 4.6%. This is still less than half the level of fertilizer application of some 165 kilograms of nutrients per hectare observed in the EC in recent years.

Cultivated areas are often expanded through deforestation. When livestock grazing increases, village commons become degraded and forests are depleted. The intensification of agriculture based on chemical inputs and irrigation also leads to environmental problems. Chemical fertilizers and pesticide residues can cause water pollution, eutrophication, and loss of fish stocks. These, in turn, reduce production in agriculture. Similarly, irrigation without appropriate

drainage can lead to waterlogging and salination. The excessive exploitation of groundwater supplies lowers the water table and increases the costs of irrigation for all. Even the development of reservoirs for irrigation is often accompanied by the submergence of forests, deforestation in upstream forests, and accelerated soil erosion. These possibilities and the growing environmental concerns throughout the world require that we examine the significance of these effects in our analysis.

While all these environmental effects can and do take place, reliable estimates of their quantitative significance for agricultural production are not available. Moreover, one has to recognize that most of these effects take place over long periods and many can be redressed, given adequate resources. Thus, saline soil can be desalinated; the Dutch have routinely turned the soil into fertile soil, in reclaimed polders although at enormous costs. Yet, postponing such costs for the future and, presumably, richer generation may not be too irrational. In any case, many undesirable environmental side effects can be prevented by using appropriate production techniques. While this will increase the cost of cultivation, the productivity of the global agricultural system can be maintained and even improved. Therefore, in our analysis of the hunger problem, with its relatively short time frame, environmental considerations are not included. We had, however, investigated the issues of sustainability in our research (see Parikh and Rabar, 1981; and Parikh, 1988).

The main global environmental concerns of carbon dioxide and the greenhouse effect, the hole in the ozone layer, and acid rain can, in principle, affect agricultural productivity, but these effects, apart from their uncertainty, are not likely to create supply bottlenecks over the next two decades. Even the measures that may be taken over the next two decades to reduce these problems, such as the restricted use of chemicals, will not reduce global agricultural output significantly, but will increase the cost of applying the chemicals in a more targeted, effective way. More expensive food will make the problem of hunger that much more pressing and the conclusions of our analysis that much stronger.

Labor

Almost 50% of the world's labor force (including farmers and landless farm laborers) is engaged in agriculture. It includes most of the women who are registered as employed; in Africa the majority of farmers, particularly those growing food, are female.

Constrained land resources and limits on resources to invest in land improvement contrast with a growing labor force, only part of which can be employed in agriculture. Few developing countries have the land resources to accommodate their growing rural populations in agriculture, but even in those cases the limits will soon be reached or, in other cases, have been made effective by skewed land ownership. FAO estimates suggest that in the future at best one-third of the growth of the rural labor force, and maybe as little as one-quarter, will find employment in agriculture (FAO, 1981). The agricultural labor force is fully employed during only part of the year and the FAO estimates assume hardly any increase in the number of days worked per person.

This picture is dominated by the situation in the land-scarce countries of Asia, with almost three-quarters of the world's agricultural labor force. A slow growth of agricultural labor demand and substantial seasonal unemployment may in fact be intensified by mechanization, particularly in countries where land ownership is skewed. Avoiding urban drift and increased rural hunger require the strong promotion of rural nonagricultural employment, in turn placing a premium on rural education.

In several African countries employment in agriculture may increase substantially, since land availability is less of a constraint in Asia. The use of less suitable land may, however, reduce land and labor productivity and as a consequence more people will be faced with inadequate food and hunger, particularly in years of bad harvests. At the same time, the ecological risks increase with the expansion of cultivated land.

In many Latin American countries, the agricultural labor force declined during the 1960s and 1970s (see *Table 3.5*) – the only exceptions are Brazil and Mexico, where the agricultural labor force increased during the 1960s and declined in the following decade. *Table 3.6* shows the share of the agricultural labor force in total labor for some developing countries. It has declined in all countries listed.

Table 3.5. Agricultural labor force in selected developing countries in thousands.

Country	1960	1970	1980	1988
Argentina	1,628	1,511	1,344	1,223
Brazil	12,094	13,642	13,784	13,523
Chile	763	669	604	593
Mexico	6,169	6,500	8,341	9,161
Venezuela	823	804	793	765
Algeria	1,744	1,294	1,262	1,379
Egypt	4,330	4,812	5,158	5,761
Kenya	2,838	3,755	5,837	7,217
Nigeria	15,895	18,467	21,866	25,930
Zaire	6,823	7,708	7,456	8,492
Bangladesh	14,024	16,625	18,802	22,167
China	n.a.	336,229	406,131	451,179
India	137,725	157,043	185,017	208,859
Indonesia	26,061	27,149	32,180	34,351
Pakistan	8,810	10,218	13,883	16,936

Source: Own calculations from data reported in *World Tables*, fourth editions (World Bank, various years); *FAO Production Yearbook* (1988).

The message from *Tables 3.5* and *3.6* is that agriculture cannot absorb the growth of the rural labor force. As a result, people either migrate to the cities or rural underemployment increases. In Brazil, it is estimated that 13.5 million people migrated to urban areas during the 1960s and 15 million people in the 1970s (Martine, 1988). For South and Southeast Asia migration did take place, but not enough to avoid rising underemployment in agriculture. In rural China, where migration to the cities is strictly controlled, since 1976 the growth of rural industries has taken up some of the slack in the labor force. The main reasons why agriculture is able to absorb smaller and smaller labor shares are the increasing mechanization of agriculture and the shortage of new land that can be cultivated.

Pricing of Agricultural Products

What has been the role of prices in this process of agricultural development? Several developing countries have discriminated against their agricultural sectors through negative protection and

Table 3.6. Agricultural labor share in total labor force in selected developing countries (in percent).

Country	1960	1970	1980	1988
Argentina	20	16	13	11
Brazil	52	45	31	26
Chile	30	23	16	13
Mexico	55	44	37	31
Venezuela	35	26	16	12
Algeria	67	47	31	26
Egypt	58	52	46	42
Kenya	86	82	81	78
Nigeria	73	71	68	66
Zaire	83	79	72	67
Bangladesh	87	81	75	70
China	n.a.	78	74	69
India	74	72	70	67
Indonesia	75	66	57	50
Pakistan	61	59	55	51

Source: *World Tables*, third and fourth editions (World Bank, various years); *FAO Production Yearbook* (1988).

overvalued exchange rates. It appears from most of the available research (Mellor and Ahmed, 1988; Hayami and Ruttan, 1985) that higher agricultural prices relative to prices of all other goods and services exert in particular a long-term impact on agricultural growth through factor accumulation. In the short run there are possibilities of positive effects through improved capacity utilization, but these tend to exhaust themselves quickly. FAO's study of price policies concludes that the

total production response to prices is large enough for prices to matter, but low enough to rule out the possibility of increasing price incentives alone fueling sustained growth in agriculture. Raising them where those have been kept low, sorts its effect largely through the enhanced attractiveness of new technologies but these require new investments in water control, farm equipment and infrastructure services before they can be adopted.

Resources take time to be mobilized for that purpose (Mundlak, 1988), and, if undertaken, will have an impact on agricultural growth only over the course of years.

Changing relative prices between different agricultural outputs has more immediate effects, by changing factor allocations between various crops and other outputs. Many governments have in the past shown concern with the demand and supply balance for a single agricultural commodity, and have therefore changed its price at intervention points. The response of output can be significant, but not enough account is taken of the fact that part of this response is at the expense of other products. Some of these products may subsequently become the focus of similar concerns and the cause of similar policy adjustments. Agricultural price policies thus often become a patchwork over time of incidental crop-specific measures without much of a view, or even objective, about the overall performance of the agricultural sector or about the needed coherence of the entire policy framework.

Investment

Much of the debate on price policies focuses on price levels and on short-run production effects, whereas long-run effects on production capacity through investment is treated less prominently. Nor is much attention given to the importance of stable price levels as part of investment-promoting policies or to the more structural measures by governments that can increase farmers' choices. These choices are most commonly discussed and analyzed in a short-run framework, concerning alternative output mixes, different technologies, and marketing channels. The instrument of price policy and the introduction of new technological packages can, however, run out of steam in terms of output responses or may even fail from the beginning when the economic and physical environments of farmers are not improved, lifting the constraints that inhibit their behavior. The limits of price and technology policies are most clear in large parts of Africa, even though yields are still very low, or elsewhere even when yields are already significantly higher. Parts of the Soviet Union come to mind as an example where the lack of processing infrastructure – including transport, storage, and distribution – puts a brake on the process of agricultural growth itself.

In the long run yields are upgraded not only through improvements of the land cultivated but also through the infrastructure provided to allow better market access. The needs for research and effective extension follow logically, since they must provide and convey the new technologies adapted to the changing environment. Increasingly this will require farmers to be educated and trained to enable them to participate in the process of agricultural development. Progress in that respect has been patchy at best. Some investments can be expected from the farmers themselves, perhaps by adding improved quality livestock to their herds, planting fruit trees, or treating soil. But the bulk of the investments requires either a difficult process of collective decision making by all farmers concerned – as in the case of irrigation facilities – or that a decisive role is played by the government.

Many of the essential ingredients for increased yields and production can only be expected to be provided by the government if these are to be technically sound and mutually supportive. Investments are needed in the areas of research and development; extension, education, and training; roads, markets, and storage; and irrigation, drainage, and flood control. By their very nature, all of these investments require government initiative and implementation for the common good; they should not be left to private parties. At this point we move to discuss the role of government in a wider context.

3.2.3. The role of governments

Intervention Needs

National security and the maintenance of domestic law and order constitute the most basic tasks of any government. In developing countries governments also play active roles in promoting growth, equity (income parity), and food security. Food policies are important in both developed and developing countries. Several tasks pertaining to resource development have been mentioned above. Considerations of access for all play a role in the assignment of such tasks to a government, as in the case of roads, extension services, or education. The avoidance of unfair benefits to the few at the expense of many is a reason for not allowing irrigation systems to be

designed and executed by farmers themselves. Also the costs and the risks of investments in resource development may exceed the borrowing capacity of the potential beneficiaries, instead suggesting the need for government-led financing and the introduction of users' charges. Government investment programs for resource and infrastructure development are the building blocks for long-term development.

Agricultural Policies

Whatever the general extent of government interventions may be, virtually all do engage in activities that are directly concerned with the agricultural and food sectors of their economies. They do so particularly to protect the purchasing power of some or all of their citizens, such as groups of consumers, agricultural producers, or government departments (or their budget resources). These aims are usually pursued through price interventions designed to affect both their levels and their stability. Each government faces dilemmas in the design of price policies, since it must compromise between imported instability and the domestic desire for stability, producer interests (high prices), consumer interests (low prices), and its own limited budget resources. Even so, price policies by themselves are insufficient and must be accompanied by complementary non-price actions (Streeten, 1987).

The means by which governments intervene and the extent of involvement differ widely among countries and over time. Some industrial countries, particularly land-abundant agricultural exporters, are reluctant to intervene in price levels. European countries and Japan intervene to support farm incomes. But at the other extreme, governments in countries where food is a sizable part of consumer expenditures cannot follow that example. They prefer to intervene at least enough to ensure reasonable price stability of basic consumer goods and keep them rather low to limit inflation. Maintenance of adequate stocks, timely access to imports, a reliable crop forecasting system, and domestic procurement are the standard elements of these policies. Again, public investments in storage and stocks are needed, together with current outlays for reporting systems and transport.

For several developing countries with large agricultural populations and limited resources with which to promote their economic growth, there is one more dilemma concerning labor markets. In those countries, laborers migrating from agriculture may not find jobs in the nonagricultural sector or may push other laborers out of theirs. In such countries the large armies of urban unemployed will tend to force governments to keep food prices low, thus making it less attractive for farmers to produce and remain within agriculture. To promote food production in such countries governments have often resorted to subsidies on farm inputs. Clearly if in a move toward trade liberalization the input subsidies are removed first and food prices are left unaltered to keep the peace in the cities, then a change may easily occur where virtually everyone loses. The farmers will lose because of higher input costs and the resulting fall in output; the urban unemployed will lose because of food scarcities and increased migration from rural areas; and the government will lose because of the need to purchase food abroad to maintain food availability in urban areas at reasonable prices.

The difficulty facing many governments in rich and poor countries alike, and in market as well as centrally planned economies, concerns the issue of stability at what costs. Many have been willing to do so at all costs, with the consequence that consumer prices for staple foods have increasingly dropped below international prices – particularly when currency devaluations take place – and below equivalent producer prices for those commodities. Consumer subsidies, which in some cases amount to 30% of total financial resources of the government, have been observed in the past, in turn reducing the scope for the government's developmental role and subsequently causing social unrest when attempts are made to change the price regime. Price stabilization needs its own carefully implemented flexibility to avoid such dead ends.

Whenever agricultural production is inherently unstable because of natural conditions, supply fluctuations facing stable demand volumes can give rise to considerable price swings for the producers. When a substantial part of output is consumed by subsistence farmers from their own production, market supplies and prices will show variations of even larger amplitude than production, tempting speculation or hoarding, which may add to the swings.

Price Policies

When prices fluctuate, farmers will continuously adjust their cropping patterns and engage in risk-avoiding production practices that may reduce output levels over time. There may be gains, therefore, from market stabilization measures undertaken by the government. Price instability today is to a large extent related to exchange rate movements, so that governments should understand the limits to stabilization measures and the risks they themselves may run (Ahmed, 1988). But these are also potential long-term benefits, through a better climate for farm investments which affect long-term agricultural development positively. Prices in a free market, by being low in years of good harvests and high when there is a short crop, tend to penalize small farmers who find market prices low when they have a surplus for sale and high when they need to buy in the market.

The European Community (EC), through its common agricultural policy (CAP), has completely severed the relation between internal and external prices for about half of its agricultural output. Although not unique, it is the largest market segmentation of its kind. It starts by setting its own producer prices at which it is willing to purchase from farmers and charges variable levies on imports to bridge the gap between internal and external prices. Farm income objectives determine price levels, which are kept stable or rising over time. At the same time, stability by design in a major market can have a destabilizing effect on the remaining (world) market. The incentives provided by this system have turned Western Europe (which in the 1960s was a net importer of almost all major agricultural commodities) into an exporter of an increasing range and volume of these commodities since the late 1970s. Surpluses are sold internally and externally with subsidies; internal sales are kept as much as possible outside regular market channels but subsidized exports compete directly with exports from other countries.

Policy dilemmas in this case were decided in favor of stability and of farmers, at the expense of consumers and taxpayers in the EC who pay more for their food. For the majority, food is only 15% to 20% of their total expenditure. But rising subsidies have necessitated also a larger tax take, still leaving the EC very little room for

the financing of nonagricultural programs and entailing the unpleasant task of frequent negotiations with member states in attempts to remain financially viable. At the same time, the competition offered by these subsidized exports has not gone unnoticed by other agricultural exporters, causing severe friction internationally.

The Issue of Protection

The EC attempts much more than just price stability: it wants to shift incomes and income growth in favor of the agricultural sector. Similar policies for the same purpose are pursued in other, particularly developed, countries (*Table 3.7*). The opposite takes place in, for example, Thailand (rice), Argentina (beef, wheat), and Pakistan (cotton), where substantial export levies are charged by the government, shifting income away from agriculture. Overvalued exchange rates for developing country currencies add to this in no small measure.

Most developing countries levy significantly higher import tariffs on industrial goods than on agricultural products, or have other import restrictions that raise the prices of domestic manufactured goods above international prices than is the case for agricultural products. As a consequence, there is a shift in the domestic terms of trade against agriculture and a real income loss to farmers. One should note, however, that most farm households in developing countries, notably on smaller farms, derive a substantial part of their incomes from nonagricultural activities and may also benefit from lower relative food prices when they obtain part of their food from the market. The effects on the livelihoods of the poor are equally uncertain, depending on what determines wage rates for rural landless laborers.

Price policies are a means of stabilizing markets and of transferring incomes between groups of citizens or between them and the government itself. They are instruments intending to give equal chance to all in a stable economic environment, yet they are also instruments that can cause costly distortions of output, trade, incomes, and government finance. These are evident from past experience and counsel care in their application. In particular, when the burden of their implementation is entrusted to a weak

Table 3.7. Relative nominal tariff equivalents^a of agricultural products as percentages of the world market prices using consumer prices, three-year averages for 1980–1982: reference scenario.

Country	Wheat	Rice	Coarse grains	Beef and lamb	Dairy	Other animal products	Protein feed	Other food	Nonfood agriculture
Argentina	-21	7	-20	-27	-17	-22	-0 ^b	-32	-5
Australia	15	27	29	-5	-7	40	15	14	-4
Austria	42	-5	85	74	34	11	20	10	46
Brazil	13	2	-16	-13	22	-36	-11	-18	-19
Canada	13	-7	14	25	53	-1	-18	-12	15
Egypt	30	-6	21	72	14	83	1	-23	-29
Indonesia	-2	-12	-17	3	10	15	-4	-16	-36
Japan	35	253	42	52	106	43	134	44	98
Mexico	-7	12	7	12	-3	22	-11	17	-33
Nigeria	44	76	15	42	51	106	-18	-12	-16
Pakistan	23	68	50	37	28	31	-2	-17	-17
Turkey	31	44	20	61	249	63	55	6	-5
EC	84	65	42	61	70	26	35	5	26
Kenya	10	0	0	-25	25	5	-5	-10	-10
New Zealand	0	0	0	0	0	20	0	0	0
Thailand	0	-20	-10	-25	30	-10	-10	-5	-25
India	68	2	9	9	48	3	1	-28	-9
USA	0	0	0	25	80	-5	0	5	25

^aThese are calculated as the difference between border prices and domestic consumer raw material prices, and depend on the direction of trade (see Parikh *et al.*, 1988).

^b-0 means a small negative number; +0, a small positive one.

government administration, the results can be most distressing, inflicting more poverty on rural areas, less reliable food supplies in cities, extra costs to the government, and foreign exchange constraints.

Distribution Policies

In principle, price policies operate in the same direction for all producers or consumers, large or small, rich or poor. People start with unequal endowments, both social and economic. What this means for a government that is seen as the focal point of a society's moral concerns is discussed further in Chapter 7. In practice, governments

do use some resources with the intent to benefit weaker strata of the population, in both developed and developing countries. Some of the more important instruments concerning food and agriculture are briefly mentioned here.

Food rationing, dual pricing, employment guarantee schemes, or food-for-work programs usually serve the purpose of providing food to people who lack adequate purchasing power to buy it themselves. Because food is to be provided at lower prices or against work performed, the costs to the government can be substantial. The implicit attempt at market segmentation may not fully succeed, with leakages adding to the cost. Nevertheless, considerable experience, both positive and negative, has been acquired over the years, suggesting feasible ways to improve the diets of the poorest people. The use of particular channels (school meals, distribution through maternity health clinics, etc.) or of particular commodities that are considered inferior goods by less poor categories appears to be attractive. But it should also be noted that in several countries some of these public schemes (notably rationing in which limited quantities are given to ration cardholders at less than the market price) appear to cater mostly to the civil service, the police, the military, and the urban population. These programs are not necessarily objectionable since they help to stabilize urban incomes and may stave off social unrest; an important criterion is that they should not add to the instability of the remaining food markets. But they hardly qualify under the heading of redistribution. Also food distribution systems suffer from a less than complete targeting to those most in need, as leakages are bound to occur. For example, a study by Gavan and Chandrasekera (1979) of Sri Lanka reports that a one-pound rice ration led to a net increase in rice consumption of six-tenths of a pound. After adjusting for substitution of other cereals and noncereals the increase in all food consumption was only a little over a tenth of a pound of rice equivalents. Similarly, in Egypt, Alderman and von Braun (1984) found that rations of bread rather than of wheat flour favored the urban dweller but that the opposite held for the rural poor. Pinstrup-Andersen (1988) notes that the choice of the commodity as the carrier of the subsidy is very important.

Another example of a redistributive policy is progressive taxation of income. In most developing countries taxes on incomes make only a small contribution to government revenues and have limited redistributive impact. In many countries high indirect taxes on luxury goods consumed by the rich probably have a more regressive effect on incomes than the income tax. It should also be noted that in several countries (including some of the industrial ones) agricultural incomes are not taxed. Large landowners are obviously the main beneficiaries of this policy.

Asset Redistribution

Finally, incomes can be redistributed in a more radical way by redistributing productive endowments, particularly land. In land-scarce countries the redistribution of land is sometimes said to be a redistribution of poverty, but the experiences in Japan, Korea, and Taiwan after 1945, and China in the 1950s and even more since the rural reforms of 1978, demonstrate the importance of redistributing an asset with increasing productivity and value. Extensive land reforms are usually the results of a revolution (such as in China), are brought about by foreign occupiers (Americans in Japan, mainland Chinese in Taiwan), or follow a war in which erstwhile landlords have been defeated (Japanese landowners in Korea). Thus, they seem only to occur under exceptional and forceful circumstances. Access to credit, new crop technologies, and modern inputs are strongly associated with land titles, so the redistribution of land can be a powerful means of reducing inequity and also of increasing agricultural production. In that sense it has a lot in common with the distribution of benefits in the process of industrialization when the entire labor force previously had access to all levels of education. To a large extent, redistribution avoids the development of an elitist economy. But resistance against too drastic land reforms is usually strong. Some countries follow a gradual course, linking land reform to land development. Thus, as a condition of land consolidation programs or the introduction of irrigation, limits are set on holdings of improved land involving a measure of redistribution of land.

Summing Up: The Costs

All of these measures to promote, stabilize, and redistribute income and its growth impose the need for public resources and thus an adequate tax system. Whatever way these resources are mobilized, it will always affect disposable incomes in the economy. In principle, many ways are open, but choices are far from easy to make as each kind of taxation carries with it some measure of distortion. In developing countries the choices are limited because incomes are low, reducing the scope for significant revenues. A weak administration leads to a choice of taxes that can be implemented with simple rules and rates, at points where controls can be easily installed. Indirect taxes on goods belong to that category, since they can be levied at the source of production, at particular collection or processing points, or at the border.

To a large extent the taxation of agriculture (which in some developing countries is substantial) takes that form, particularly by taxing agricultural exports. Sometimes this is done through border levies but more often parastatals are set up which are given an export monopoly and which also set domestic procurement prices. To prevent farmers from switching to other more remunerative crops, some governments prescribe minimum acreage allotments to export crops, in turn requiring a control system to enforce them. Taxation of this kind appears to be conducive to neither the buoyancy of government revenues nor to agricultural development.

3.3. The International Food System

Nations are linked into the world economy by trade, capital flows, and small movements of labor. The tendency, at least with respect to trade and capital services, has been toward greater interdependence. What holds true in general also applies to food and agriculture. By the beginning of this century agricultural trade consisted mainly of grain exports from North America and tropical products from the colonies, both mainly flowing to Western Europe. Today a much larger share of agricultural production is traded internationally and many more countries are engaged in the exchange of a

broad array of agricultural products, including their processed forms.

For a variety of reasons nations have maintained or even strengthened the roles played by their governments with regard to farming and farmers. In this section we describe the international food system along those lines: nations as actors, each with policies of their own, interlocking through competitive international markets. Within that setting we take another look at the place of the poor in this system - those who lack the purchasing power to buy sufficient food. The role of aid, and of food aid in particular, is also discussed.

3.3.1. Nations as actors in the world food system

Divergent Trade Positions

All countries participate in international trade in agricultural products, but their particular position and importance differ widely. First, there are only few major exporters in the land-abundant countries of the Americas (Canada, the USA, Brazil, and Argentina) and the remaining southern hemisphere (Australia, New Zealand, South Africa, and Zimbabwe). They all share the characteristic that they were settled - sometimes rather resettled - by migrants from Western Europe in the eighteenth and nineteenth centuries who introduced large-scale farming and cattle raising. Good climatic conditions and the provision of infrastructure made it possible to produce large volumes of agricultural output that exceeded the domestic demand of these relatively sparsely populated countries. Large-scale mechanized monocultures enabled low-cost production and international competitiveness. In Brazil and parts of Africa competitiveness was achieved to some extent with cheap labor.

Western Europe, whose agriculture has been brought under a common EC regime, has in recent years turned from being the largest agricultural import zone of the world into a net exporter. The northern continental part of the EC traditionally exported dairy products, but for virtually all other agricultural products the EC needed to import. In addition to its roughly 35% share in world dairy export markets, it now accounts for 15% of international grain

supplies (including grain equivalents) and of sugar. The EC also exports meat, but remains an importer of fish, fruits, vegetables, and vegetable oils. It has become a force to reckon with in international markets, after a period when other exporters had already lost their sales in the EC market itself. This change of position has much to do with the agricultural policies described in the previous section. The agricultural policies of the small European countries that are not members of the EC show many similarities with those of the EC; the same holds true for Japan.

The position of the Soviet Union and the East European countries is somewhat surprising. A considerable potential for food production remains untapped, and, next to Japan and Western Europe which are both land-scarce, the region has become one of the major agricultural importers. Again here, past policies have a lot to do with this performance, even when admitting that natural conditions are less stable and that large production swings are unavoidable. But the region did not have 50 years of continuous bad weather. With the recent political changes this may change in the years ahead, but for the time being it holds an element of uncertainty for the outlook for world agricultural markets.

The same applies to China, another major agricultural producer which in the past maintained a balance in its external agricultural trade but which has recently stepped up its imports. Land scarcity combined with a rapid increase in the demand for animal products suggest increased reliance on imported food, but government objectives concerning grain remain formulated in terms of achieving self-reliance in grain. It is not clear in what way this issue will be resolved in the years to come. From *Table 9.8* it can be seen that most of the remaining countries play a modest role. Some Asian countries are fair-sized exporters, but others are net importers. Sub-Saharan Africa as a whole is a small trading group with a small agricultural trade surplus. The only significant other group on the import side consists of the oil- and gas-exporting countries of the Middle East and North Africa, most of which have income levels permitting a high level of food intake but which have little if any land suitable for agriculture.

Table 3.8. Trade in agricultural products by main regions in 1985 in billion US dollars.

Region	Exports	Imports
North America	56.6	42.6
Brazil, Argentina	16.3	1.9
Other Latin America, Caribbean	18.2	10.7
Australia, New Zealand	12.4	2.7
South Africa, Zimbabwe	1.8	1.2
Western Europe	103.8	128.2
Japan	2.3	27.6
USSR, Eastern Europe	12.2	27.4
China	7.3	6.6
India	2.6	1.6
Indonesia	3.8	1.1
Malaysia	5.9	1.8
Thailand	3.9	0.9
Other Asian developing countries ^a	10.3	16.0
Middle East, North African oil exporters	1.8	22.5
Other Middle East, North Africa ^b	4.2	4.5
Other Africa	9.3	6.7
Total World	272.7	304.0

^aIncluding Oceania.^bIncluding Israel and Turkey.

Source: FAO, 1985.

National Policies and International Markets

The nature of the interactions by all these nations in the world food markets is controlled by two basic considerations that cannot easily be brought into harmony. On the one hand, virtually all countries with an agricultural sector within their boundaries want to set their own sovereign objectives and policies with regard to their own agricultural sectors. At the same time, virtually all countries expect world markets to provide them with remunerative outlets for their surpluses and with food imports at affordable prices. It implies an attitude by governments that can easily become unreasonable. It

will not matter all that much if small trading countries try to improve their self-sufficiency in food through subsidies to farmers, or distort markets with their domestic stabilization policies. But when large trading nations increasingly separate their domestic food market from the international market, one can no longer expect the latter to remain well-behaved.

A common characteristic of national agricultural policies is their orientation toward domestic objectives and issues. Almost everywhere, the stated objective is a reasonable degree of self-sufficiency in staple food products. At higher levels of development, when domestic demand for agricultural products lags increasingly behind overall economic growth, farm incomes become a growing concern, inducing measures to raise their level beyond what the market offers. Both objectives – self-sufficiency and income parity for the farm population – lead to protectionist measures at the expense of the few exporting countries and of domestic consumers.

3.3.2. International markets

The Actors in the Market

The effects of national interventions in agriculture are first of all visible in the domestic economy where shifts in supply, demand, and prices occur. Changes in imports and exports transmit part of the effects to international markets and become magnified since, on average, only some 15% of agricultural production is traded. The international market has neither the policy-making authority to fix upper and lower bounds on prices, nor the resources to intervene. In some commodity markets arrangements were proposed or implemented in the past, a few of which remain operational. These arrangements were usually endowed with limited resources and few instruments, and they often created tensions between participants. Compensatory finance arrangements do exist to tide over countries that are hurt by reductions in world prices of their major exports or by price increases of imported cereals. It is to be noted here that in the quest for stabilization and compensation the potentially benefiting countries derives in large part from governments wishing to maintain stable income levels from export monopolies. At the

same time, these public bodies pay stable – but mostly low – prices for farmer products.

On the whole, international markets are free markets where nations offer their supplies and enter with their demand for imports. Prices adjust and are usually volatile because of the relatively small size of the markets and because a considerable part of supply volatility inherent in agricultural production itself enters the world market. It is not easy to operate in those markets as risks are high, particularly when account is taken of the additional risk of exchange rate fluctuations. To stay in those markets, large amounts of risk capital are needed and traders must be able to absorb and interpret massive amounts of information to be on the “right” side of the market in time and to ensure an economic return on capital. The risks for private trade are made even larger when governments, which have large resources at their disposal and may be willing to make financial sacrifices to meet domestic objectives, are also participating in the international market.

Whether markets are in all cases competitive is a matter that is widely discussed. Many markets for agricultural commodities have a limited number of private trading houses, only one or two exchanges worldwide with restricted membership, or a small number of processing firms. Allegations are frequently made that they can, or do, rig the market, especially those for wheat and coarse grains, sugar, tea, coffee, or cotton. The likelihood of this being the case need not to be ruled out but nevertheless seems small. In the short run gains can undoubtedly be made by inventory policies geared to market expectations. But the costs and risks of attempting to force the market in a particular direction for more than a short while are too high to be within reach for virtually any firm. The risks are particularly high when governments can enter markets with additional supplies.

Market Distortions

Returning again to policy issues, the protection of agriculture in rich but relatively land-scarce countries of Western Europe and Japan, and for some commodities in the USA and Canada, has effects on both the level and the volatility of international prices. Production has grown rapidly behind the barriers of protection, first reducing

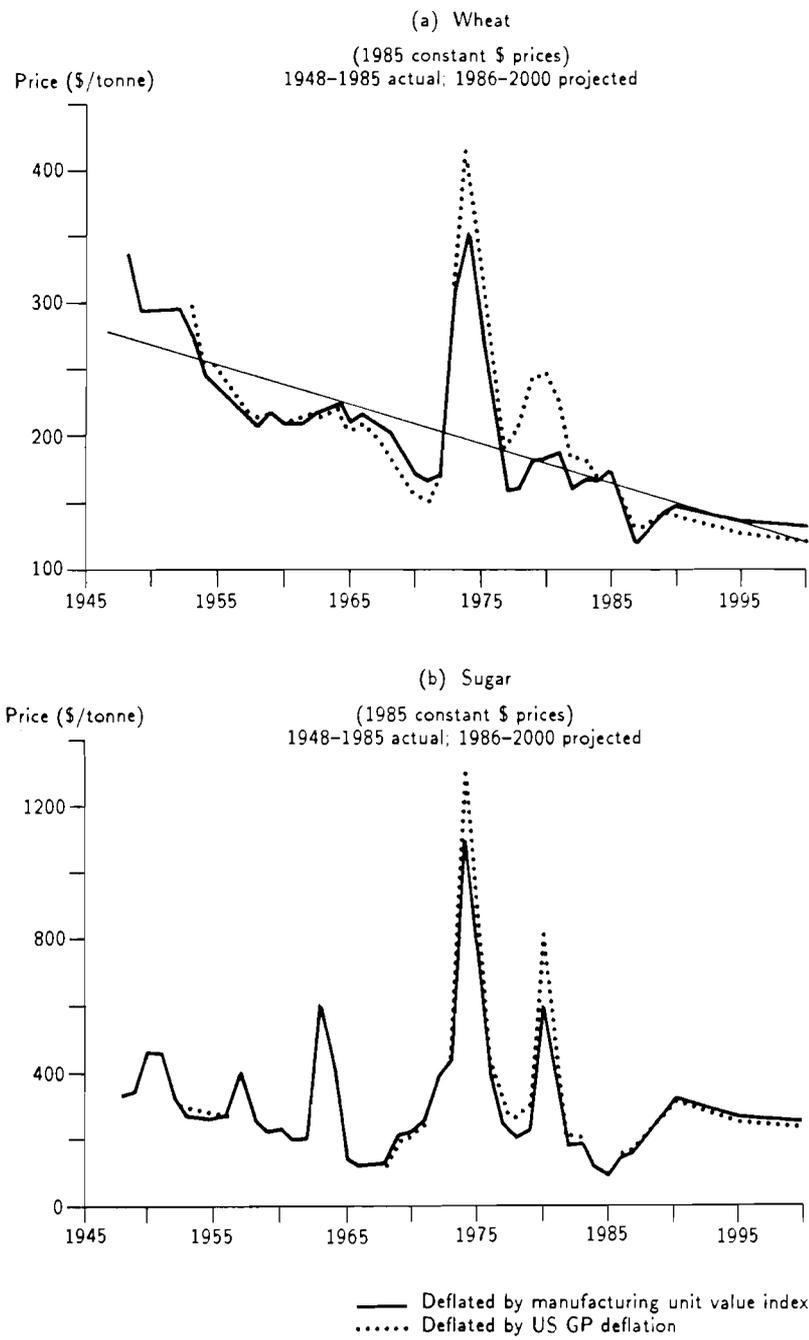


Figure 3.4. Price movements in world markets for wheat and sugar.
Source: World Bank, 1986.

these countries' demands for imports and subsequently increasing world market supplies, offered at subsidized prices. Temperate-zone products such as dairy, and those competing with tropical products such as wheat and sugar (see *Figure 3.4*), have shown substantial declines in world market prices, measured by international purchasing power for nonagricultural goods and services. At the same time, when a crop failure somewhere outside the protected countries leads to higher world prices, prices within the protected countries remain unchanged, without inducing reduced demand for imports or more export supplies. Similarly, a crop failure within the protected country will be fully reflected in additional import demand, but not in internal prices. In both cases the adjustment is entirely passed on to the world market and to other countries with open trading regimes. The volatility of world markets is increased.

World markets for major agricultural products are subject to short-run and long-run distortions. Countries with no major stake in world markets, particularly if they are small net importers, will not see this as a major problem as long as these distortions do not interfere with their domestic policy objectives. However, exporting countries not wanting to subsidize their exports undoubtedly react differently as their export earnings are reduced and they may need to take costly measures to maintain their market shares.

Analysts and policymakers have different views when defining what constitutes an intervention and even more what constitutes a distorting intervention. Governments have a vast array of instruments available to influence agriculture directly and indirectly; these differences are not a matter of taste or political preference but are genuine. Virtually every government intervenes at some time, so that some can now claim that their interventions are not distorting but intended to offset distorting interventions by other governments. Exporting developing countries cannot participate in that race because they cannot afford the costs of subsidization. They must adjust their trade and their domestic factor allocations.

3.3.3. International adjustment

Surplus production has continued to increase in both the land-abundant countries and the highly protected ones, with world prices declining in some instances to historic lows in the last few years. It has also led to large and costly intervention stocks held by governments – subsidized sales for fodder, for army consumption, for distribution to disadvantaged groups, or for subsidized export sales and food aid. The measures do not cope with the surpluses themselves, but with their disposal. More incisive measures are increasingly being taken to dam the accumulation of surpluses, such as by paying farmers to leave land lying idle, by limiting price guarantees to particular quantities, by reducing the scope for selling farm products to intervention offices, or by outright reduction of guaranteed prices. The effectiveness of these measures is not satisfactory in all cases but recently a somewhat improved balance of demand and supply has been reflected in a recovery of world market prices.

Two basic causes which have led to these measures of retrenchment can be mentioned. One is the budgetary cost of gluts; the other is the ominous consequences for international trade relations, particularly between the EC and the USA. Where costs are concerned, virtually all industrial countries have experienced serious fiscal problems that are difficult to bring under control and have led to a reduced willingness to tolerate high farm support costs. For the EC an additional reason is the need for more budgetary room to maneuver in the course of economic unification. Agricultural support in the EC is subject to considerable fluctuations due to exchange rate movements, and this provides an additional reason to limit liabilities and to make structural changes in the support system.

The trade aspects are of more immediate concern, as sometimes threat and counterthreat become a daily routine, in some instances followed by actual measures restraining trade. It should be noted that agricultural products have never effectively come under the rules of the General Agreement on Tariffs and Trade (GATT), which set the standards of conduct for international trade. Its past efforts to maintain a liberal trading climate in the world have always excluded, by agreement of the parties, the agricultural sector. The short-term action and counteraction of the past has

created a haphazard structure of ad hoc arrangements that may reduce conflagrations and acrimony, but sacrifice a good bit of consumer welfare in the process, of which a substantial part is foisted on the developing and importing countries as the weakest partners in this play.

In the Uruguay Round of trade negotiations the GATT formed a separate committee on agricultural trade where measures are being discussed toward more orderly trade relations. One proposal is a prohibition of export subsidies to avoid the entrance of high-cost production into world market competition. Another proposal concerns the replacement of variable border levies by fixed border charges, which will expose protected markets to movements in international markets. A possible third (alternative or complementary) proposal is a gradual reduction of the cultivated acreage.

Abolishing subsidies and variable levies is not the same as a move toward free trade. It permits the maintenance of a system of quantity controls, geared to domestic demand, by products coupled with high guaranteed prices for those quantities (possibly even higher than is currently the case) to compensate farmers for lost volume. All production would then serve domestic markets, the costs would be passed on to domestic consumers, and in years of low international prices deficiency payments would probably be made to maintain farm incomes. Whether a system of quantitative controls would work depends on technological developments and their impact on production growth. Also, the question will be raised to what extent exports can be added into the production quotas, particularly when higher world market prices are expected to prevail due to the phasing out of export subsidies. There is every reason to expect farmers to raise the issue of their "rightful share" in the world market, even when this revives - openly or in a more complex and hidden way - the issue of export subsidies.

This is the basic dilemma. Once all the existing paraphernalia of bureaucratic controls are in place, the major exporters will be under strong pressure to negotiate shares in the world market and to fix the price range. An agreement of this kind should be seen for what it is: an international cartel that pursues its farmers' interest at the expense of its own consumers and of the importing countries. The odd situation prevailing now, with free competition between few exporters, is obviously in no one's best interests. It inflicts costs on

all suppliers that are immediately raised to the level of political conflict, since governments must assume the costs. Governments are not in a position to withdraw from their role as major actors because of their domestic agricultural objectives, so they are pushed toward negotiated market shares and production restraints. The Boren-Boschwitz proposal of 1986 advocating cooperative supply adjustment strategies is one that moves in this direction and continues to be strongly debated. The alternative route, toward free trade in agriculture, is longer and more arduous, requiring the dismantling of the current control and support systems and their replacement by some form of deficiency or other compensation payments coupled with acreage reductions. The last strategy is essential in order to avoid a situation in which either the cost of deficiency payments becomes too large or the agricultural income objectives move out of reach. At the same time, world market prices may still remain disappointingly low. Policymakers face a dilemma either to create a cartel or to step into the uncharted terrain of trade liberalization. In the latter case acreage reductions are essential, and in the former they will be hard to avoid.

3.3.4. Adjustment, aid, and hunger

An end to gluts, whatever way it is brought about, will bring higher world market prices in its wake. Developing countries will consider higher prices a mixed blessing, with benefits to farmers and from exports, but additional costs for imports and for consumers. It poses the usual problem for these countries: how to pass on price incentives to farmers without engendering social unrest in the cities, or alternatively incurring unsustainable subsidy costs due to maintenance of lower consumer prices. In the case of those consumers already at the margin or below safe nutritional levels, measures will be needed to protect them from higher food costs at the expense of government budget resources.

There is a *prima facie* case here for additional external assistance, avoiding the reallocation of limited budget resources to food subsidies for the poor. However, this should not be mistaken for a plea to provide more food aid, since the subsidy costs do arise irrespective of whether the country is a net importer or exporter of

food, or self-sufficient. Aid is needed in a form that enables the government to provide food subsidies to the poor without disrupting its ongoing programs. This calls for program support; if the country happens to be food importing and the type of food required for its market happens to be available under food aid, so be it. In fact, when food aid can substitute for commercial food imports, this is attractive in that it is the purest form of convertible financial aid. Hunger is a large problem, aid to cope with it within a reasonable timespan would also need to be massive (IFPRI, 1988), possibly in the order of doubling net flows of aid and reallocating between countries as well. This may seem unlikely, but we return to that in Chapter 6.

There is a popular notion that food aid serves particularly to cope with the human devastation caused by famines. However, emergency food aid in most years does not exceed 20% of total food aid shipments, the remainder being supplied to countries which need regular imports to meet market demand but lack foreign exchange to import commercially. The popular notion of food aid as emergency relief stems largely from confrontation of a large public through the media with appeals for its support when famine threatens many lives. Nongovernmental organizations (NGOs) play an important role, using both permanent and temporary actions to address specific emergencies. They have the advantage that they are capable of mobilizing a large audience into action and support. At the same time, they are not tied to governmental channels at the recipient country side. This last attribute is worth mentioning as it encourages donor governments to channel resources through NGOs when there is good reason to mistrust the capability or the willingness of a recipient government to use aid receipts, in particular emergency food aid, to benefit famine-affected population groups.

Most food aid consists of grains. In recent years aid-financed grain imports were less than 10% of total grain imports of the developing countries, or about 9 million tonnes yearly. Around its mobilization, allocation, and delivery there is a strong international framework of organizations, with the World Food Programme (WFP) at its core. Early warning systems notify the donor community of impending food shortages; there are regular meetings to assess overall and country needs and to coordinate bilateral and multilateral action. Funding is also provided to meet the nonfood

costs of transport and distribution. Still, the amounts of available food aid remain strictly limited and the case for larger (and sometimes also more timely) flows could convincingly be defended.

The direction of policy change is probably in the opposite direction: if gluts were to end, so would most food aid which has not been able to shed its image of surplus disposal. No doubt improvements did come about over the years in the quality of food aid, with more attention given to what is needed in markets of destination rather than to what happens to be available in intervention stocks. It remains an important and useful instrument of emergency relief and famine assistance, but it is not necessarily a good instrument of long-run assistance to development (see von Braun and Huddleston, 1988). Even for the poor it holds true that they want to spend some of the additional income obtained as food for other purposes. Ultimately, at the national level the additional purchasing power injected by way of food aid will show up as additional demand for imports of which only a small part is food. Program aid is therefore preferable, with income support to the poor and in a policy context that enables additional import demands to be met.

3.3.5. The food system and the hungry

The way in which the world has been divided among its inhabitants, and the constraints imposed on some countries and governments, cause hunger to persist. It is easy to criticize the performance of the governments of developing countries meeting the food needs of their populations. Yet, the constraints imposed by the developed world, such as restrictions on the movements of labor, capital, and technology, are overwhelming factors causing the fundamental polarity of the system. Many of the policy changes now considered with respect to world agriculture and trade, however important from other angles, do not seem too significant when looked at from the perspective of the hungry.

CHAPTER 4

The Need for a Comprehensive Analytical Tool

4.1. Characteristics of the BLS

The study of hunger and poverty in its proper national and international context required the development of a new modeling system. Some of the reasons why previously existing models, or systems of models, did not appear suitable are briefly summarized here and the main characteristics of the Basic Linked System (BLS) are presented.

4.1.1. Geographic classification

Models used for economic policy analysis should identify specific policy instruments and decision makers, and should therefore be designed for use at the level at which policies are made. Even international agreements have to work through national policies, so that countries need to be treated as units in a system of national models. Global models without a country dimension but operating at global, continental, or regional levels do not tell us "who should do what," and so are not suitable for economic policy analysis.

Table 4.1. Models in the Basic Linked System.

Models with common structure	Models with country-specific structures	Regional group models
Argentina	CMEA	African oil exporters ^a
Australia	China	Africa medium-income exporters ^a
Austria	India	Africa medium-income importers ^a
Brazil	United States	Africa low-income exporters ^a
Canada		Africa low-income importers ^a
Egypt		Latin American high-income exporters ^a
Indonesia		Latin American high-income importers ^a
Japan		African medium income
Kenya		Southeast Asia high-medium exporters ^a
Mexico		Southeast Asia high-medium importers ^a
Nigeria		Asia low income
New Zealand		Southwest Asia oil exporters
Pakistan		Southwest Asia medium-low income
Thailand		Rest of the world
Turkey		
EC		

^aThis classification refers to net agricultural trade.

The risk is to move to the other extreme of wanting to model all countries, which is neither a feasible proposition nor strictly necessary: it might easily lead to the use of a common structure of national models of such simplicity that it may defeat the purpose of the analysis. In the world food system it is possible to distinguish between countries that are large enough in terms of their national food systems to warrant separate models. Other countries which are smaller in those terms can be grouped together and do not need a fully specified policy module as they are price-takers in the world food markets.

In the BLS 20 countries (including two country groups, each with a common policy framework) are modeled as national units; these represent some 80% of world food production, consumption, and trade. The European Community (twelve countries) and the members of the Council for Mutual Economic Assistance (seven countries, the Soviet Union and Eastern Europe) are each represented by one national model; this set of models embraces 37 countries. The 130 countries and territories accounting for the

remaining 20% of the world food system are grouped into 14 regional group models using geographic location and the main characteristics of their national food systems on the world market as criteria for their classification (see *Table 4.1*).

The BLS is therefore a tailor-made system for the analysis of food issues. Other issues such as industrial development, the world energy economy, or international capital flows would require appropriate reclassification of countries to suit those purposes.

4.1.2. Commodity classification

Obviously a modeling system concerned with food issues should have the major food items as separate commodities. Their classification should be the same in all models that constitute the global system to permit international linkage.

It is not sufficient to make a modeling system of a partial nature, only containing food items or only covering agricultural products. This would result in a modeling system that deals mostly with the production side of the food equation, but with food demand largely exogenous since the demand generated by incomes outside agriculture is not modeled. Partial analysis is not attractive for that reason, as it does not permit a satisfactory representation of price formation, price policies, or the interactions between the agricultural and the nonagricultural sectors and intersectoral allocation of production factors.

The full representation of all demands for and supplies of food require economy-wide modeling with a commodity classification that is exhaustive. Nonfood agriculture needs to be included as does the nonagricultural sector. The models define agricultural products at the producer level. At the consumption level these commodities are consumed jointly with nonagricultural outputs in proportions prescribed to represent the inputs and costs of processing the agricultural commodities between the farm gate and the final user.

4.1.3. Micro-foundations and actors

The food system as part of the national economy consists of actors, each with endowments and constraints, responding to signals reaching them through markets or otherwise. The models must identify those actors, describe their behavior exhaustively for the national economy, and integrate them through the classical identities on quantities and financial flows. The models actually distinguish agricultural and nonagricultural producers, consumers, and governments as actors, placing them in the context of a general equilibrium framework. That framework is comprehensive in that it embraces the entire economy, all actors and all foods and services without unaccounted sources of supply or demand.

The BLS models (except one) do not distinguish classes of actors such as consumers by income groups or agricultural producers by size of productive assets. The exception is the BLS model for India. Models of the same type, but not linked into the BLS, do exist for Bangladesh, Indonesia, and Thailand. It is unlikely that one could make another version of the BLS in which all national models would feature classes of producers and consumers. They require knowledge of a country's socioeconomic structure that does not allow generalization and standardization of model structures, leading to a much more decentralized effort and therefore major coordination problems to ensure that models can be linked (and delivered in time).

For the analysis of poverty and hunger a classwise approach is desirable, particularly for the purposes of policy analysis. The BLS can do this for India, and for the other countries with detailed models it can be done by using the assumptions and findings on aid flows and international prices as exogenous variables for country scenarios. Greater detail in the policy modules of these models add to the usefulness of such scenarios. For the other country indicators relating to variables such as agricultural and nonagricultural production per capita incomes have to be used.

4.1.4. International linkage

Domestic demand and supply forces determine a country's imports and exports under a constraint of net capital inflows determining the permissible current account deficit on the balance of payments. Net exports, by commodity, of all countries meet in the world market where prices adjust to clear markets. These price adjustments are transmitted back to all countries and cause deviations from the permissible current account deficits, so that world market price adjustments followed by domestic adjustments must take place until the world markets clear.

Changes in domestic and international policies of the major trading countries or changes in capital flows lead to a different course of trade and price adjustments in world markets and in all national economies. In that way, the BLS is an appropriate tool for tracing the effects of policy changes in one or more countries on the economies of all others. In the case of India directly, and for a few others indirectly, these effects can be traced further to particular population groups. The analysis of issues concerning hunger and poverty in an international setting requires both a BLS and the more detailed national models used here.

4.2. The Analytical Apparatus

The system of linked national agricultural policy models was developed by IIASA's Food and Agriculture Program (FAP) with the help of a network of collaborating institutions. It constitutes a system that lends itself to the study of the effects of alternative policy measures on the domestic food situation in given countries. These measures may be taken by their own governments, by the governments of other countries, or by international organizations operating under specified international agreements.

4.2.1. The BLS of national models

Currently in the Basic Linked System there are three types of model, as shown in *Table 4.1*. The first set contains what are called the Standard National Models, all of which were developed at IIASA. Although they have a common structure they are individually estimated. The parameters are separately estimated for each country from country-specific data. The second group contain some detailed models built by collaborating institutions; these models do not necessarily follow the common structure of the Standard National Models. These models have relied on country-specific data and so embody much more country-specific policy structures. The third set of models represents groups of countries in a simpler yet methodologically consistent way.

Although national models may have greater commodity detail, the international exchange among the national models takes place at the level of the ten commodities shown in *Table 4.2*. The BLS is a dynamically recursive simulation model solved in yearly time steps.

Table 4.2. Commodities considered in the model.

Wheat	Other animal products
Rice	Protein feeds
Coarse grains	Other food
Beef and lamb	Nonfood agriculture
Dairy products	Nonagriculture

4.2.2. A typical FAP national policy

The building blocks of the IIASA/FAP model system are the national models; each reflects the specific problems and characteristics of that particular nation. Although the national models do not differ in their structure, they are country-specific in their contents, particularly in their descriptions of government policies. The FAP model system enables such diverse models to be linked, but requires that all national models have a common sector classification at the international trade level (nine agricultural and one nonagricultural

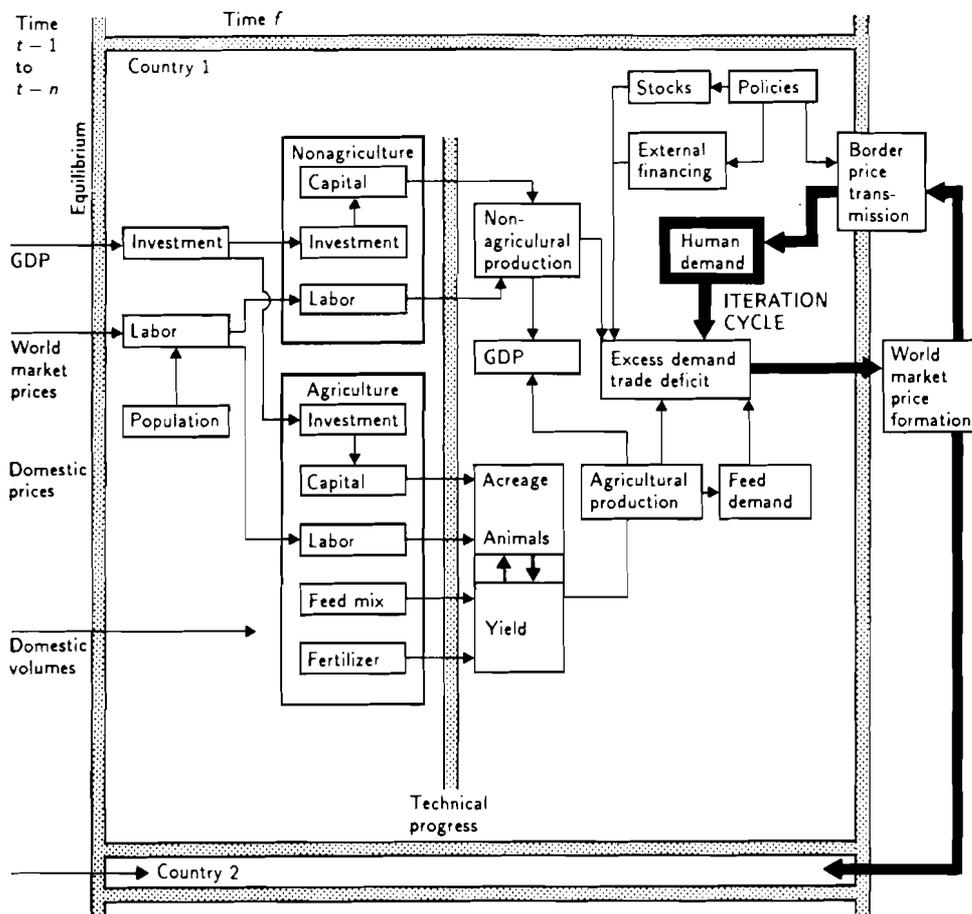


Figure 4.1. Information flows in a typical national model.

sector) and meet reasonable additional technical requirements. For example, net exports have to be continuous functions of relative world prices and be independent of their absolute levels. Even though the national models differ from each other, the broad structure is common to all. In some, food supply and demand are distinguished according to income groups. The information flows in a typical model are shown in *Figure 4.1*.

Past prices and government policies affect production decisions. The domestic production in each sector of the economy accrues to each sectoral groups. The income this represents is

determined by the price that these products command. For example, if farmers have grown two million tonnes of wheat and one million tonnes of rice, they would have an income of twice the price of a million tonnes of wheat plus the price of a million tonnes of rice, minus the cost of producing wheat and rice. These initial entitlements of the different products for the various groups may be redistributed by government policies.

Given these entitlements and world prices, groups trade among themselves under the influence of government policies, which include national market policies (price, buffer stock, trade), public finance policies (balance of payments, public demand, direct taxation), and international market and finance policies (agreements on prices, buffer stocks, trade, financing). The resulting exchange equilibrium determines the domestic prices, net exports, tax rates, and the consumption patterns. In the process of exchange all the markets are cleared within the (national) balance of trade constraints and the income and resource constraints faced by the various actors. Within the broad schematic outline of such a national model, the methodological approaches do differ from model to model. Some of the methods most commonly used are as follows:

Supply responses. Four alternative approaches are used in the various models:

- Econometric estimation of acreage response and yield functions based on past performance. These include relative profitabilities, critical inputs, and factors as explanatory variables. This is the approach followed in the models of India, the USA, and one version of the Canadian model.
- A nonlinear programming model to allocate land, factors, and inputs to different crops based on estimated production functions is used in the IIASA/FAP models.
- A linear programming approach integrating economic and institutional aspects with agronomic potentialities and constraints is used in models of Thailand and in one earlier version of the model for Bangladesh.
- A hierarchy of linear programs is used in the models of centrally planned economies (Hungary and Poland) to describe

and coordinate the behavior of planned sectors and various agricultural subsectors.

Income generation. Within the BLS, only the model for India distinguishes different classes of actors based on the distribution of assets such as land, draft animals, equipment, and so on, and the product is distributed across these classes as income entitlements accruing to labor, land, capital, etc. In other models, not part of the BLS, a similar approach is adopted. In the developed country models no income distribution is included because food consumption is hardly affected by it.

Demand behavior. Demand behavior in the BLS is described through estimated equations, one for each commodity, which express human consumption as a function of income and price. Each year these are approximated by a linear expenditure system. For developing countries where different expenditure classes are distinguished (notably in the case of India), a separate demand system is estimated for each class from time series of household expenditures.

Government policy. Government policy in each national model can be described by a hierarchical set of adjustment rules for policy targets such as domestic price targets, trade quotas, stock targets and bounds, tax rate bounds, and so on. However, to minimize the problem of exploding numbers of variants in the BLS, price transmission functions are used to characterize government policy. These functions relate current to past world market relative prices and self-sufficiency to the domestic relative target price.

4.2.3. The international linkage

A first round of net exports of all the countries is calculated for an assumed set of world prices, and international market clearance is checked for each commodity. World prices are then revised using a non-differentiable optimizing algorithm and transmitted to the

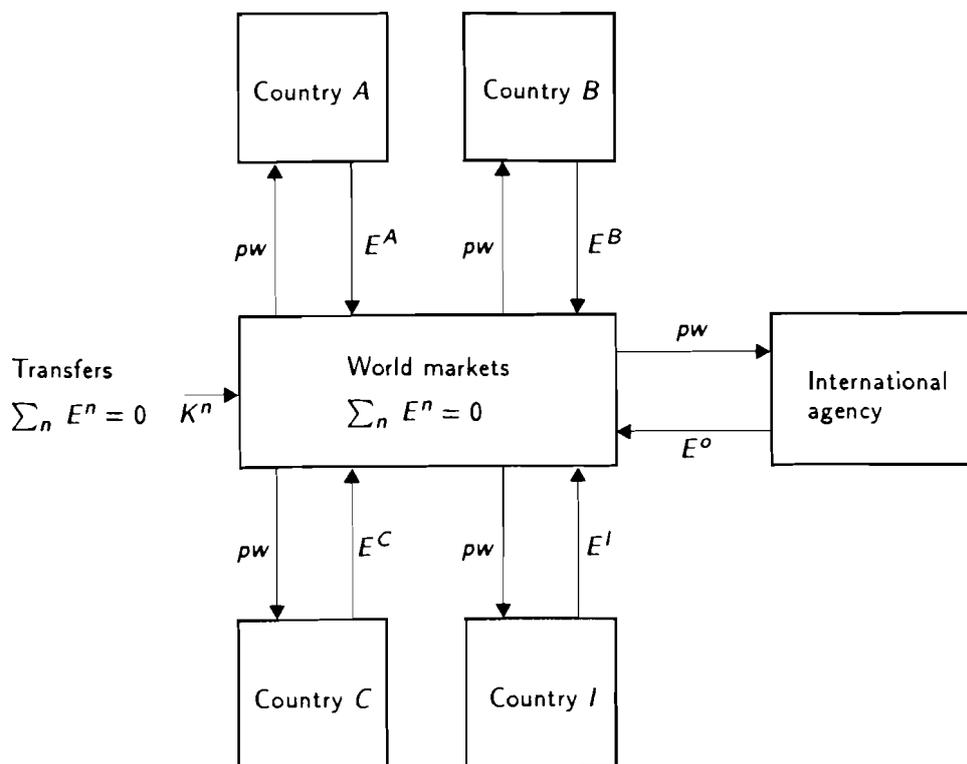


Figure 4.2. International linkage: K , trade deficit; E , net trade vector; pw , market price vector.

national models. Next, these generate new domestic equilibria and adjusted net exports for all countries.

This process is repeated until the world markets are cleared in all commodities. At each stage of the iteration the domestic markets are in equilibrium. The procedure is shown schematically in *Figure 4.2*. It may be noted that any international agency – such as a buffer stock agency – can be represented as a country, and the effectiveness of its policies can be evaluated within a framework in which country policies react to the policies of the agency. This process yields international prices as influenced by government policies. The outcome of this process is examined by governments who may change their policies for the next period. Agents in the model do not formulate expectations about government policies, so that issues of time consistency and the like do not arise in our models.

Since these steps are taken on a year-by-year basis, a recursive dynamic simulation results. Simulations are carried out over a 20-year period during which alternative policies are phased in and their consequences are projected not only for individual countries but also for the entire system.

The approach of the FAP model system is undoubtedly bold, but, if certain major policy issues are to be adequately explored, we believe that such a level of complexity is inescapable.

4.2.4. Validation and tuning

In validating and tuning the models, emphasis was placed on the fact that the primary purpose of developing the BLS is to obtain a medium-term policy analysis model and not a short-term forecasting one. It does not incorporate short-term variations due to weather nor any speculative behavior resulting from such variations. For policy analysis we want the BLS to track the central tendencies correctly.

The model system was validated in three phases. In the first phase individual national models were tested in a stand-alone mode (i.e., unlinked to other models with given world prices). For each of some 90 endogenous state variables generated by the model, values were regressed against the values observed. The performance was found to be satisfactory. In the second phase the country models were run up to the year 2000, again in a stand-alone mode with given world prices. In the last phase a series of "linked runs" with full interaction between the individual national models within the global exchange system were carried out.

The objective in phases 2 and 3 was to test whether the models behave reasonably. Since this is a very subjective notion, specifications and parameters were changed in individual models only in case of extreme results. The outcome of this process was to generate certain base runs which in turn were used as the basis for comparison with specific policy runs.

4.2.5. Exogenous and endogenous variables in the BLS

Several important variables remain exogenous, though for a large and complex model system such as this the exogenous variables form only a small part of the total. The more important of these are summarized below:

- Population and its growth is taken from the latest UN and ILO sources (median projections), but for some individual countries such as India these have been adjusted by the latest national information and projections. Population growth in the scenarios is not affected by changes in nutritional status.
- Similarly, the participation rate in the total labor force is defined exogenously, but the allocation of the labor force between agriculture and the rest of the economy is endogenous.
- Land available for cultivation is exogenous, and the data are taken predominantly from FAO sources and from national estimates. This also includes the development of existing and new land over time.
- Rates of total investment as a share of the GDP are estimated from the historical period, and after a period of adjustment in the early 1980s they are kept constant. Some exceptions to this exist, such as India, where the investment rate changes exogenously over time.
- A number of important exogenous assumptions are made for the “Rest of the World,” i.e., the group of residual countries that are modeled only in groups for inclusion in the system. These include growth rates for both agricultural and nonagricultural production based on past performance. As a baseline for the 13 regional aggregates representing the less developed countries (LDCs) in the category “Rest of the World,” we have adopted the demand and production estimates of the “medium growth” scenario of a detailed FAO study, *Agriculture: Toward 2000* (FAO, 1981; Alexandratos, 1988). Unlike in the FAO study, however, outputs and demands respond to changes in world prices.

4.2.6. The reference scenario, welfare indicators, and comparisons for policy evaluation

As is usual in such analysis, the results of simulated policy scenarios of the model will be compared with those of a reference scenario. Since the reference scenario provides only a basis for comparison, it need not be described in detail. Suffice it to say that in the reference scenario, the continuation of present policy regimes is assumed, and it generates growth from 1980 to 2000 comparable with that realized in the 1970s.

It may be reiterated that the reference scenario is not a prediction. It merely serves the purpose of providing a point or line of comparison. Of course, it should be specified in such a way that policy conclusions are not distorted. Analyses were carried out with alternative reference scenarios with different economic growth rates, and we found that the basic nature of the results were not sensitive to the choice of the reference scenario.

The simulations are carried out over the years 1980 to 2000 and policy changes are introduced between 1982 and 1985 depending on the scenario. Comparisons are generally expressed as a percentage change of the particular variable from its value in the reference scenario. Moreover, three-year averages of the values of the variables are taken for comparison. Four indicators were used to compare scenarios:

(1) *Gross domestic product at constant 1970 prices.*

(2) *Equivalent income.* Equivalent income corresponding to a consumption bundle is defined as the income required under a reference set of prices (we used 1970 prices) to obtain the same utility as is provided by the given consumption bundle. This notion is similar to the Hicksian equivalent variation measure.

(3) *Calorie and protein intakes per capita.* Although average calorie and protein intakes do not by themselves give a precise indication of the nutritional status of the population, any changes in these variables across scenarios do suggest the direction. Since changes in protein and calorie intakes are very similar, only results for calorie intake are reported here.

(4) *Population suffering from hunger.* In order to evaluate the impact on hunger in different countries and in the world an indicator is generated. A cross-country regression to FAO's (1977) country-wise estimates of the levels of hunger is fitted to *recover the FAO methodology in a reduced form* that can be easily used in simulation. Using the data for the years 1969 to 1971 for 58 countries, the FAO provides estimates of percentages of populations suffering from hunger.

4.2.7. Comparative advantage of the BLS

Compared with other global policy models, the BLS can be characterized by the following:

- It is a general equilibrium system empirically estimated (and not benchmarked on one year's data). As a general equilibrium model, it distinguishes a number of commodities, but it distinguishes more agricultural commodities than other general equilibrium models.
- Governments are important actors in the system, and a broad range of government policies is included, modified in response to changes in world market prices. Thus a change in the policies of one government affects through world market prices the policies of other governments, which in turn are affected by them. This is important because excess demand functions facing a country may change when policies change.
- The BLS is a policy analysis tool that can explore simultaneous changes in several policies of different governments.

In comparison with commodity models the strength of the BLS lies in the fact that the reactions to policies pertaining to other commodity markets are also taken into account. However, it should be repeated that the BLS is not meant to be a tool for short-term forecasting, and hence it includes none of the usual short-term phenomena. The BLS is used to generate policy scenarios to give insight into the nature of the world economic and food system and to explore the effectiveness of alternative policies to alleviate hunger.

CHAPTER 5

The Nature of the World Food System: Why Do Many Policies Fail?

5.1. Introduction

The world food system consists of many actors, some powerful and others dependent. Together they make the system move to meet demand for food, to produce it in increasingly efficient ways, and to trade it nationally and internationally. Although the system does not provide stability, it has generated long-term real declines in prices for major staple foods (*Figure 5.1*). Yet, to the poor who do not have means to purchase food, the world economic (and political) system is of little help. The poor are vulnerable to changes in the prices that affect them and when economic shocks occur the system seems to transfer the major burden of adjustment to those who are too poor to buy or produce the food they need. Even under stable economic conditions their biological requirements exceed their effective demand.

This description of the nature of the world economic system is demonstrated in this chapter through simulations using the BLS. In particular, we show that hunger is a stubborn problem. It will not go away by merely increasing global food production or by removing barriers to agricultural trade. It will not go away if the rich

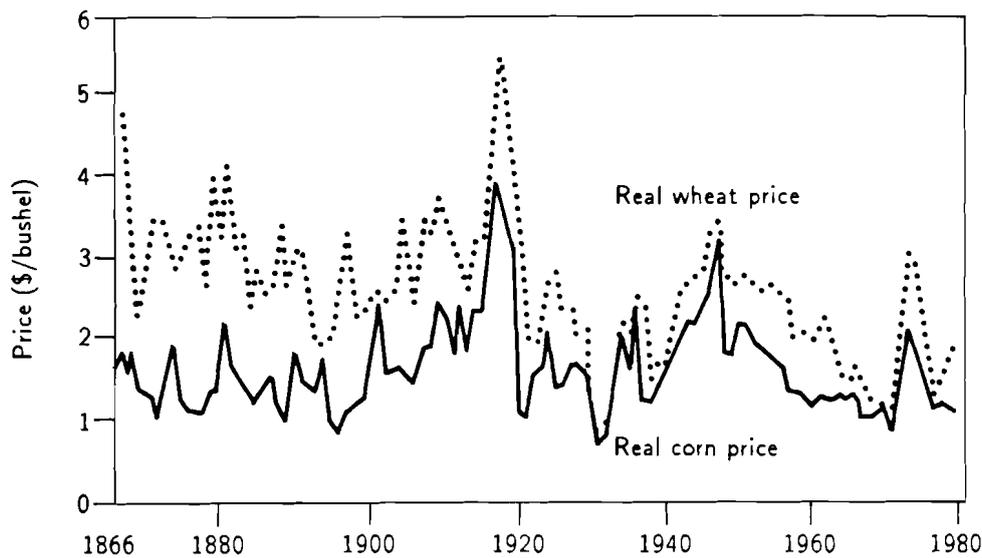


Figure 5.1. Long-term corn and wheat prices in the USA. Source: Martin and Brokken, 1983.

countries restrict their consumption or if they increase production, or even if they reduce their agricultural production to give economic incentives to agricultural producers in developing countries. These propositions are tested using the BLS by generating various policy scenarios until the year 2000 and comparing the results with those of a reference scenario.

Before we turn to the results of the policy scenarios developed using the model, a word of caution is in order. Computable models provide numbers and quantitative estimates. Such quantification is important in judging the relative effects of different policies, in identifying critical elements in the working of the global system, and in evaluating the direction of net effects of many interacting factors. However, some skepticism regarding the accuracy of such quantification should always be exercised. We have tried to estimate parameters econometrically, we have tested the model in many ways, and we feel the workings of the model conforms to economic theory and common sense (certainly the results of the scenarios look believable). Yet one must treat these numbers with caution.

5.2. Popular Suggestions for Alleviating Hunger: Do They Work?

Many people concerned about global development and equity are deeply disturbed by the conditions of abject poverty and the hunger suffered by millions of people in the developing world. Thinking about ways to alleviate hunger, they have proposed several actions, often pertaining to changes in the life-styles of people in the economically advanced countries to benefit deprived people elsewhere.

Some suggestions for life-style changes are made primarily with domestic objectives in mind, but these also derive some of their arguments from a supposedly beneficial effect on hunger in the world. Whatever their motives, these must be taken seriously as they reflect the same concerns that led to the construction of our models. These models can now be used to test the validity of some of these courses of action, and their effectiveness.

These suggestions can be grouped according to the way they are supposed to work. Some focus on increasing global food supplies; others suggest ways of increasing domestic food supplies in developing countries; still others suggest ways to increase the real incomes of the poor. Nevertheless, there are some who argue that there is no need for any special policies to deal with hunger, as trickle-down of overall economic growth will take care of it in due course. The various suggestions grouped in this way are shown in *Table 5.1*. In this chapter we look at policies that are to work through the first three mechanisms listed in *Table 5.1* and show why they are inadequate to solve the problem. Policies that increase real incomes of the poor will be examined in Chapter 6.

5.2.1. Trickle-down over time: A painfully slow process

As we have seen, the numbers of people who are chronically hungry have not declined over the last 40 years, despite the fact that these four decades have seen unprecedented economic growth at the world level. These decades have also witnessed an equally unprecedented growth in the populations in developing countries. Although global population growth rates are gradually slowing down, the populations

Table 5.1. Policy suggestions for alleviating hunger.

Policy suggestion	Policy action
Through trickle-down over time	No special policy needed
Increase food supplies on the world market	More production in developing countries Less consumption in developed countries "Miss a Meal" Avoid overconsumption and waste Eat less meat; feed people not pigs
Increase food production in developing countries	Better production incentives in developing countries Give better prices to producers Let the markets work; remove trade barriers Lower production in developed countries
Increase productivity of the assets of the poor	More public investment Develop infrastructure of roads, markets, electricity, and irrigation Research and extension
Increase real incomes of the poor	Increase demand for labor, particularly unskilled labor Through faster economic growth Through labor-intensive technology Larger emphasis on labor-intensive sector Technical innovation Make food cheaper (more expensive) when poor are net buyers (sellers) of food International migration Transfer of money or goods

of the developing countries will continue to grow for many more decades.

Economic growth, in general, increases employment. The associated increases in consumption and the demand for services also create some additional employment opportunities for unskilled workers. This trickle-down of the effects of economic growth, even without significant efforts to redistribute incomes, can be expected to raise, on average, the incomes of the poor. If these increases are

not completely offset by increases in the number of the poor due to population growth, one would expect some reduction in chronic hunger. Although trickle-down has reduced the proportion of populations that suffer from chronic hunger, it has not eliminated it over the past 40 years.

To examine to what extent trickle-down, without any specific policies to alleviate hunger, would reduce chronic hunger in the world, a model scenario was developed. This scenario is termed the reference scenario. It starts from the basic assumption that the policy regimes in various countries will continue to be the same as in the past. The simulation is carried out from 1980 to 2000. The reference scenario paints a perspective of development up to the year 2000 that can be characterized as follows:

- The economic growth rate is somewhat more optimistic than the historical trend over the 1960s and the 1970s.[1]
- Although the effective demand for food grows substantially because of higher incomes and larger populations, the world food system meets this effective demand with very modest increases in agricultural prices.
- Despite the continuation of existing protective policies, agricultural trade increases still further, again continuing past trends toward global interdependence.
- Considerable improvements in various indicators of welfare are noted. In particular, the proportion of the populations of poor countries affected by chronic hunger decrease significantly, although the absolute number of hungry decline only marginally and large numbers remain hungry even by the end of the century.
- Even though the numbers of hungry decline after 1990, they still constitute a sizable number. Estimates of the hungry at the global level are given in *Table 5.2*. Although the incidence of hunger in developing countries (excluding China) declines from 23% of the population in 1980 to 11% by 2000, there are still 400 million hungry people in 2000, somewhat less than the 510 million shown in the scenario for 1980. This implies a reduction of little more than 1% per year over the projection period.

- Unless economic growth in developing countries is much more rapid than it has been in the past, or unless their development strategies are dramatically reoriented to generate much more employment than in the past, trickle-down will reduce chronic hunger at a very slow pace.

Table 5.2. Global incidence of hunger in the reference scenario.

	1980	1985	1990	1995	2000
<i>Population (million)</i>					
World	4,340	4,750	5,190	5,660	6,160
Developing countries ^a	2,190	2,480	2,800	3,160	3,540
Africa	430	495	570	660	750
Asia	1,260	1,420	1,595	1,780	1,980
Latin America	350	395	445	500	560
Near East	150	170	190	220	250
<i>Hunger in developing countries (million)</i>					
Developing countries ^a	510	490	470	440	400
Africa	110	110	105	100	95
Asia	330	320	305	280	245
Latin America	40	30	30	25	20
Near East	30	30	30	35	40
<i>Percentage of population in hunger</i>					
Developing countries ^a	23	20	17	14	11
Africa	26	22	18	15	13
Asia	26	22	19	16	12
Latin America	11	9	7	5	3
Near East	21	18	17	16	15

^aExcluding China.

5.2.2. Would increased global food supply and lower world market prices help the hungry?

If consumers in the richer communities were to reduce overconsumption and decrease waste, or if American farmers were allowed to produce all they wanted, or if new biotechnologies enabled food to be made from nonfood materials or industrial wastes, global food supply would increase and world market prices would fall.

Some evidence shows that world grain prices are at times raised artificially by the government policies of some major exporting countries, preventing poor countries from importing more, particularly when their needs are large. Thus, not just prices but also hunger are kept at a higher level. What would happen if increased global food supplies were to keep world prices low, permitting poor countries to import more than they do now?

To explore these questions we developed a scenario in which it is assumed that a hypothetical country enters the market with a firm intention of selling, at any price, 50 million tonnes of wheat each year which it gets as "manna from heaven" to help poor importers. A new additional supply channel is thus opened in the system that produces a fixed amount irrespective of the price, without any claim on production resources and demands nonagricultural goods in exchange. The 50 million tonnes were chosen to represent a generous estimate of the amount of cumulative food deficits of all those who at present do not obtain a minimum satisfactory diet. In other words, if this additional food supply were in fact to reach those people, hunger would be entirely eradicated. The amount is – maybe surprisingly – small and would add only about 3% to global cereal supplies (Reutlinger and Selowsky, 1976).

It should be emphasized that though this hypothetical country gets this wheat as "manna from heaven," it does not give it free to others but sells it on the world market in exchange for nonagricultural goods. To ease the shock to the system the additional annual supply to the world market starts at a level of 10 million tonnes in 1981, reaches 50 million tonnes in 1985, and stays at that level up to the end of the simulation period in the year 2000.

As an immediate result of the increased wheat availability on the world market the international price of wheat falls by more than one-third, depressing simultaneously more or less all other agricultural prices. Supply in the model responds with a timelag, and the demand elasticity is low, so that this price movement is to be expected. The agricultural terms of trade on the world market decrease in the initial phase by 4.3% when weighted by production and even more, by 8.2%, when trade weights are used.

The world food system, which itself is the outcome of actions by farmers and consumers, reacts to the deterioration of prices with a twofold strategy. As an immediate response, agricultural inputs

and resources are reallocated to more attractive agricultural sectors subject to flexibility constraints inherent in the agricultural sector and individual production possibilities.

A series of adjustments starts as soon as the first additional supplies appear on the market. The international market response is rapid. The major wheat exporters reduce their exports by increasing their stocks, and importers increase their imports. Yet the quantity is too high to be completely absorbed at prevailing prices. Initially the wheat price drops and stays depressed for some time, but this is followed by a substantial recovery later on.

The second-stage adjustment on the part of the exporting countries, after reducing their exports, is to reduce their production as well. This happens with different timelags, different speeds, and different intensities. This is the general response of all exporters.

The second-stage adjustment on the part of the importers, after increasing their imports and domestic demand, is to reduce domestic supply. In other words, they substitute domestic production for cheaper imports. Of course, they reallocate their production capacities to other products. Because of these substitutions the consumption of wheat increases only marginally, and hungry people do not eat much more.

The real advantage seems to be in the beef market. In almost all countries there is an upward shift in feed consumption: either wheat is directly used as animal feed or producers substitute wheat for coarse grain production. Beef production and exports in the exporting countries and imports in the importing countries go up, and for some years after the shock an upswing in the beef market is created, until prices and production begin to adjust.

These two mechanisms – the reallocation of agricultural resources and inputs in the short run and the adjustment of intersectoral substitution and investment decisions in the long run – work together with the dynamics of the world market and the adaptation of consumer demand to achieve a new equilibrium. This adaptive nature of the world food system explains its resilience to shocks but also its stubbornness with respect to hunger. The protective nature of this adaptation process (protective for the rich agricultural producers) is captured in *Figures 5.2* and *5.3*, which show how the agricultural prices relative to the BLS reference scenario recover over time.

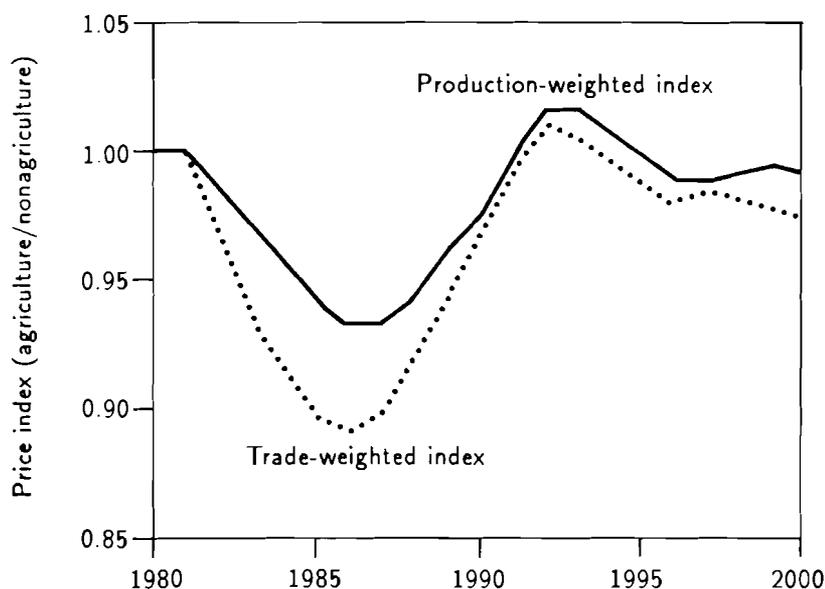


Figure 5.2. Index of world market prices in the manna scenario relative to the BLS reference scenario.

After all these adjustments we may ask what happens to the additional 50 million tonnes of wheat put on the market by the imaginary country? The answer is that they have been absorbed into the system. *Figure 5.4* shows the percentage distribution of the manna in terms of four “destinations”: replacement of foregone production, human consumption, feed use, and changes in national buffer stocks.

By the end of the simulation period in the year 2000, more than 85% of the 50 million tonnes of manna wheat supply has been neutralized by means of production reductions and only less than 3 million tonnes (about 6%) are left for additional human consumption. Wheat in buffer stocks is back to levels slightly lower than those observed in the reference scenario.

It needs little explanation to understand that the nutritional impact of the manna wheat supply is at best marginal, as can be seen from *Table 5.3*. The reduction in the estimated number of hungry indicator used in the BLS comes to only 2.5%, equivalent to about 10 million out of a total of 400 million undernourished people in the year 2000. Even the short-term impact on hunger as

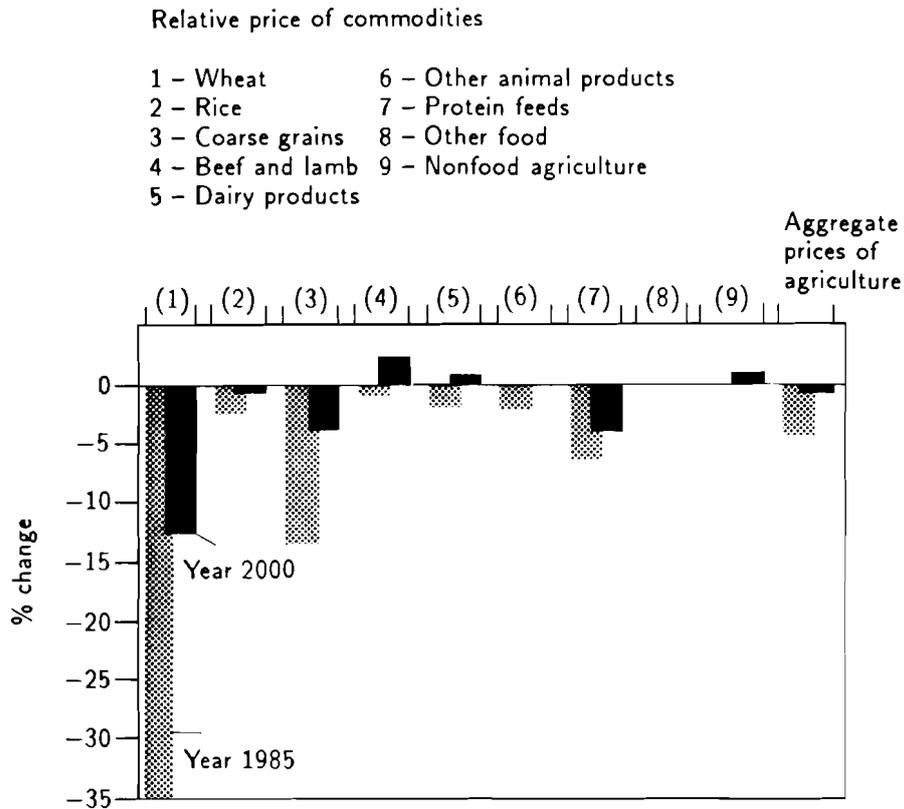


Figure 5.3. Changes of world market prices relative to the BLS reference scenario in the manna scenario, 1985 and 2000.

represented by the 1985 comparison seems far from dramatic – namely, a 6.3% decline in the hunger indicator, i.e., about 31 million out of 490 million hungry people. These results certainly reflect the rapid response of the wheat sector to changing prices on the world market and the limited impact through that market exercised on the incomes and purchasing power of the poor.

Thus very little of the manna reaches the hungry of the countries represented. Consequently, hunger is not eradicated; instead a new export and production structure is created that is more profitable with the new relative prices. The market mechanism does not take into account the needs of the poor.

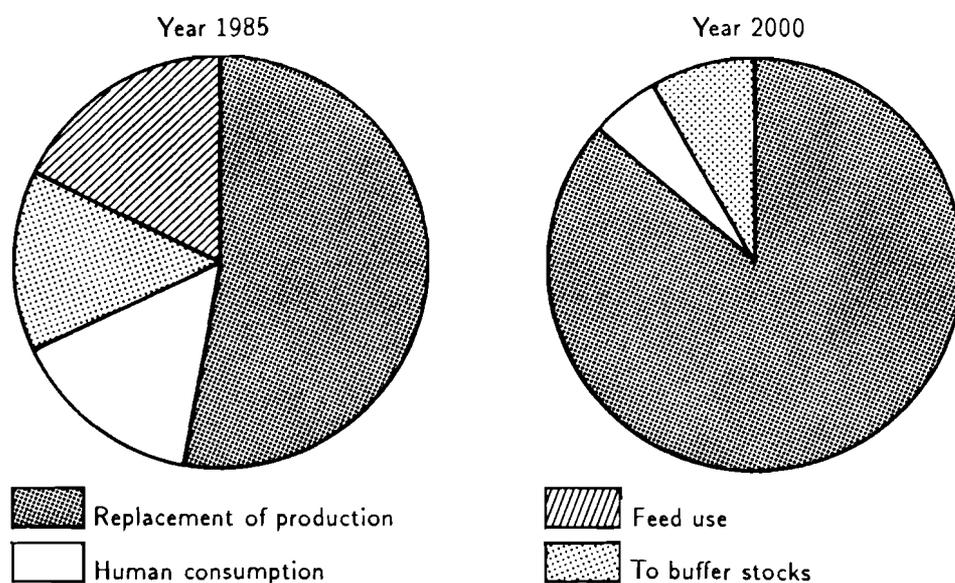


Figure 5.4. Share of utilization of the 50 million tonnes of wheat in the manna scenario, 1985 and 2000.

Table 5.3. Changes in the number of hungry: manna scenario versus reference scenario, 1985 and 2000.

Developing country group	1985		2000	
	Reference scenario (million)	Change in manna scenario (million) (%)	Reference scenario (million)	Change in manna scenario (million) (%)
Total ^a	490	-31 -6.3	400	-10 -2.5
High-middle income	45	-5 -11.2	35	-1 -3.7
Low-middle income	100	-6 -5.5	60	-2 -2.8
Low income ^a	345	-20 -5.9	305	-7 -2.2

^aExcluding China.

We now consider why the world food system behaves this way. We also assess whether the model provides a fair description of the system or whether the outcome is merely due to some peculiarity of the model. The agricultural producers in the developed countries are first of all concerned with maintaining their own incomes; when prices change they adjust their production structure by reallocating their resources so that they maximize their expected incomes. So when 50 million tonnes of wheat are dumped on the world market and wheat prices fall, producers shift resources away from wheat to produce commodities other than wheat. Much of the additional wheat supplies are neutralized this way.

A major objective of governments in developed countries is to protect the incomes of their farmers to maintain some desired level of income parity between agriculture and nonagriculture. Thus when the world price of wheat falls they try to counteract it first by putting more wheat into stocks or by changing their trade policies or both. At the next stage they may also lower their support prices for wheat and increase support prices for other agricultural commodities in an attempt to limit their budgetary outlays associated with farm income policies. This will encourage farmers to shift cropping patterns away from wheat.

Similarly, the governments of poor developing countries also try to protect their domestic producers against the fall in the price of wheat in the international market. They try to insulate domestic prices by adjusting tariffs and trade restrictions. Some will import more when wheat is cheaper on the world market, but the amount of foreign exchange they can command to import grain is usually very limited. Also, larger imports of basic staples such as wheat may violate self-sufficiency objectives that are politically motivated and are therefore pursued in spite of their economic costs. But even when they do import more, the domestic price may still not be allowed to fall to reflect the decrease in the world market price fully. As a consequence the poor in such countries can be expected to benefit only marginally from the manna on the world market.

This is how the model also characterizes the behavior of producers and governments. The model solution does indeed seem sensible against this background. However, we should point out one mechanism that can possibly change the outcome and is not captured in the model. When food stocks build up within developed

countries, they may give more food aid to poor countries. The developing country receiving such food aid may in turn reduce its commercial food imports from the open market. By neglecting this possible switch from trade to aid, more food imports may in fact take place with the manna scenario than the model suggests. Still, it assumes that developed countries are willing to provide more aid and also that the aid-receiving government will pass on the benefit to its own consumers. In fact, the benefits of such induced aid are likely to be small, since food aid is often directed for political considerations to selected countries that may not necessarily be the neediest ones. Also, experience suggests that recipient governments do not usually give priority to the poor when distributing the benefits of food aid.

This scenario can be interpreted in other ways too. If people in developed countries were to eat less wheat, more wheat would be available on the world market and the effects would be similar: it would lead to similar changes in the structure of production, trade, and prices with only a marginal impact on the hungry in the world.

5.2.3. Would reduced meat consumption in the developed countries help the hungry?

One idea offered, especially by the younger generation in the developed countries, suggests that a reduction in meat consumption in the developed countries would reduce the use of grains for animal feed, leaving more food for the starving in developing countries. Since the production of a kilogram of meat requires more than 4 kilograms of grain as feed, this idea has intuitive appeal and has been the subject of earlier research (Linnemann, *et al.*, 1979). In most proposals of this kind, the grain saved is somehow transferred to developing countries. However, this cannot be assumed to take place by itself, since this requires a separate decision to transfer resources.

During the period from 1978 to 1980 average grain production in the developed market economies amounted to some 545 million tonnes per year. Domestic consumption (production less net exports) amounted to 453 million tonnes, out of which approximately 310 million tonnes (of grain equivalent), i.e., 68% of domestic

consumption, were fed to animals. (For details of the calculations performed on the underlying database, see Fischer and Sichra, 1983.) If the calories derived from consuming the meat had instead been obtained by consuming the grain directly, no more than 80 million tonnes of grain would have been needed. Thus 230 million tonnes of grain would have been saved, a tremendous volume indeed. Using a generous estimate of average human calorie intake requirements in developing countries of 2500 kcal per capita per day suggests that a 50% reduction in meat consumption in developed market economies would save sufficient food for about 300 million people. Put another way, 1200 kcal each day could be provided for the 510 million people estimated to be suffering from hunger, and therefore could, in principle, completely resolve the hunger problem.

Would reduced meat consumption in the developed countries, as may result from a spread of vegetarianism, lead to a reduction of hunger in the poor developing countries? In this scenario, called the "vegetarian scenario," the demand for meat in the developed countries explicitly represented in the BLS (Australia, Austria, Canada, Japan, the EC, and the USA) is reduced gradually by 50% over the period from 1981 to 1990. To make up for the implied calorie gap due to reduced meat consumption, the demand for cereals, roots, vegetables, and dairy products is increased proportionally.

These reductions in meat consumption compared to the reference scenario amount to some 15 million tonnes of beef and lamb and approximately 3 million tonnes of the protein equivalent of pork and poultry in the year 2000. This would release roughly 110 million tonnes of feed grain annually.

Again, as with the manna scenario, the economic agents in the system adjust in a variety of ways. The reduced demand for meat initially lowers meat prices, and this stimulates meat consumption. Thus compared with the reference scenario the actual reduction in meat consumption in the developed countries, where demand is lowered, is only 32% in 1990 and 41% in the year 2000. Even so, the reduction in the use of grain for animal feed in these countries is 56 million tonnes in 1990 and 93 million tonnes in the year 2000. The result is that world grain production is reduced and human consumption is increased, but mainly in the developed countries; grain consumption in the developing countries goes up by 1.6% in 1990 and only 0.5% in the year 2000.

As a consequence of the vastly changed demand pattern in the selected developed market economies and the resulting reduction in feed grain consumption, overall demand for agricultural commodities decreases, causing a major reduction of agricultural terms of trade. Over the transition period, 1981 to 1990, during which the changes in consumption are introduced, the index of world market prices for agricultural goods, relative to nonagricultural prices, falls steadily to about 12.6% below the level observed in the reference scenario. The changes in agricultural prices trigger a worldwide adjustment process, on both the producer and the consumer sides, restoring agricultural prices at the end of the simulation period to about 3.4% below the respective values in the reference scenario.

As a consequence of the specification of the vegetarian scenario, the fall in prices is especially dramatic for meat products and commodities used mainly for feed, such as coarse grains and protein feed, and to a lesser extent for wheat and rice. The only exceptions in the general picture are dairy products which even experience a price increase as a consequence of the increase in milk consumption to substitute partly for protein from meat products. Some details of the price responses at the global level are given in *Table 5.4*.

The associated changes in production and demand for the grain sectors are shown in *Table 5.5*. Cereal production in the developed market economies is reduced relative to the reference scenario by 24 million tonnes in 1990 (-3.5%) and by 56 million tonnes (-6.7%) in 2000. This offsets approximately half of the reduction in the use of grain for feed, amounting to about 56 million tonnes (-14.8%) and 93 million tonnes (-20.8%) in 1990 and 2000, respectively.

In the developed countries, the human consumption of cereals increases to compensate for the implied calorie gap that arises from lower meat intake by no less than 15.7 million tonnes (+14.1%) by 1990 and 22.1 million tonnes (+18.0%) in the year 2000. This increase in human consumption of cereals, together with the adjustment of other cereal uses and of production, leaves only about 21.3 million tonnes (+14.9%) for additional exports in 1990 and even less - only 13.5 million tonnes (+6.9%) - in the year 2000. However, not all of this export availability of grains leads to additional consumption in the developing countries since there are similar production

Table 5.4. Percentage change in relative world market prices: vegetarian scenario relative to reference scenario, 1990 and 2000.

Commodity	1990	2000
Wheat	-14.2	-7.5
Rice, milled	-10.2	-0.9
Coarse grains	-30.1	-10.5
Beef and lamb	-52.1	-46.7
Dairy products	+22.1	+44.0
Other animal products	-34.4	-30.6
Protein feed	-27.0	-30.6
Other food	-1.6	+5.6
Nonfood agriculture	-3.6	+10.5
<i>Prices of agricultural relative to nonagricultural products</i>		
Production weights	-12.6	-3.4
Trade weights	-16.1	-6.8

Table 5.5. Response of grain sectors in the vegetarian scenario and reference scenario, 1990 and 2000.

	1990			2000		
	Reference scenario (million tonnes)	Change in scenario (million tonnes)	(%)	Reference scenario (million tonnes)	Change in scenario (million tonnes)	(%)
<i>Developed market economies:</i>						
Production	694.6	-24.1	-3.5	828.4	-55.8	-6.7
Human consumption	111.4	15.7	14.1	122.9	22.1	18.0
Feed demand	378.3	-56.0	-14.8	446.6	-92.9	-20.8
Total demand	548.4	-41.3	-7.5	639.5	-74.0	-11.6
Net exports	143.0	21.3	14.9	195.0	13.5	6.9
<i>Developing countries (excluding China):</i>						
Production	504.1	-17.4	-3.5	656.8	-20.5	-3.1
Human consumption	33.1	7.0	1.6	578.5	2.8	0.5
Feed demand	95.8	-2.5	-2.7	143.8	-13.9	-9.6
Total demand	578.6	4.2	0.7	787.4	-12.8	-1.6
Net imports	75.0	21.4	28.6	130.4	8.2	6.3

adjustments in this group of countries as a result of lower farm prices.

From the above outcomes it becomes obvious that the impact of the proposed reduction in meat consumption will fall far short of the level suggested by the simple back-of-the-envelope calculation made in the discussion of the motivation for the vegetarian scenario. In terms of average calorie consumption the overall effect on developing countries (excluding China) by the year 2000 is almost negligible, as shown in *Table 5.6*.

Table 5.6. Percentage change in daily calorie consumption in developing countries: vegetarian scenario and reference scenario, 1990 and 2000.

	1990	2000
Developing countries (excluding China)	+1.4	+0.4
Middle-income developing	+2.3	+0.9
Low-middle-income developing	+0.6	0.0
Low-income developing	+0.8	+0.1

Accordingly, the estimated number of hungry people (see *Table 5.7*) does not change significantly in the long run. There is an average 7% improvement by the year 1990, i.e., about 34 million fewer hungry people, and even that decline is largely swallowed by the year 2000 due to the lagging but steady adjustment of agricultural producers to the changing world market conditions.

Thus although the effects are in the right direction, the reduction in consumption by the rich is by itself inadequate to have a significant effect on hunger in the world. In a sense the vegetarian scenario is similar to the manna scenario, in that both try to channel more food to the poor by increasing food supplies on the world market. In both cases the additional food supplies come from outside the poor countries where the majority of the hungry live. Both of these options fail to make a significant reduction in hunger for the same reasons. The producers adjust their production to the changing market environment. Also, in both scenarios there is no direct income transfer to the poor nor any direct increase in the income entitlements of the poor. Their real incomes go up only to the extent that the prices of food that they buy fall. This does not amount to

Table 5.7. Estimated number of hungry people in developing countries: vegetarian scenario and reference scenario, 1990 and 2000.

	1990			2000		
	Reference scenario (million)	Change in scenario (million)	(%)	Reference scenario (million)	Change in scenario (million)	(%)
Developing countries (excluding China)	470	-34	- 7.1	400	-6	-1.4
Middle-income developing	40	- 8	-19.6	35	-3	-8.0
Low-middle-income developing	85	- 5	- 5.8	60	-1	-0.6
Low-income developing	345	-21	-6.0	305	-2	-0.8

Table 5.8. Percentage change in agricultural input factors in the vegetarian scenario relative to the reference scenario in the year 2000.

Country	Capital	Labor	Land	Fertilizer	Volume index	GDPA
Australia	-14.3	3.8	0.0	-41.3	-10.4	9.3
Japan	- 5.8	- 3.7	- 3.2	- 4.3	- 9.8	- 3.8
USA	n.a.	n.a.	- 1.9	n.a.	- 6.7	- 5.1
EC	- 7.9	-11.6	- 2.2	- 4.6	-10.6	- 9.4
Argentina	-23.3	-23.0	-26.1	-26.3	-21.7	-19.4
Brazil	-11.6	- 1.1	- 4.6	- 1.4	- 4.3	0.3
Egypt	-14.5	-15.4	-15.3	-15.6	-11.7	-11.3
India	n.a.	n.a.	0.0	- 2.6	0.0	0.1
Indonesia	- 3.7	- 0.1	0.0	0.2	- 0.4	- 0.4

much, particularly after some time when producers have adjusted their production structures. The employment impact on the poor of the changed production structures is mostly adverse because lower agricultural prices reduce agricultural output in most countries and hence also reduce agricultural employment on which many of the poor depend (see *Table 5.8*).

5.2.4. Would a Green revolution in the OECD countries promote a Green revolution in the less developed world?

The increased availability of food and lower prices on the world market would appear to be of little help to the hungry. However, increases in food production in the developing countries themselves may help because many of the poor depend on employment in the agricultural sector for their livelihoods. But how can developing countries be stimulated to put more emphasis on agriculture? Many developing countries tend to keep agricultural prices low and to tax agriculture, thus reducing incentives for farmers to grow more food. Assuming that higher agricultural prices on the world market are at least to some extent passed on to domestic markets, more remunerative prices to farmers and increased agricultural production could result. If world market availability is reduced and prices are increased for agricultural products, although the poor consumers in developing countries may be hurt by the higher food prices, the stimulus to agricultural development would in time, and one hopes in the not too distant future, help them too.

Lower supply and higher prices on the world market could be realized if the OECD countries were to reduce their output. Suppose, for example, that the environmental concerns represented by the Green parties in Europe culminated in attempts to reduce the use of chemical fertilizers and to restrict the extent of land cultivated. A tax on fertilizer prices may be introduced to provide for the cost of cleaning up existing environmental pollution. To simulate this "Green scenario" we stipulate the following. A tax of 50% is levied on fertilizer prices in the OECD countries. Moreover, total cultivable area is reduced by 20%. It should also be noted that, like in the vegetarian scenario, no additional transfers to developing countries take place.

The changes are introduced over a nine-year period from 1982 to 1990 in the OECD countries explicitly modeled in the system (Australia, Austria, Canada, Japan, the EC, and the USA). Although the share of OECD countries in global agricultural production is less than 50%, the share in global agricultural trade is much larger. Thus world market prices for agricultural commodities

Table 5.9. Percentage changes in prices and production: Green scenario relative to the reference scenario, 1990 and 2000.

Commodity	1990				2000			
	World market price	Production			World market price	Production		
		Total	OECD countries	Developing countries		Total	OECD countries	Developing countries
Wheat	52	-2.6	-14.3	11.4	55	-3.4	-17.8	12.8
Rice, milled	20	0.2	-9.0	1.3	11	0.2	-9.4	1.2
Coarse grains	63	-3.4	-12.4	12.8	45	-2.4	-10.3	12.1
Beef and lamb	8	0.1	0.7	-1.2	9	1.0	0.1	1.3
Dairy products	22	-1.1	-1.0	-3.8	21	-0.4	-1.6	-1.9
Other meat & fish	15	-2.2	-3.7	-2.8	18	-2.7	-6.4	-0.4
Protein feed	35	0.1	-0.8	1.5	44	-3.1	-9.2	5.3
Other food	5	0.0	-0.7	0.6	3	0.2	-4.6	2.1
Nonfood products	4	-0.1	0.9	-0.4	-2	-0.9	-0.8	0.3
Total agriculture	17	-1.2	-3.9	1.1	14	-1.2	-5.8	2.5

increase significantly and as expected agricultural production increases in the developing countries (see *Table 5.9*).

Yet the higher domestic prices that promote increased agricultural production also lead to a lower calorie intake in most developing countries. Moreover, in terms of consumer utility (i.e., equivalent income) almost all show a decline. The utility measure is based on the underlying utility functions behind the expenditure systems that characterize consumer behavior. The results summarized in *Table 5.10* indicate that even when agricultural production increases substantially (as it does, for example, in Nigeria, Pakistan, and Turkey) the average calorie intake and utility indicators may fall. Thus, the gains from higher incomes and food consumption in the agricultural sector are in most cases more than offset by the negative effect of higher food prices on food consumption of those who are net buyers of food.

In the previous scenarios it was seen that lower world market prices have slight but positive effects on reducing hunger. Higher world market prices have, not unexpectedly, the opposite effect by reducing food consumption in developing countries. Even after 15

Table 5.10. Impact on developing countries: Green scenario compared with the reference scenario (percentage changes by 2000).

Country	Relative price of agriculture (P_a/P_n)	Food price index	GDP		Calorie intake	Equivalent income	Persons hungry
			at 1970 prices	agriculture at 1970 prices			
Argentina	11.5	5.1	0.2	6.1	-0.5	2.1	9.5
Brazil	8.6	5.1	-0.2	0.7	-1.1	-0.8	24.1
Egypt	16.5	8.3	-1.4	-3.1	-0.7	-0.4	-
India	6.1	-	0.4	-0.1	-2.1	-0.3	13.6
Indonesia	3.6	2.0	0.3	0.1	-0.3	0.2	-
Kenya	11.2	9.7	1.6	4.5	1.3	-	-6.2
Nigeria	0.6	2.6	1.2	9.6	-0.6	0.4	53.4
Pakistan	-0.2	0.6	-0.2	7.1	-0.8	2.1	11.1
Thailand	13.9	7.1	0.2	4.7	-0.4	-	4.7
Turkey	6.8	2.8	0.5	8.6	-0.3	0.4	6.8
All developing countries	-	-	-0.2	1.6	-0.9	-	9.0

P_a agricultural prices; P_n nonagricultural prices.

years of increased production in the year 2000, there are 9% more hungry people than in the reference scenario.

5.2.5. Would agricultural trade liberalization and "right prices" help reduce hunger?

The World Bank and the IMF have repeatedly advised developing countries to liberalize their economies. The developing countries are often told that if only they get their "prices right" and let the markets work (Yeutter, 1989) to increase the incentives to their farmers, the hunger problem would take care of itself. In contrast, although the Green scenario demonstrates the effects of higher world market prices on developing countries and on hunger, it differs in that it is assumed that the domestic policy regimes in the developing countries are not changed. Several countries with domestic price regimes isolate domestic prices of staple food products from international prices. In liberalization scenarios these regimes are assumed to change, with increased transmission from world market movements to domestic prices.

The impacts of agricultural trade liberalization on the global food system and on national economies have been described in detail by Parikh *et al.* (1988), and so here we give only a brief summary of some relevant aspects.

The Notion of Agricultural Trade Liberalization

The analysis of trade liberalization in this study is restricted to the removal of distortions between trade prices and domestic prices at the level of raw materials of the agricultural commodities. They do not remove all distortion-creating measures from all market and production activities. Thus, the scenarios move toward free trade and not to total trade liberalization so that they should be characterized as "freer" trade scenarios. The reason for restricting the analysis to removal of border protection measures only is the difficulty in obtaining accurate information on all trade-distorting measures.

For some country models additional changes are introduced. In the case of the US model, land set-aside programs are also removed in the scenarios in which the USA liberalizes trade. The wedges existing between the consumer and producer prices for wheat, coarse grain, and beef and lamb in Japan, and for wheat in Nigeria are also set to zero when these countries liberalize; and in Canada the quotas imposed on dairy production in the reference scenario are removed when it liberalizes. The monetary compensatory amounts (MCAs) that are given to EC member countries are still implicitly included in the producer prices, since the EC is treated as one aggregated country. The kind of distortion resulting from this takes a much more elaborate model to assess. Since, however, the MCAs are small in comparison with the EC's protection against third countries, one might argue that their impact is not very drastic. This is especially so if one works with the hypothesis that the MCAs distort only the (absolute) price levels between the EC member countries but not the relative prices of agriculture, which are the same in all EC member countries. Of course, to the extent that the MCAs vary across commodities and across countries, the relative prices will vary throughout the EC.

Thus, in our analysis of trade liberalization where these calculated tariff equivalents are removed, only the assistance given at the border is abolished. The assistance given for domestic production

or consumption or both is not affected by the removal of tariff equivalents. This holds for all types of domestic assistance, such as subsidies on nonagricultural inputs, price support payments, storage subsidies, deficiency payments, production quotas, consumer subsidies, transportation subsidies, marketing licenses, export credit, insurance support, and so on.

Trade liberalization is partial in our analysis in yet another sense. Agricultural trade liberalization is done in the scenarios by removing protection from agricultural commodities, as reflected in the protection factors estimated. Because reliable information on the protection factor for nonagriculture is not available, it is not removed from the nonagricultural sector. As a consequence, trade liberalization here is partial. Relative distortions among agricultural commodities are removed, but the relative distortion between agricultural and nonagricultural sectors is not fully removed. The protection factors as indicated by available crude estimates for the nonagriculture sector are much smaller compared to those for agricultural commodities in the developed market economies. Thus, the removal of distortion from the nonagricultural sector should have a small impact on the overall results when only these countries liberalize. Yet, the rich countries strongly protect some of the products of interest to LDCs, such as processed food and textiles. Thus the effects on the LDC exporters could be somewhat distorted in these scenarios. Full liberalization would favor exports of manufactures from developing countries, possibly at the expense of somewhat lower primary product exports. In the estimates presented here, some underestimates of overall export growth may be presumed, and a possible overestimate of agricultural exports. But these are no more than intuitive presumptions.

For the developing countries, the nonagricultural protection factors may be expected to be somewhat larger but many play a comparatively modest role on the world market. Thus, here also, the effects on the results for the world market should be small. Of course, for individual countries the results can be significantly affected by total liberalization.[2]

The Scenarios

In alternative scenarios of agricultural trade liberalization different groups of countries liberalize. These scenarios are designated by F-OECD, F-LDC, and F-ALLME, where F refers to freer trade and the countries liberalizing are indicated in the designation (see *Table 5.11*). The results are compared with the BLS reference scenario.

Table 5.11. List of agricultural trade liberalization scenarios.

Designation	Description
F-OECD	All OECD countries excluding Turkey
F-LDC	All developing countries excluding China
F-ALLME	All market economies

In all the trade liberalization scenarios discussed, it is assumed that China and the CMEA countries do not participate in trade liberalization, though they do moderately modify their trade patterns in response to changing world prices.

All the scenarios are run from 1980 to 2000. Trade liberalization is gradually introduced over a five-year period, from 1982 to 1986, so that 1986 is the first year of fully liberalized agricultural trade. In these scenarios agricultural trade is liberalized without the introduction of any compensating lump-sum transfers either within countries or among countries.

Impact on World Market Conditions

The changes in the relative prices of agricultural commodities on the world market compared with the reference scenario for the three trade liberalization scenarios are summarized in *Table 5.12*. When the LDCs liberalize, the aggregate price of agriculture (production-weighted) goes down, but, when the OECD countries liberalize, it goes up. This is what one would expect since the OECD countries in general protect their agriculture to a much greater extent than do developing countries, many of whom in fact tax their agriculture.^[3] What is also worth noting in *Table 5.12* is that the structure of relative prices of agricultural commodities differs significantly depending

Table 5.12. Changes in world market prices and global net exports (percentage change over the reference scenario).

Commodity	Relative prices				Net exports			
	1990	2000			1990	2000		
	F-ALLME	F-ALLME	F-OECD	F-LDC	F-ALLME	F-ALLME	F-OECD	F-LDC
Wheat	16	23	18	5	1	3	-2	3
Rice	22	16	21	1	35	36	37	-12
Coarse grains	17	13	11	4	-4	-3	-5	0
Beef and lamb	26	11	17	-3	52	69	35	27
Dairy products	38	34	31	12	30	24	13	24
Other animal products	3	-1	-0	1	3	14	17	-4
Protein feed	11	13	13	1	5	4	5	-1
Other food	-1	-3	5	-6	4	10	10	-2
Nonfood								
agriculture	-11	-17	-2	-14	5	6	5	0
Nonagriculture	0	0	0	0	13	13	17	-3
Total agriculture	9	5	9	-2				

on which group of countries liberalizes. Although the aggregate price of agriculture changes by a small amount, changes in prices of some of the commodities are large.

In spite of large changes in prices of many commodities, global production levels change only marginally (see *Table 5.13*). This again is an understandable outcome since the demand for agricultural products is largely price inelastic in the richer countries who dominate global trade. The global production adjusts to meet the small change in global demand. However, the levels of global net exports change substantially so that for an individual country, the world market environment can significantly alter its opportunities.

Table 5.13. Changes in global production levels in trade liberalization scenarios (percentage change over the reference scenario).

Commodity	F-ALLME		F-OECD	F-LDC
	1990	2000	2000	2000
Wheat	1.4	1.5	0.5	1.5
Rice	1.3	1.6	1.2	0.7
Coarse grain	0.7	1.7	1.7	-0.0
Beef and lamb	2.2	5.3	3.3	1.6
Dairy products	1.2	2.4	1.9	0.4
Other animal products	0.7	1.0	0.8	-0.0
Protein feed	2.7	2.3	2.0	0.3
Other food	0.2	+0.0	0.2	-0.3
Nonfood agriculture	-0.1	+1.1	-1.5	-0.3
Nonagriculture	+0.0	-0.0	-0.0	-0.3
Total agriculture	0.8	1.1	0.8	0.1

Impact on Growth and Sectoral Composition

The changes in world market prices affect domestic prices of individual countries. The effects depend on changes in their trade policies. *Table 5.14* shows changes in domestic prices, growth of aggregate GDP, and growth of agricultural GDP in selected countries.

The aggregate numbers in *Table 5.14* should be interpreted with caution, since they involve pitfalls of aggregation. Yet these numbers show that, in general, agricultural GDP does respond to relative prices of agriculture. However, the impact of agricultural

Table 5.14. Impact on relative price of agriculture on GDP and agricultural GDP (percentage change over reference scenario for the year 2000). Numbers rounded off: +0 means > 0 but < 0.5; -0 means > -0.5 but < 0.

Country	Agricultural trade liberalization by								
	F-ALLME			F-LDC			F-OECD		
	P_a/P_n	GDP	GDP agric.	P_a/P_n	GDP	GDP agric.	P_a/P_n	GDP	GDP agric.
Japan	-39	+0	-6	-1	+0	-0	-35	+0	-5
EC	-12	+0	-8	-0	+0	-1	-9	+0	-7
USA	-5	+0	1	-0	+0	+0	-2	+0	2
New Zealand	8	1	11	-3	-0	-2	16	2	14
Canada	13	-0	17	-0	-0	1	16	-0	17
Australia	9	+0	1	-6	-0	-1	15	+0	3
Austria	6	+0	+0	-3	+0	-2	8	-0	2
Turkey	-10	1	-9	-13	2	-14	1	-0	6
Pakistan	-1	3	-1	-10	3	-9	+1	-0	3
Nigeria	-9	-1	-1	-9	-2	-7	+0	1	7
Egypt	8	-3	5	1	2	-4	5	-1	2
Mexico	-5	-4	1	-5	-2	-3	-1	-2	4
India	3	+0	-0	-2	-0	-1	3	+0	+0
Argentina	48	-0	47	31	+0	29	12	0	14
Brazil	25	-1	7	18	-1	6	8	-0	1
Indonesia	17	1	6	13	1	4	2	+0	+0
Thailand	20	+0	6	14	+0	4	8	+0	3
Kenya	15	3	10	7	1	4	11	2	5

P_a/P_n = Price of agriculture/price of nonagriculture weighted by domestic production.

GDP at constant 1970 prices.

trade liberalization on aggregate economic growth is rather small. Even after 15 years of liberalization, for many countries the GDP hardly changes. For developed market economies this is as expected because agriculture is a small part of the economy. For the developing countries this is rather surprising; even with large changes in the relative price of agriculture and consequent significant changes in agricultural GDP, the aggregate GDP changes but little. Yet the result is understandable. Higher agricultural growth comes about as a result of additional investment in agriculture, which in the absence of any additional aid is realized by reducing investment in

nonagriculture. Thus, changes in the relative price of agriculture do alter sectoral proportions but their impact on total GDP is rather small.

Another point to note in *Table 5.14* is that policies of other countries do matter. For example, when only the LDCs liberalize, Egypt's GDP goes up. However, when along with the LDCs the OECD countries also do so, as in the scenario F-ALLME, Egypt's GDP falls.

We should emphasize once more that agricultural trade liberalization here is only partial and that some of the commodities of particular interest to many developing countries such as sugar, coffee, and tea are not distinguished as separate commodities in the models. Disaggregated analysis may change the result for some developing countries, but the broad nature of the results may not be expected to change. General equilibrium models of trade liberalization do not seem to show large efficiency gains due to changes in sector proportions (Whalley, 1985), perhaps because such models usually account only for gains due to movements along the production possibility frontier. It is often argued that the potential gains from the removal of wasteful rent-seeking, directly unproductive activities, and the introduction of greater competition and efficiency brought about by freer trade can be significant (Krueger, 1974; Bhagwati and Srinivasan, 1982; Harris, 1986).

Although in these simulations the agriculture-nonagriculture sector proportions seem to be unimportant for growth, one should also look at the results from a different perspective. A small change in sector proportions can lead to large changes in relative prices. Therefore, the objective of price stability requires that either the sector balance is carefully set or that trade policy is flexible.

Impacts on Equivalent Incomes, Food Intake, and Chronic Hunger

Even when agricultural trade regimes, relative prices of agriculture, and sector proportions seem to have little impact on the aggregate GDP of an economy these could have important consequences for equivalent incomes, food intakes, and the level of chronic hunger. *Table 5.15* shows these effects on selected countries.

Table 5.15. Changes in equivalent income, food intake, and chronic hunger (percentage changes in the year 2000 over reference scenario values).

Country	Average equivalent income			Average calorie intake			Levels of hunger		
	F-ALLME	F-LDC	F-OECD	F-ALLME	F-LDC	F-OECD	F-ALLME	F-LDC	F-OECD
Turkey	2	2	-0	+0	+0	-0	-6	-2	2
Pakistan	3	3	1	1	3	-1	-17	-32	8
Nigeria	+0	-1	2	1	1	+0	-57	-60	-47
Egypt	-2	2	-1	-0	1	-1	^a	^a	^a
Mexico	-4	-2	-2	+0	-0	-1	-3	-6	9
India	1	1	-0	-0	2	-1	2	-9	6
Argentina	3	1	2	-2	-1	-0	31	24	7
Brazil	-1	-1	-1	-2	-1	-1	50	34	12
Indonesia	-0	1	-2	2	+0	+0	^a	^a	^a
Thailand	n.a.	n.a.	n.a.	-0	-0	-0	3	4	1
Kenya	n.a.	n.a.	n.a.	3	1	2	-14	-6	-9

^aNo hunger in the reference scenario in year 2000.

Average equivalent income (see Section 4.2.6) is in some sense a better measure than per capita GDP to see the impact on growth. It accounts for consumer preferences (at least the preferences implied by the demand system of the average consumer, whatever that may mean), which per capita GDP does not do. In general, the observed changes in equivalent income are similar to changes in GDP, though for some countries the two do show different signs. Nonetheless, the conclusion remains that agricultural trade liberalization makes a small impact on the economic growth of developing countries, even in equivalent incomes.

Even when the average consumer's equivalent income becomes better-off, particular groups of consumers may be worse-off. Thus, their food intake may go down and hunger may still increase. For example, for Argentina in all three scenarios equivalent income increases but calorie intake falls and hunger increases. Similarly, but in reverse, equivalent income falls in Mexico but calorie intake increases and the number of hungry falls.

The estimates of hunger are based on calorie intake and constant income distribution patterns. The changes in calorie intake and in hunger are therefore consistent. Nonetheless, it is worth noting that percentage changes in the levels of hunger are much larger compared with changes in average calorie intake. (However, the very large percentage changes in hunger in *Table 5.15* reflect the very low level of hunger in the reference scenario for several countries.) What emerges from these scenarios is that when agricultural trade liberalization increases domestic food prices in a developing country, calorie intake may go down even when real income increases and this has an adverse impact on the chronically hungry in the country.

For developing countries as a whole the changes in hunger levels are summarized in *Table 5.16*. In addition to the countries shown in *Table 5.15*, these numbers also include other LDCs (though it is assumed that there is no hunger in China).

It can be seen that the global level of chronic hunger is somewhat affected by agricultural trade liberalization. When only the LDCs liberalize, the world price of agriculture goes down and hunger in the world is somewhat reduced. When only the OECD countries liberalize does the reverse happen. When all market economies liberalize then hunger goes up marginally.

Table 5.16. Impact on hunger of various agricultural trade liberalization scenarios (percentage change in the level of hunger over the reference scenario).

Scenario	1990	2000
F-ALLME	+8.0	+1.4
F-OECD	+3.3	+3.6
F-LDC	-4.7	-4.6

Summary

The results indicate that agricultural trade regimes and the associated relative prices and sectoral balances, though important for their impact primarily on food intake and hunger in a country do not provide a solution to the problem of hunger. As we have seen, a move to liberalize agricultural trade results in small changes in growth and sectoral balances but has no significant impact on hunger.

We now reiterate three limitations of our analysis. The first is that only agricultural trade is liberalized. Our results may not be generalized to liberalization of other sectors. The second limitation is that some possible gains from trade liberalization due to the abolition of rent-seeking, directly unproductive activities are not captured in our analysis. We recognize the possibility that such gains may be large. However, the significance and extent of such gains, particularly for agriculture, remain to be demonstrated empirically. The third limitation is that because of the need to aggregate commodities, such as sugar, tea, coffee, and cocoa, in one group, gains from freer trade in such commodities to small countries exporting these commodities may be understated. For major exporters of such commodities the possible adverse effects of the loss of terms of trade is also not fully accounted for due to aggregation. Nonetheless, for the developing countries with separate national models in our system, the impact of such an understatement, we believe, is not likely to change the nature of the results nor our conclusions.

Finally, although we have shown the importance of relative prices for hunger, we wish to emphasize that price policy alone cannot adequately deal with hunger in the sense of virtually eliminating it by the year 2000.

5.3. Concluding Comments

A reference scenario with relatively optimistic growth rates shows that, although the numbers of hungry in the world will go down, many people are likely to continue to remain hungry by the year 2000.

Increased supplies on the world market are absorbed into the system as producers, consumers, traders, and governments adapt their behavior with negligible improvement in the consumption of poor consumers in poor countries.

Reduced meat consumption in the developed countries, as may be expected from a spread of vegetarianism, frees up resources from the production of animal feed that could, in principle, be directed to the provision of more food for the poor. However, this again would have no significant impact on the hungry.

Reduced agricultural production in the OECD countries will increase world market prices, increase export opportunities for developing country exporters, and increase domestic agricultural prices in those countries, thus stimulating their production, which in the long run (hopefully not too long a run) would benefit the poor. In this case the results show that although domestic agricultural production does increase as expected, the calorie intake or utility measures suggest that consumers would be worse-off even after 15 years.

Agricultural trade liberalization does provide incentives to increase domestic agricultural production in many developing countries and in a number of them the agricultural GDPs also increase. However, the higher agricultural growth is brought about by diverting resources from the nonagriculture sector and the aggregate GDP changes little.

When the developing countries liberalize their agricultural trade but the OECD countries do not, there is a small reduction in hunger. This gain disappears when the OECD countries also liberalize. Thus, agricultural trade liberalization would provide no solution to the hunger problem.

Therefore solutions that attempt to deal with hunger through the market mechanism, either through increasing supply on the world market or through increased agricultural production in the developing countries, do not work well enough. The present world

food system is shown to be resilient for the rich but stubborn for the starving.

Notes

- [1] Growth in the 1980s was actually much slower than in the preceding two decades.
- [2] In fact, model scenarios in which crudely estimated nonagricultural protection factors were also removed confirmed these expectations. The main results at the global level and the character of the scenarios did not change significantly. A significant impact on the size of efficiency gains and losses for some developing countries was seen but that too was not dramatic nor did it alter the qualitative picture. In any case, it does suggest the need for having better estimates of nonagricultural protection factors.
- [3] Negative protection is, like positive protection, removed in these scenarios to the extent that it is effected through export taxation.

CHAPTER 6

Policies that Effectively Reduce Hunger

6.1. What Works and Why?

The search for effective policies to reduce hunger requires that a closer look be taken at the character of the issue to be tackled. Those who suffer from hunger appear not to be a part of the markets for food, which raises questions about the reasons for their exclusion. These indications of the economic position of chronically hungry people should, in turn, suggest effective ways to improve their access to food. The main characteristics of the problem of chronic hunger, emanating from a large body of research in developing countries, are the following:

- Hunger is closely related to poverty, manifested as the inadequacy of available purchasing power to obtain sufficient food in the market.
- The largest proportion of poor people (some 70% to 80%) live in rural areas that are not within easy reach.
- The urban poor and a major part of the rural poor earn their incomes by offering unskilled labor in markets with abundant supplies of such labor.

- Rural families, particularly in Africa, use primitive agricultural technologies and are unable to produce enough food for subsistence even with full use of all available labor.
- No safety net exists to maintain minimum levels of income to people not employable: the old, the sick, and the disabled. Also an adequate household food supply is no guarantee that all members of the household, particularly women and children, will obtain what they need.
- In some countries and regions local social structures permit the exploitation of abundant labor by those endowed with control over complementary production factors.
- The daily concerns of the poor with survival and their lack of resources severely limit their influence on national priorities for development.
- Even when policy priorities stress the needs of the poor, effective instruments are difficult to identify and to apply.

What these characteristics suggest is that in order to deal with hunger we first have to deal with poverty. This means increasing the value of the endowments the poor have, namely, unskilled labor and land if any, or giving them other endowments through transfers. The value of unskilled labor could be increased by increasing its demand or reducing its supply, or by developing skills through education and training. The value of land could be improved by investments in land improvement, through irrigation, drainage, and leveling operations, perhaps using labor-intensive methods. The impact of various policies can be enhanced by lowering population growth rates. Some policy actions that may be effective in reducing hunger include the following:

- (1) Lower population growth rates.
- (2) Rural works programs and investments in land development such as irrigation, drainage, and leveling.
- (3) Food and other aid.
- (4) International migration.

We now discuss each policy in turn.

6.1.1. Lower population growth rates

Lower population growth can benefit the poor in several ways. For an economy whose growth rate is limited by the available aggregate investment, a smaller population means higher per capita incomes. Thus with the same income distribution the poor would have higher incomes and would be able to buy more food. Smaller population growth also means more land per capita and that there would be fewer landless and marginal farmers. With the labor supply reduced, wage rates would go up. This would also reduce hunger. But this conclusion depends on the assumption of unchanged aggregate investment and savings.

Unfortunately, without coercion, population growth rates fall rather slowly and often significant reductions occur in groups with higher per capita incomes. Thus there is a chicken-and-egg problem here. To raise incomes we need to lower population growth and to lower population growth we need higher incomes. In peacetime, infant mortality and the birth rate are the main levers of demographic change but their impacts are very slow. Over a period of, say, twenty years starting today, population size largely depends on the number of those alive. Thus, changing the population growth rate is more of the nature of an analytical exercise to find out about long-run effects "projected" on the near future. Nonetheless it is worth exploring the impact of lower population growth.

To do so, a BLS scenario has been designed where population growth in developing countries (excluding China) is gradually reduced to 75% of its value in the BLS reference scenario. Hence, average annual population growth in these countries for the years from 1990 to 2000 is reduced to 1.8% per annum compared with 2.3% in the reference scenario. *Table 6.1* shows the adjusted population projections used in the simulation run. Accordingly, the estimated number of people in the developing world in the year 2000 (excluding China) would drop from 3587 million to 3281 million, i.e., by 7.2% or some 306 million people. On a world scale this would represent a 4.2% reduction.

The reduced population would lead to a somewhat reduced production capacity in the developing countries; however, on a per capita basis indicators such as GDP or grain production increase by 3% to 5% (see *Table 6.2*). It comes as no surprise that the estimated

Table 6.1. Reduced population growth scenario (population in millions).

	1990				2000			
	RS	RGS	Δ pop- ulation	Δ %	RS	RGS	Δ pop- ulation	Δ %
World	5,189	5,130	-60	-1.16	6,158	5,901	-256	-4.17
DEV	2,803	2,743	-60	-2.13	3,537	3,281	-256	-7.25
Middle income	502	491	-11	-2.21	637	590	-47	-7.37
Low-mid. income	889	870	-19	-2.11	1,111	1,033	-78	-7.03
Low income	1,412	1,382	-30	-2.14	1,789	1,658	-131	-7.35
PGR > 2.5% p.a.	939	915	-24	-2.51	1,242	1,138	-104	-8.34
PGR < 2.5% p.a.	1,864	1,827	-37	-1.96	2,296	2,143	-153	-6.67

RS = Reference scenario.

RGS = Reduced growth scenario.

DEV = Developing countries.

PGR = Average annual population growth from 1990 to 2000 in the reference scenario.

Table 6.2. Percentage changes in selected indicators in the year 2000, reduced population growth scenario relative to the BLS reference scenario.

	World		DME	DEV	
	Δ %	Δ % per capita	Δ %	Δ %	Δ % per capita
Population	-4.2		0.0	-7.3	
GDP	-0.6	3.7	+0.0	-4.3	3.2
GDP agriculture	-1.0	3.3	-0.3	3.0	4.6
Cereal production	-1.2	3.1	-1.0	-2.4	5.2
Net calorie production	-1.6	2.7	-1.6	-2.5	5.2

DME = Developed market economies.

DEV = Developing countries, excluding China.

number of people with inadequate diets drops significantly compared to the BLS reference scenario. There are fewer people, with higher incomes and slightly lower food prices; the results are summarized in *Table 6.3*. In summary, a reduction of population in developing countries of 306 million people by the year 2000, as assumed in the reduced population growth scenario, leads to 131 million fewer suffering from hunger. Hence, the scenario results suggest that in the medium term, around the growth pattern assumed in the

Table 6.3. Impact of reduced population growth rates on the level of hunger.

	Reference scenario				Reduced population growth scenario			
	1990		2000		1990		2000	
	No. of hungry (mln)	% of total pop.	No. of hungry (mln)	% of total pop.	Change in number of hungry relative to reference scenario (mln)	% change	Change in number of hungry relative to reference scenario (mln)	% change
Developing countries	473	16.9	396	11.2	-41	-8.8	-131	-33.0
Middle income	40	7.9	34	5.4	- 5	-12.9	-	-47.8
Low-middle income	84	9.5	57	5.1	-10	-12.0	- 24	-42.0
Low income	349	24.7	305	17.0	-26	- 7.5	- 91	-29.8
PGR > 2.5% p.a.	159	16.9	150	12.1	-21	-13.2	- 61	-40.9
PGR < 2.5% p.a.	314	16.8	246	10.7	-20	- 6.5	- 71	-28.8

PGR = average annual population growth from 1990 to 2000 in the reference scenario.

reference scenario, for every 100 children fewer born in the developing world there would be 50 fewer starving. Population pressure and insufficient success in decreasing net population growth rates in developing countries certainly hinder attempts to solve the world's hunger problem. Of course, this should by no means be an excuse for not trying to find other measures that would reduce poverty and hunger.

In this scenario we introduced a 5% reduction in population growth rates in all developing countries. If it were possible to reduce the population growth rate of the poor proportionately more, the benefits of lower population growth on reduction in hunger would have been larger than those shown in the scenarios.

6.1.2. Rural works programs and investment in land development

Since many of the poor depend on agriculture for their incomes, increased agricultural productivity can be expected to help the poor gain higher incomes and to make more food available, which should reduce hunger. Land is the most critical resource in land-scarce Asian countries with high population densities, where the majority of the hungry live. In Africa land is not so scarce, but productivity is low for want of water or drainage. Thus investment in irrigation and drainage that would improve land productivity offer an attractive option to deal with the problem of hunger.

We noted in Chapter 5 that increased food production in response to high food prices does not help to alleviate hunger significantly, but investment in land improvement such as irrigation, drainage, and leveling could increase output without increasing food prices. Moreover, such investment can be very labor-intensive and the additional employment could provide scope to increase the incomes of the poor.

In countries where the poor are hampered in their quest for higher incomes by the lack of productive employment opportunities, there is an obvious case for creating additional wage employment. This is particularly attractive in rural areas during the agricultural slack season, providing incomes to those who cannot be expected to be absorbed by the employment creation associated with the overall

economic growth process. Rural works programs could thus be effective in providing targeted income supplements to those in greatest need. Beyond that, it is possible to use these programs for the creation of productive assets that would contribute to economic growth. If such programs become sufficiently widespread to operate as employment guarantees, then the wage rate offered would become an effective minimum wage.

There is considerable experience with programs of this kind in southern Asia and in China. Some have used food aid as a main source of financing, paying wages partly or entirely in the form of grain. Such programs have not been without problems (technical as well as managerial) in preparing and executing them and in maintaining the assets created. The programs are small in relation to the total demand for employment, and a rapid expansion could easily overtax local organizational capabilities, leading to larger leakages and reducing the income benefits for the rural poor.

There may also be institutional obstacles to such programs. The creation of additional employment opportunities for the rural poor would tend to increase wage rates and thus may be resisted by the relatively well-off and economically powerful rural landholders who employ wage labor. Also, when land is unevenly distributed, the benefits of productivity improvements accrue unevenly and mostly to the larger landowners. It may also not be possible to tax the landowners to recover from them the costs of land improvement. Still, most observers agree that land development programs could be expanded and that their benefits are sufficient to justify larger programs.

India: Rural Works Programs Can Be Effective but Cannot be Financed Solely by Domestic Resources

For an analysis of the effectiveness and consequences of rural programs one cannot rely on a single set of assumptions, and so expansion of this approach is fraught with uncertainties. These pertain to the methods of financing, the leakages in reaching the poorest rural groups, the productivity of the assets to be created, and the wage rate to be set. In our analysis carried out with the model of India, the choice is made for a program that provides a wage of about Rs 6 (in 1985 prices) per person for each day worked, paid in the

Table 6.4. Impact of rural works programs on growth and on the rural poor (percentage changes from the reference scenario in the year 2000).

Scenario specifications				Estimated results		
Addi- tional tax (% of cost)	Target- ing effec- tiveness (%)	Invest- ment effec- tiveness (%)	GDP per capita (1970\$)	Average calorie intake per capita	Calorie intake per capita	
					Poorest class	Two poorest classes
100	100	100	3.5	5.7	70	40
0	100	100	-4.6	4.7	70	40
0	50	100	-3.7	3.0	40	20
0	50	50	-7.3	2.1	40	20
0	50	0	-11.8	1.0	40	20

form of wheat at the prevailing market price. The two rural classes with lowest incomes in the agricultural and nonagricultural sectors of the rural economy are assumed to participate at a rate of about 200 person days for each family. An additional 50% is added to the wage costs of the program for materials, equipment supplies, transportation, and other overheads, and the total is charged against the government budget.

Also, it is assumed that in the best case the assets created by the rural works programs are as effective as normal investments in increasing agricultural productivity. Even though there is some evidence that well-planned and well-executed land development projects can be very productive, this assumption is made to eliminate the suspicion that the results of the scenario depend on the assumption of such productivity gains, which may appear "magical." Moreover, the scope for such "magical" land-improving investment is limited and may not provide opportunities to generate the needed employment.

In terms of effectiveness, alternatives are analyzed regarding the leakages of benefits to other income groups and the productive value of the assets created by the program. As for financing, the assumption is made that the government either will raise sufficient additional revenues from taxes on households or will offset the costs by reducing other public investment outlays. *Table 6.4* presents some alternatives and their results, compared with the reference

scenario. The latter contains only the existing food rationing scheme for the urban population.

In all classes there is a major improvement in the food situation of the poorest rural classes, even when the targeting effectiveness is assumed to be only half of the total wage bill. In fact, the calorie intake is improved so much for those groups that one may conclude that hunger would be eradicated particularly when targeting is successful and the investments made are productive. These results are the same regardless of how the program is financed, i.e., either through increased taxes or through reductions in other investments. Also, with less optimistic assumptions about targeting effectiveness, dietary improvements for the poorest classes remain impressive; logically the pessimistic assumption that, in the last alternative presented, no productive assets would be created has no effect on the improvement of the situation of these poorest groups, but the GDP per capita is significantly lower.

This result should be seen in conjunction with the implications for the entire economy of India, which are not small and are strongly dependent on the assumptions made with respect to the modes of financing and the effectiveness of rural works programs to create productive assets. If the program is financed by additional taxation, overall economic growth is accelerated significantly and the national average calorie intake improves even more rapidly, leaving no groups worse-off but the poorest groups considerably better-off. However, how realistic is the presumed tax effort that will be needed to achieve this attractive result? Taxes on household incomes in 1980 amounted to about 2% of GDP (excluding taxes on foreign trade and on corporations) in India and would need to be raised to some 8% or 9% of GDP to generate the resources required. Although 2% of GDP may seem a small level of taxation, one has to realize that it is collected from a very small fraction of the population. In 1988 India had 7 million taxpayers out of a population of more than 800 million. India has one of the highest tax rates in the world; in 1990, incomes above Rs 22,000 (US \$1250) per year were taxed, and those above RS 100,000 had a marginal tax rate of 54%. Thus to raise direct taxes to 8% of the GDP from the relatively rich, the tax rate would have to be so high that evasion would be widespread. Even though the additional financial resources would gradually become a smaller part of taxation in time, it is hardly

likely that an increase of this magnitude could be achieved, particularly when the purpose is so clearly the transfer of resources from the rich to poor.

If the rural works program were to replace the regular public investment program, thus avoiding the need for additional taxation, the macroeconomic effects would be much less attractive because there would be a significant reduction in economic growth. This loss of growth momentum has increased pessimism about the effectiveness of rural works programs to contribute to the creation of productive assets. In the least attractive case, in which the program involves digging holes and filling them again, the level of per capita GDP in 2000 is set back by 12% and it is likely that the gains of the poorest classes in terms of calorie intake would be offset by reductions in the nutritional status of the next higher income classes. In overall terms, growth is reduced from an annual average of 5% in GDP in the reference scenario to barely 4.5%, which is a considerable price to pay.

In the process of introducing rural works programs, we also consider the consequences for the balance of payments. In all scenarios it is assumed that government policy will maintain target prices for food in the domestic market, so that changes in domestic demand caused by the distribution of food to the rural poor are bound to affect the country's external trade position. The financing of the program is highly problematic: either the tax burden is high or reduced investment will result in lost opportunities for economic growth. This raises the question of possible external financial support.

Could additional aid flows be used to support rural works programs? If so, what level would be required, and what kind of aid would be helpful? The results of model runs exploring these questions are summarized in *Table 6.5*. As expected, rural works programs on this scale change the pattern of trade, and tariff revenues go down. To maintain the growth rate of the economy at the level of the reference scenario when the government is unable to raise the tax rate, the additional aid therefore needs to include compensation for changes in tariff revenues as well as the cost of the rural works program. Changes in tariff revenue can be large because the significant redistribution of income due to the rural works program leads to a change in the structure of domestic demand and hence in

Table 6.5. Rural works programs, balance of payments, and aid needs for India.^a

Variables (billion 1970 \$ ^b)	Year	No extra aid	Aid to maintain growth	Larger aid, terminated by 1996
Per capita income	1985	111.0	117.0 ^c	121.0
(1970 \$)	2000	155.0	182.0 ^c	195.0
Costs of the rural works program	1985	3.6	3.6	3.6
	2000	3.2	3.1	3.1
Change in tariff revenue from the reference scenario	1985	-0.2	-2.0	-2.8
	2000	-1.2	-1.0	-0.4
Change in trade deficit (= aid) from the reference scenario	1985	-0.1	5.4	9.6
	2000	-0.4	3.9	0.0

^aGenerates some 10 billion person days of employment per year, two-thirds of the expenditure reach the target groups as wages, and investment is assumed to be totally ineffective.

^bExcept for per capita income.

^cEqual to the reference scenario.

the sectoral composition of net imports. Large increases in aid also result in changes in net imports and hence tariff revenues. The level of aid needed is some US \$5 billion (at 1970 prices) per year, which decreases over time. With such aid to maintain the growth of the reference scenario, India remains dependent on substantial additional aid flows to sustain the program. The most attractive option is to start with additional aid in the early years to raise economic growth to a higher level, which then enables the extra aid to be terminated in the late 1990s without disrupting the financing of the rural works programs. Even for such a strategy the level of aid needed is less than US \$10 billion per year for a period of 15 years. Considering that nearly one-third of the world's hungry live in India, this is a modest amount.

Bangladesh: Alternatives to Increase Incomes of the Poor

The effectiveness of the rural works program is based on the additional incomes it creates for the poor. Other policy alternatives to do this and the role that external aid can play in facilitating such policies are explored with the model of Bangladesh. Over the past few years Bangladesh, with about 100 million inhabitants, has

succeeded in improving its domestic supply of food (mainly rice) so that domestic rice supply roughly balances effective demand. As in India, this in no way indicates a situation in which all people receive adequate food: up to half the population has insufficient purchasing power to meet its food needs.

Further increases in food production can easily have some less desirable impacts on the economy: the current rice price is determined by the import price plus domestic trade and transport margins, but would fall to the export price less such margins to get rice to the point of shipment. The price may even fall further as the quality of the rice produced may not meet international standards. Procurement and stockpiling by the government could only be short-run palliatives if production were to remain above effective demand, and declining prices are unlikely to lead to more consumer demand because real incomes of rice producers fall and those of others which rise in real terms are not expected to spend much more on rice. In short, the Bangladesh economy shows signs of contraction once market demand is met by domestic production.

It is doubtful whether at this stage industrialization can generate enough offsetting push to the economy to overcome the contracting impact exerted by the food market. There is a serious shortage of skilled labor, most industries depend heavily on imported inputs and spares, capacity utilization in existing industries is low due to unreliable supplies of power and natural resources, and there are management problems. Some industrialization can be expected to occur but is unlikely to become a major driving force for the economy in the medium term.

The question therefore becomes whether ways can be found to prop up the demand for the main staple foods domestically and to forestall an undesirable decline in the price of rice. As in the case of India, obvious possibilities are subsidized rationing to people with a high propensity to consume rice – the poorest classes – as well as investment in rural works programs that would employ the same groups. The capacity to undertake the latter is not as yet at the level reached in India, and the main emphasis, at least in the near term, therefore falls on expanded rationing. Experience in recent years suggests that a substantial part of rationing subsidies and food-for-work programs does reach the rural poor.

Table 6.6. Rationing scenario for Bangladesh: yearly subsidy increase, 1985-1990

Outcome for 1990	3%	25%	35%
Rationing subsidy (billion Taka)	2.3	6.0	8.8
Trade deficit (billion Taka)	49.5	52.4	54.5
Wheat imports (billion Taka)	7.9	8.6	9.1
Calorie intake			
Landless	1,672	1,726	1,748
Rural informal	1,718	1,749	1,772
National average	1,982	1,996	2,006
Income per capita ratio, farm/nonfarm	0.7	0.7	0.7

US \$1 = Taka 26.

Scenarios analyzed with the Bangladesh model assume significant increases in subsidized rationing targeted to the poorest groups: the program is expanded at a rate of 25% or 35% per year for the period 1985 to 1990 and is compared with a scenario with only a 3% increase per annum, slightly in excess of population growth. As expected, this improves the income distribution to the benefit of the poorest groups; it also leads to a small improvement in the ratio between farmers' and nonfarmers' incomes as the program is successful in maintaining or even slightly improving the real market price of rice. Production is hardly affected as a consequence, however, due to the inelastic supply of rice. There is a slight increase in the import demand for wheat, but this is only a small part (less than 20%) of the additional subsidy costs.

The most important finding concerns the financing of the subsidy. Some part (about 25%) is met from additional tax receipts due to the slightly faster growth of the economy; the remaining 75% shows up as an enlarged trade deficit in the country's external account (see *Table 6.6*), translating into an additional need for aid from abroad. Some part of it can take the form of food aid (wheat); but additional food import needs are small, and therefore additional food aid can only provide 20% of the needed finance. The rest needs to be provided as balance-of-payments aid, freely usable by the government to finance nonfood imports. This is interesting for two reasons:

- About three-quarters of the increase in food subsidies results in an increased trade deficit, which makes rationing an expensive proposition unless additional aid is provided.
- The additional aid can only be provided in the form of food aid to the tune of 20%, since the program of rationing must focus on the distribution of domestic rather than imported grains, in turn requiring aid in the form of balance-of-payments support.

The additional need for aid is roughly US \$200 million, 10% more than the actual and projected level of aid to Bangladesh. This is not much - some US \$2 per capita - and it also bridges only one-fifth of the gap between the actual calorie intake of the poorest groups and estimated minimum requirements. Further growth of the coverage of rationing after 1990 could reduce hunger, at a cost that does not appear excessive in terms of external and domestic resources. But the former should be in forms other than food aid.

6.1.3. Food and other aid

Section 6.1.2 has indicated that certain measures can effectively counter hunger; these are primarily of a national kind, either through targeted rationing, with the expansion of rural employment programs or through a shift of investment resources to regions where poverty is concentrated. In each case, it was noted that external assistance would need to be increased to ensure the availability of adequate resources to maintain economic growth.

The examples are all from South Asian countries where poverty is most intense and widespread, and therefore the analysis is highly relevant. Our models for Africa, Latin America, and other parts of Asia where poverty affects large numbers of people are unfortunately not well-enough specified to attempt the same type of analysis. There can be some doubt about the relevance of findings in South Asia to other parts of the world, where the characteristics of poverty are not the same. In Latin America the skewed distribution of land ownership may hamper the effectiveness of the approaches suggested for the cases of India or Bangladesh. Similarly, in Africa excess labor supply may be much less rampant, particularly among rural women, since the low levels of agricultural technology and crop

yields even for subsistence food production require amounts of labor in excess of many households' labor supply. For these reasons, one should interpret our results with caution.

One remaining question concerns the benefits to be expected from additional external assistance, assuming that no changes occur in the national policies of the recipient countries. In other words, it is assumed that the objectives of development policy are in no way altered with increased aid flows and resource allocations continue to be made as before. An analysis along these lines will shed some light on the issue of eradicating hunger in developing countries outside Asia; it can also provide some guidance on aid levels that may be needed to achieve significant progress in eradicating hunger before the end of this century.

Another question in this connection concerns the form that aid should take. Many donor countries find it easier for domestic political reasons to give aid in the form of food. Food aid has often been criticized for its adverse impact on incentives for domestic food production, but there is also clear evidence that such impacts occur mostly as a consequence of inappropriate policies by donors and recipients alike, rather than the intrinsic characteristics of food aid itself. In particular, when a decline in the availability of food is the cause of hunger, as is the case during droughts and famines, additional food brought to the region should help. However, when hunger is the outcome of inadequate incomes, as chronic hunger usually is, the effectiveness of food aid is not obvious. In fact, food aid can be counterproductive, but this applies to all other forms of aid as well. To explore these issues further with the Basic Linked System, several aid scenarios were developed.

Aid Scenarios

Existing flows of assistance on concessional terms - low interest, long repayment periods, or outright grants - amount to approximately one-third of 1% of the developed market economies' GDP and has hovered around that level for many years. This is only half the effort called for in a number of UN resolutions. Most of the poorest countries, with little prospects for increasing their export earnings, lack the capacity to absorb loans at harder terms as their debt servicing limits will soon be reached. Yet, in fact less than half

of the limited amount of concessional assistance goes to these countries.

A simple and straightforward approach to additional aid has been taken in designing the scenarios. A tax is levied on all countries with per capita incomes of US \$1500 or more (in 1970 dollars) amounting to 0.5% of their GDP, and is distributed to countries with per capita incomes of US \$1500 or less. It is assumed that the distribution is inversely and exponentially related to per capita incomes, so that a country with a per capita income of US \$100 receives five times more than one with an income of US \$1000: this provides the main part of additional aid to the poorest countries. The scheme is assumed to start in 1984, and to add to concessional capital flows, which in the reference scenario gradually increase to 0.4% of the developed market economies' GDP in the year 2000. Thus in the aid scenarios, over the entire period from 1984 to 2000, the UN objective of 0.7% of GDP is exceeded and the aid level moves from 0.83% in 1985 to 0.9% by 2000. (The scenarios all begin in 1980. What may look like an attempt to rewrite history for the 1980s was not so when these scenarios were made in 1985.)

Several other more detailed scenarios have been tested which formulate international taxation proposals and burden-sharing alternatives in which various groups of countries participate. Links have also been made to reduce defense expenditures. For the scenario discussed here, as for others not presented, it is assumed that none of the recipient countries lacks absorptive capacity, whereas in reality additional aid may have decreasing effectiveness.

Two alternative and simple assumptions are made about the use of additional aid by the recipient countries. In one case, all new aid resources add to the level of investment, i.e., domestic savings efforts remain the same as before aid was provided. This assumption expresses a preference of donor countries, but in practice has been found difficult to achieve. In most aid-receiving countries investment spending rises by less than the aid amount, domestic savings rates are somewhat reduced, and consumption - public as well as private - rises. Therefore, an alternative scenario assumption provides the same additional aid flows but leaves it to the country itself to determine its use. In that case the propensities applicable to domestic resources will most likely apply to the external resources as well: if a country normally saves 20% of its resources and

Table 6.7. Alternative aid scenarios for all developing countries:^a percentage change from the reference scenario.

Scenario	Reference run		A-Cap ^b		A-Bop ^c	
	1990	2000	1990	2000	1990	2000
Number of hungry (million)	470	400	-13	-32	-24	-32
of which, in poorest countries	345	305	-15	-40	-29	-40
GDP per capita (1970\$)	370	500	2.4	5.3	0.5	1.7
of which, poorest countries	120	170	9.8	24.7	1.4	3.5
Number of hungry (million) when aid is terminated in 1998:						
All developing countries			-13	-25	-24	-17
of which, in poorest countries			-15	-34	-29	-12

^a Excluding China.

^b Additional aid given for capital formation.

^c Additional aid given for balance of payments support.

consumes the remaining 80%, it will use additional resources in the same way. Thus, investment, savings, and consumption rates remain the same but apply to a slightly increased availability of resources. Actual use of additional aid for investment may be between these two extreme cases.

Full addition to investment outlays in run A-Cap (aid for capital creation) leads to a significant increase in economic growth in all developing countries together, and a particularly strong increase in the poorest countries. When the additional aid is spent freely by the recipient countries (A-Bop, aid for balance of payments) there is also some economic growth but the difference is small because the impact on savings and investment is limited. The difference between these two scenarios in terms of reducing hunger after 15 years in the year 2000 is only very small (see *Table 6.7*), suggesting that consumption use of aid can be as effective in reducing hunger as its use for investment purposes. In both cases the effects on food prices are similar. But consumption creates a stronger dependence on continued aid flows, as is demonstrated by terminating the aid flows in both scenarios in 1998 and comparing the effects on hunger in the year 2000. In the "consumption" scenario, hunger rises rather steeply, but in the "investment" scenario the effect is much smaller because the reduction of hunger in that case has a more solid

foundation in employment and incomes created alongside the higher levels of investment.

The scenarios demonstrate that a rather modest but sustained effort to provide additional aid leads to significant improvements in the food situation in recipient countries. The effects are more sustainable, the more recipient countries succeed in channeling additional resources into larger investment programs. The effort is modest, as appears from what happens with the economic growth in the developed market economies: by the year 2000, their GDP ends up hardly smaller (by 0.2% to 0.4%) than in the reference scenario. Additional aid obviously leads to additional imports by the recipient countries, which to a large extent are purchased in the industrial countries and thus compensate for the deflating impact of the aid flow itself. This compensation is almost 100%.

To explore the possible impacts of increased aid in kind, three scenarios were developed and analyzed with the BLS. Again, the scenario design has been kept simple and transparent and does not pretend to explore the issue exhaustively. A tax is levied in developed market economies equivalent to the respective current value of 50 million tonnes of wheat annually for the period 1982 to 2000. The entitlement for these 50 million tonnes of wheat is transferred to selected developing countries with per capita incomes of US \$1500 or less (those explicitly represented in the BLS include Egypt, India, Indonesia, Kenya, Mexico, Nigeria, Pakistan, Thailand, and Turkey). Three variants of this basic setup were tested:

- (1) Recipient countries were supplied with wheat from this additional aid-in-kind fund with no restrictions on usage.
- (2) Recipient countries were supplied as above with restrictions on re-exporting the donated wheat.
- (3) General balance of payments support was given to the poor countries in sums amounting to the equivalent of 50 million tonnes of wheat.

In each variant, the government receives additional incomes. Even when wheat is received in kind, when sold in the domestic market (in variants 1 and 2) or when re-exported (as can happen in variant 1), the government receives additional income. Such budgetary support permits a government to increase public

Table 6.8. Scenarios on wheat aid to selected developing countries: percentage change relative to the reference scenario in the year 2000.

	RS		Variant 1		Variant 2		Variant 3	
	DME	DEV	DME	DEV	DME	DEV	DME	DEV
GDP	5,053	985	-0.10	0.21	-0.16	0.03	-0.04	0.40
Agricultural prod. (1970 \$ billion)	151	158	0.63	0.14	2.46	-0.59	0.39	1.20
Net food prod. (10 ¹² kcal)	1,633	1821	2.70	-0.87	9.25	-3.56	0.41	0.55
Cereal prod. (million tonnes)	746	449	1.41	-1.28	5.92	-4.01	0.31	0.53
Wheat prod. (million tonnes)	222	144	6.32	-5.39	20.54	-13.70	0.54	0.49
Cereal food consump.	95	346	-0.31	2.51	-0.86	8.26	-0.04	1.24
Wheat food consump.	50	127	-0.48	7.02	-1.10	22.90	0.06	1.28
Number of hungry (millions)		184		-11.82		-30.35		-10.34

DME (Developed market economies). Aid is provided by selected developed market economies: Australia, Austria, Canada, Japan, New Zealand, the United States, and the EC.

DEV (Developing countries). Aid is given to selected developing countries: Egypt, India, Indonesia, Kenya, Mexico, Nigeria, Pakistan, Thailand, and Turkey.

expenditure and investment or to lower domestic tax rates. No restriction is imposed in these scenarios on the use of this income, nor is any change in a government's allocative behavior stipulated. Variants 1 and 3 differ in that in variant 1 the value of re-exported wheat would be lower than its import value.

Table 6.8 highlights some of the results from these scenarios. As expected, the second variant shows the biggest impact on the estimated numbers of hungry, a decrease of a little more than 30% in the affected developing countries, i.e., some 60 million people. However, this improvement is achieved at the expense of increased dependence on foreign cereal supplies. In the year 2000 the domestic production of wheat in the nine developing countries studied declines by 13.7% (some 20 million tonnes) relative to the reference scenario, the total production of grain crop decreases by 4% (i.e., 18 million tonnes), and feed production as measured by net calorie production is lowered by 3.6%. General balance of payments support

equivalent to 50 million tonnes of wheat (variant 3) has less of a short-term effect on hunger, approximately 10% decrease, yet this does not discourage agricultural producers as in the previous case. The results clearly suggest that stepping up food aid cannot lead to a sustainable solution to the hunger problem.

6.1.4. International migration

We saw in Chapter 2 that today natural resources including land have been completely divided among nation-states, and massive international migration is no longer an option. Natural resources are distributed unevenly in relation to the distribution of people. Under these circumstances, is it reasonable to expect that poor countries could follow the example of the rich? In a world divided by fences, some to keep people out from where resources are abundant, others to keep them in where endowments are poor, the chances of escaping from poverty are severely limited, even when the international framework for trade and capital flows is a fairly liberal one. Not only are there barriers to migration between developed and developing countries, but also between developing countries such as India and Bangladesh and within countries such as Ethiopia and China. In this scenario we focus on migration from developing to developed countries. The modeling system lends itself to illustrating why, even in a world with free mobility of all goods, services, and capital, poverty will persist as long as labor markets are protected.

Fences around countries and their labor markets no doubt serve noneconomic purposes, such as protecting national cultures, identity, and sovereignty, but they also cause a loss of potential welfare. In other words, these noneconomic purposes have their costs in economic terms and these are unevenly distributed; those inside the fences protecting the rich will gain, those outside will lose. Without suggesting that the fences should be lowered, one may still want to know how much the advantaged gain and how much the losers bear; the potential welfare gain for the world from removing the fences entirely would be large enough to compensate those who lose their now privileged positions, and still leave something for those who now bear the burden of the world's

compartmentalization. Leaving the fences standing should logically lead to the question of whether those who benefit (earn a rent) from the fence, should not compensate those who now bear the losses.

Nations have widely divergent endowments of natural resources, including their own location, which suggests that the analysis of liberalization cannot be restricted to goods and capital alone. Given such unequal endowments it is highly unlikely that poorly endowed or located countries could develop in ways that could ever bring their income levels up to those prevailing in the rich countries; they are bound to run into obstacles as they try to acquire available land, energy, food, and affordable capital from abroad. One cannot devise development strategies that would use abundant labor for the production of export goods without reaching the limits on international demand for those products. The equalization of wages requires that people from these countries work abroad and possibly repatriate their earnings. Whether analyzed in a static or a dynamic sense, the conclusion reached is that the only way out of poverty is to increase the marginal product of labor and that the chances of doing so to equalize wage rates around the world are exceedingly slim if there is no migration. Technological developments may even work in the opposite direction of equalization.

If for sociopolitical reasons the fences are retained, then one should realize that these work in the same way as any other import quota in international trade and that compensation of the losers is a relevant economic issue. If one accepts the neoclassical model, as free trade advocates do, one should also recognize that all arguments from welfare theory which advocate free trade in commodities and open capital markets will hold, *a fortiori*, for labor services once it is recognized that some factors like agro-ecological resource endowments, i.e., land, can never be traded. The point is not merely a theoretical one. The restrictions of the fences can be felt every day. Turks and Yugoslavs in Germany, Hispanics in the United States, North Africans in France, all contribute to the economic development of their host countries, yet those guest-workers are not always welcome. These reactions are often voiced by organizations whose proclaimed aims are to maintain national cultural identity as well as to protect labor markets for the unskilled. The highly skilled need less protection of this crude kind if only because they are already sufficiently well protected through educational requirements (such as

doctors and lawyers) or security interests (say for officials and magistrates).

Opposition to migration therefore amounts to opposition to free trade, and in any case is inconsistent with a no-aid argument if a policy of free trade is based on the logic of compensation for migration barriers. In that sense the calculation of welfare gains from free migration is relevant in that it gives quantitative expression to the compensation to be paid to remain credible when advocating free trade but banning migration. We now examine the magnitude and distribution of the aid flows that can be related to this argument.

Our modeling system is not sufficiently detailed to include some of the features needed to explore scenarios of international migration satisfactorily, but with some assumptions (admittedly heroic ones) it was possible to generate such simulation runs. The following assumptions were made:

- (1) Migrants acquire the skills and life-style of the country to which they have immigrated to as soon as they arrive.
- (2) The costs of migration are negligible.
- (3) Large-scale migration is tolerated and does not disrupt the economies of the countries of origin and destination, and the migrants repatriate none of their earnings.
- (4) Migration is driven by the differences in per capita incomes between the country and the global average.

In a scenario in which nearly 300 million people were relocated over a 15-year period the global GDP at 1970 world prices at the end of this period (the year 2000) increased by more than 20%. This amounts to more than US \$1000 billion.

Hamilton and Whalley (1984) tried to assess the implications of barriers to labor mobility between high-wage and low-wage countries. They point out that the efficiency gains implied by the removal of migration restrictions are substantial, suggesting that this issue may be much more important to LDCs than any other issues raised thus far in the North-South debate.

Our admittedly very crude estimate indicates the extent of the global economic loss. In comparison, the resources needed to eliminate poverty and hunger seem a pittance. Yet in the current

climate of skepticism about aid, such additional aid may be hard to mobilize, unless it is a part of policy changes that address concerns of the developed countries themselves. Agricultural surpluses, trade, export shares, and trade liberalization are issues that cause concern in many developed countries. It is to these issues that we now turn.

6.2. Aid: Why?

6.2.1. The stubbornness of the hunger problem

We have found scenarios that work and, according to the model, do help in alleviating the hunger problem, yet the policies suggested have not yet been adopted. It may be that the preceding analysis is wrong and thus irrelevant, but, if we suppose that it is not, then there are three basic factors that may explain why the suggestions have not been adopted, or at least not to a sufficient degree. What is required for effecting a change and may have been lacking in the past is knowledge of strategies that can bring about change, power to effect the strategy, and willingness to help. If knowledge had been the main limiting factor in the past, this report could end here, leaving it to the readers to judge whether the suggestions are appropriate or not, or at most concluding with some views on the administrative aspects of implementing the suggestions. Alternatively, if in spite of knowledge and a strong willingness no collective action could be mobilized to combat poverty and hunger, then the answer could also be very simple: no concerted action is possible, so act as an individual and help as much as you can; do not wait for others. Given the modest amounts of aid required, however, the assumption of a lack of power seems unrealistic.

This brings us to the third and most important constraint, namely, the willingness (or absence of willingness) to help. As long as the rich are unwilling to help more, there is little reason to expect any quick solution, although changes will undoubtedly occur. Technical progress will go on, environmental protection will be of increasing concern, wars, droughts, and floods will attract the world's attention, but hunger will persist. In fact, in many ways this appears to be the situation today. At present, development aid is in an economic sense marginal. Willingness to put pressure on

countries with inequitable policies is minimal, and international migration has been virtually blocked. Inadequate willingness to help thus seems to be the major lacuna. Why people are reluctant to help and what can motivate them are the questions we explore next.

6.2.2. Why people are reluctant to help

The absence of willingness to help may be rationalized in several ways. We first consider the position that the Darwinian principle of “survival of the fittest” has a moral value by itself and justifies the neglect of the poverty problem. Leaving aside the moral aspect, one may dismiss this view by pointing out that poor people who in this view are “less fit,” rather than having fewer survivors, in fact tend to have higher fertility and net reproduction rates than the rich, so the fact that poverty is so widespread goes against the principle itself. To this it may be objected that Malthusianism certainly must work at some stage of deprivation, but this amounts to advocating genocide and hardly any society has permitted such uncontrolled operation of Malthusian solution.

Second, following a more benevolent line of argument, there is the optimistic view that aid is not necessary; the problem will resolve itself. Technical progress and economic growth in developed countries can serve as engines to the world economy and solve the problem. Policy reforms may be required but those would be related to deregulation to let the self-interests of all parties concerned work more efficiently. It is to be hoped that we have shown that this line of reasoning is inconsistent, at least as long as migration is prohibited. In many poorly endowed countries foreign aid is essential to mitigate the hunger problem.

Third, some people think that the problems are so enormous that no significant advances can be made. Our and others’ calculations have indicated that this is too pessimistic a view. With sufficient willingness to help, it could be solved, perhaps even quite easily.

Fourth, arguments against aid itself follow the line that it often is so difficult to give appropriate aid that it may be better not to give it at all. Aid is bad for the poor, and the reasoning is as follows. To alleviate poverty two types of remedy are usually

suggested. In the short-run direct income transfers from the rich to the poor should alleviate current suffering; structural investments aimed at improving the poor's capacity to earn adequate incomes are advocated as a long-run solution. The arguments against direct transfers tend to express the idea that short-term direct income transfers lead to long-term transfers and create aid dependence. Investment aid directed to the poor may necessitate the acceptance of less profitable projects which, in this perception, would never have been selected on commercial terms. The arguments derived from these views can be listed as follows:

- (1) When the poor receive guaranteed minimum incomes, they will not be willing to work at very unpleasant, low-wage jobs, causing wage-push inflation which in turn will erode the real value of this income.
- (2) The poor spend most of their incomes on consumption. Future generations should give aid so as to stimulate investment.
- (3) When the poor are given minimum incomes they will also buy more of some goods that cannot be produced in the domestic economy and thus increase import dependence.
- (4) A higher domestic production caused by, say a bumper crop, would reduce poverty in the eyes of the donor and thus reduce aid, so that the poor who can foresee this are discouraged even further to produce more.
- (5) When transfers are given as commodity aid of a fixed composition, say food aid, domestic production may be discouraged by less remunerative producer prices.

It would not be difficult to expand these arguments but the points listed may sufficiently illustrate the idea that it is bad for the poor to provide direct transfers to them, much in the way it is bad for a child to receive too many candies. Although each argument has some degree of validity, that should only be a reason to look for ways to provide aid effectively, as other means to alleviate hunger will take too long.

The arguments against investment aid essentially relate to the high project costs and the low profitability of the capacity created. In this view aid is seen as an investment subsidy that distorts the orientation of the recipient country. Again, such reasoning is faulty.

The selfish forces of “the market“ do not solve problems of income distribution. There is no need for transfers. Also investments go to the most profitable destinations under free markets. Aid is needed precisely because free commercial investment, say across national borders, has not been and cannot be expected to ensure sufficient labor and land productivity in all nations. Low wages do not necessarily attract the investment that would be required to raise them. The natural environment, locational factors, and shortage of accumulated skills may prevent this.

Aid is often a transaction between governments that cannot always be swayed by moral arguments. Governments often spend the money on armaments and wasteful prestige projects resulting in corruption, capital flight, and conspicuous consumption rather than on poverty alleviation. Unless safeguards are devised to guard against such waste and misuse, reluctance to support aid may be understandable.

Despite all these reasons for not supporting aid, the fact is that many people do care and want to help fight hunger. It is worth examining what positive motives people have to help.

6.2.3. Willingness to help on moral grounds: Voluntary income transfers

A fundamental source of willingness to help and a major reason for optimism is that people care for each other. They may dislike others being richer than themselves, but seeing people starve gives satisfaction to virtually no one. Almost everyone would very much like this problem to be solved, and this represents a strong political force, especially as we have seen that relatively little sacrifice would be needed to achieve a solution.

In the economic literature aid is often termed a grant or transfer. Boulding (1982) provides the following definition of transfer:

There are two basic economic relationships between economic partners: exchange, in which there is a mutual flow of economic goods from each party to the other; and the grant or transfer, which is a one-way flow of economic goods from one party to

another, without economic goods passing in exchange although there may be noneconomic goods passing.

Sociologists and anthropologists (see, for example, Hirschleifer, 1985) have attempted to elaborate upon these noneconomic goods in an attempt to reduce all relationships to exchange relations, in this way expanding the paradigm of selfishness. This tends to obscure the fact that compassion and a sense of fairness do exist, that an individual's decision to give to a charity is usually not governed by selfish motives, and that the individual tends to be more easily discouraged by the low marginal effectiveness of his or her country's gift than being encouraged by possible future rewards. Sociologists may be interested in identifying the noneconomic goods purchased through transfers. But as long as social scientists are far from being able to measure these goods it is useful to maintain the concept of altruism and the associated willingness to help.

Spinoza in his *Ethica* (1677) postulates that humans show willingness to help as a kind of a reflex. The more similarity one observes with some other person, the more one behaves as if it was oneself. Thus, one person will defend another in case of attack and help him or her when in danger. Rawls's "veil of ignorance" (Rawls, 1972) is a reinvention of this concept. Under this concept, the less people know, the more similar they become. Spinoza's view has the advantage that it helps explain why, for example, aid programs exist in which children, say, in Europe help children in India. Identification appears to be the basic concept. Their willingness to help is elementary.

Spinoza also makes clear that identification with other people has its limits: one may even recognize a threat in another person and dislike him; one may also dislike another person because he is better-off. In other words, people identify with others only up to a point. It is here that the concept of the voluntary grant comes into play. Its voluntary nature makes it possible to orient the gifts to whom one likes, and the fact that one is only allowed to give, not to take, protects those who are disliked. A grant works one way only: the donor decides, all the recipient can do is refuse it.

We now look at whether this process of voluntary income transfers can be expected to contribute to the solution of the hunger problem. Such a model of an economy was first presented by Arrow

(1984) and was later elaborated upon by Keyzer (1987). Each agent cares about others as well as himself and is able to transfer income to other agents according to his preferences, the availability and cost-effectiveness of the projects, and the need perceived. This process is not necessarily fair. Selfish people may not want to help, thus forcing others to help more; recipients may lie about their need. Thus, the process of voluntary transfers may degenerate.

Nevertheless, when we speak about hunger in the long run, no lie is possible. Willingness to help is an elementary drive and voluntary income transfers offer means to channel it, provided the donor–recipient relation is truthful. Emergencies may be exaggerated once but not repeatedly, and the donor may introduce conditions for aid. In times of emergency there is little donor agencies can do but help; at other times donors can ask for domestic reforms and income redistribution in exchange for assistance; otherwise their own constituencies would be unwilling to pay any longer.

Yet it is too simple to argue that voluntary transfers alone will resolve the hunger problem. Clearly, it is a major resource for the poor but not one that can be expected to grow suddenly by itself. Moreover, as we have seen, the increased willingness of some donors may, in theory, fail to increase total aid disbursements. Thus, there is a need to consider other motives for giving aid and to search for potential synergy between them.

6.2.4. Selfish motives: Aid to satisfy donors' economic, political, or security interests

One way to mobilize support for the cause of poverty alleviation would be to prove that helping is in the donor's interests. Used as a policy instrument, aid can further the donor's economic, political, and security interests, and may also be viewed as an insurance premium against adversity.

A purely selfish agent, as represented in the BLS and in most economic models, would not engage in helping others. However, when price effects are taken into consideration, the consequences of helping may be positive for the donor under the so-called transfer paradox (Bhagwati *et al.*, 1984), according to which the gift may create a demand which improves the donor's terms of trade and

overcompensates for the cost of the aid. However, several simpler arguments exist, all of which explain aid as being in the donor's interests (see Maizels and Nissanke, 1987; Ruttan, 1989), which can be categorized as follows:

- (1) Current economic interests. These include stability of the donor's export industry, support for domestic producers (say farmers or arms manufacturers), and tax deduction rules for private donors.
- (2) Future economic interests. These include future supply of noncompeting goods, demand for the donor's goods and the development of preferences through habit formation in favor of the donor's products, and insurance against adversity.
- (3) Political and security interests (votes in the UN, alliances, military bases).

Each argument may have a degree of validity of its own, but the first argument (particularly stabilization of the donor's export industry) is in its unqualified version a fallacy. It may be true that the donor suffers from overcapacity in some sectors. Generating increased demand may then help producers, but not if their increased output is then given away in the form of aid (the shipping and supervision costs incurred would burden the balance of payments, for example). The advantages of producing more becomes apparent only when the surplus is sold commercially so that it represents an increase in national savings to be recaptured through future earnings; this would not apply when those earnings are then given away as aid.

Yet there is a stronger argument. When used efficiently by the recipient country, it will accumulate resources that will reduce import needs and eventually expand exports. In due course the recipient country will even provide goods and services to the donor at competitive prices. Development aid could then be seen as being similar to investment in an employee. However, it may also be that the aid stimulates consumption in the recipient country more than it does production. The recipient will then incur a debt that does not benefit the donor unless it is being repaid at a high rate of interest, and for this a surplus would have to be created.

With respect to the other arguments it is clear that tax deduction and support of interest groups do not necessarily represent the donor's interest. In these cases the taxpayer is the actual donor and he or she is not consulted except at election times. As for the long-run interests (argument 2), these may indeed exist, but unless the recipient is fully colonized by the donor, the donor's competitors are likely to benefit most from the aid.

Hunger represents a tremendous waste of human resources. By not feeding children properly, both their physical and mental growth is impaired. As a consequence they may become liabilities to the world community instead of assets, even if only a few would possess the brilliance of a da Vinci or an Einstein. Preventing serious malnutrition is a public good for humanity because of the potential contribution to human welfare.

Let us also observe that if appropriate levels of aid may already be argued for with no reference to the recipient's interests then apparently these arguments either must have been unknown or were not very convincing in the past. Otherwise the levels of aid would have been much higher. In general terms, it is probably true that it is beneficial for a donor to give some aid, but unless this aid is viewed from the recipient's point of view, there is no reason to expect that it would be sufficient to resolve the hunger problem.

More important, the economic, political, and social interests would never allocate most "aid" to the most needy; rather, they would invest it where the return is highest. It would not be targeted to groups that do not serve the donor's interest. The poor would be most likely written off and any beneficial impact on them would be purely coincidental.

Aid to the poor may also have features of an insurance premium against adversity. Even completely selfish people will be willing to pay this premium, provided they believe that they or their children may themselves be poor someday and that the scheme is reliable, so that it will work for them if and only if they pay the premium today.

In such a scheme, a subjective assessment of the likelihood of future events determines present-day certainty. Yet, how does one assess future uncertainty? One way is to regard the future as completely uncertain, as reflected in Rawls's "veil of ignorance," neglecting not only factors that are irrelevant in the sphere of consideration

but all factors. Such a mental exercise greatly exaggerates the agent's uncertainty and thus his or her willingness to pay a premium.

Morality in some sense reflects this, i.e., it is the result of the mental exercise of assuming that one would be the other person or living creature and ranked differently in society than one currently is. This self-imposed uncertainty may motivate one to make voluntary transfers. Obviously, in the real world perfect morality cannot exist: one cannot meaningfully make the mental exercise of being Mrs. X in the year 4003 and act accordingly; nor can anyone be expected to treat his neighbor's children as his own. What the veil of ignorance makes clear is that willingness to help may be enhanced by uncertainty. Earlier we saw that fences erected in the form of constraints on migration drastically reduce the risks of the rich. They have more resources, temperate climates, good health care, tight security measures, strong defense, and solid pension funds. The compartmentalization hardly stimulates solidarity with those on the other side. Some environmental and security risks may also affect the rich, but in many respects it may be more rational, from their point of view, to build a fortress of security measures around themselves and to use force against any threats. Until some global environmental disasters occur this fortress could probably survive technically, but not morally of course. Labor-saving technology would even allow small communities to flourish; the highly skilled and resource endowed would have little need for the others. The rich would find it cheaper to protect themselves by strengthening fences that reduce their risks than by paying for aid as an insurance premium. Rather than performing mental exercises which increase uncertainty, such as the veil of ignorance, they would develop an infrastructure to reduce it.

At this point the scope for increasing international aid may seem bleak. Limited capacity on the part of the recipients to use the funds effectively restricts the scope for increasing aid when viewed as an investment, and fences around countries may provide better protection than any aid scheme. Yet, there is still an argument for aid that we should examine.

6.2.5. Aid as a share in the benefits from international cooperation

As long as international aid is seen as something peripheral that is not required for the well-functioning of the rich as well as the poor, it will lack institutionalization and will depend on a level of public awareness that would be difficult to maintain over long periods of time. To have international aid function in a more institutionalized way it must play a central role in the sphere where it belongs – in the sphere of international relations.

We return to the case of trade liberalization discussed in Chapter 5. Once the potential gains from multilateral tariff reductions have been appreciated by all parties, the reduction itself must be agreed upon. Not only should gainers compensate losers, but agreement also should be reached on sharing the overall gains from the agreement. It is not easy to find rules for this because there are many situations where free-riding may be best for some individuals or countries, that is, to have the others liberalize and to keep one's own hands free to affect, say, the terms of trade. Yet when all parties do this, no agreement is reached. In other words, it is not often possible to reward individual participants according to their marginal contributions when joining an agreement (see Walzer, 1983). The situation is basically the same as in a relatively small noncorporate firm, say a law firm. There the employees together generate an income but the harm that a former employee can cause by setting up a firm around the corner is not necessarily a good indication of what he or she could earn inside the firm. Seniority, membership, and other ranking rules will often be used to distribute the corporate surplus, and principles of distributive justice will have to be adhered to in order to achieve acceptance of these rules (see Walzer, 1983).

In any negotiations, even when they start from pure selfishness, ethical notions have to be used to justify the sharing of cooperative surplus and to establish reliability of the scheme. Distributive justice thus enters the economic sphere. Joining a long-term agreement is in some sense like joining a community with its own principles of distributive justice, its own policy, and its own rules for handling disagreement. New agreements determine who are members and nonmembers and in some sense change the system itself. Only those agreements where participants are so unimportant

that their joining or not joining hardly matters (and such agreements are reached on the market in everyday life by individuals) leave the institutional structure unaffected. This is so either because no one is large enough to affect it or because the agreements have such a short duration that there simply is no time to find out what the cooperative surplus actually is. This is precisely what distinguishes a large from a small organization. In a small organization power will tend to be shared equally unless the organization is like a prison from which some of its members cannot leave (the migration argument once again). For larger organizations this is why workers' unions may be needed, simply to create the monopolistic power needed to enforce distributive justice.

Once it is accepted that all long-term agreements are steps toward the formation of communities, and once it is understood that agreements need concepts of distributive justice to function, then it is only a small step to conclude that international agreements, such as those on trade liberalization discussed in the Uruguay Round, need an aid component. This would not only compensate the losers, but would also give credibility to the agreement's principles of distributive justice.

It is here that the rent-of-the-fence argument fits in. The argument against protectionism is that it causes a loss welfare; indeed, the world could be better-off if there were no protection. The international agreement to abolish it will have to stipulate how the gains from abolition are to be distributed, and, if some parties want to make exceptions, they will have to pay for it. To claim, for example, that the agreement applies to agricultural products but not to minerals would not be credible.

Should the same principle of distribution apply to labor, minerals, and agricultural commodities? If not, then what principles should apply in different areas? To explore this it is necessary at this point to consider some of the ideas by Walzer (1983, pp. 30-63), who argues that no single principle of distribution could ever hold for all commodities. In particular, several commodities (in the broad sense of social goods) should never be sold or distributed according to the rules of the market. Examples of such goods include membership of a community, public office, marriage, or a doctor's title, which would then lose their meaning.

Some sort of allocational principle is required in each sphere. Walzer argues that for such an agreement to function the allocation must be "fair" within its own sphere but not necessarily in other spheres. Not only should one not buy public office, one should not marry to get public office. Nor should irrelevant criteria such as race or sex count. This is not to say that the positions should be distributed by lottery, only that characteristics irrelevant to the sphere of operation should be ignored. We stress that the word "should" is used here not in an ethical sense. Violation is not necessarily immoral but it hampers satisfaction of the interests of all participants.

With respect to migration this has important consequences which Walzer points out as follows. A country consists of regions with neighborhoods as basic elements. Each neighborhood is some sort of community. If foreigners were allowed to move freely into the country, fences around the country would soon be replaced by fences around neighborhoods. Language, common history, and common habits distinguish members from nonmembers. A foreigner gaining access to the labor market would be more than just a provider of labor services. He would bring his culture, possibly his family, and would require a place to live. For this he would need to gain access to some neighborhood that might not wish to accept him as a member. It is the essence of a community that it has the right to decide whom to accept as member. The right to give up membership has to be a private decision, otherwise surplus sharing cannot work. (Still there are cases where termination of membership has to be restricted somewhat, such as divorce.) Again the term "right" is used in a positive rather than a normative sense: for the community to function the right must be recognized. Following Walzer's thinking it is legitimate for communities and maybe even their essence to restrict membership. This only strengthens the rent-of-the-fence argument, to which we now return.

If living in some small community is desired by a group of individuals but has a welfare cost to some members of a larger community to which this small community belongs, then following the principles of free trade agreements, the people who enjoy the small community life should compensate their fellow members in the larger community. If the larger community is at least in part an economic one, then a financial payment is an adequate

compensation. In this case the rent of the fence is one way to define the payment. This way is by no means unique but the larger community will have to decide on what is considered just within its own sphere. The rent of the fence is not a damage claim which once paid relieves the donor countries of all responsibility; rather, it is a consequence of the necessity for the larger community to maintain consistent standards. It may be commonplace to say that the world has become more interdependent, as is demonstrated by the fact that an increasing number of long-term international treaties and private contracts are being signed. But at the same time, the poor countries signing the agreements may be aware of the cost in terms of the functioning of their own community, while the rich consider the agreement necessary to maintain the status quo. Antiterrorism, arms reductions, the environment, telecommunications, trade, the resources of the sea, in order to reach agreement on any of these issues all parties must first agree on the fair principles for distributive justice. In many of these cases, nonparticipation of some can be extremely costly to others, so that marginal pricing cannot provide guidance. For agreements to work, distributional principles that transcend the boundaries of individual agreements are required. A government that violates human rights or neglects starvation at home will lack the moral authority to use fairness arguments in international negotiations.

In this way, the fair sharing of the benefits of an international agreement can be expected to affect domestic policies, and to generate new international agreements. A trade liberalization agreement, followed by monetary coordination, calls at some point for the coordination of social policies. The finer the tissue of international conventions, the more unavoidable it becomes to apply and institutionalize common distributive standards. It is hard to foresee whether this will lead to the recognition of the individual's right to food in an absolute sense or only to a right to, say, paid employment. All we can argue here is that an international order in which nations participate freely will have to operate with a minimum level of fairness, not because those nations have formally committed themselves to do so, as in 1948 with the Universal Declaration of Human Rights, but because they cannot function efficiently without it. In this respect the free traders and the interventionists seem to agree. Fair competition, fair opportunities, and basic rights are

more than normative principles imposed from the moral sphere onto the system of international relations. They reflect the sustainability requirements of the system itself.

6.2.6. Arguments and prospects for increased aid flows

We have argued that willingness to help the hungry out of compassion should be viewed as an integral part of human behavior and therefore of economic reality. Aid is also given for selfish reasons to satisfy donors' policy objectives or to serve as an insurance premium. Somewhere between compassion and self-interest lies the need for equitable sharing of benefits from international cooperation, and it is this need that gives the best reason for hope. A plea for more international aid to alleviate poverty is particularly relevant at this point in time, for several reasons.

First, the negotiations on trade liberalization in the Uruguay Round will probably lead to a reduction of agricultural protectionism worldwide and possibly eliminate altogether the food surpluses that currently provide an easy source of food aid. Once these surplus stocks have been depleted the donors will have to buy on the market the food they want to give as aid. To do so might increase their wage costs and inflation, and so they may prefer to invest in more rewarding projects. In the Uruguay Round, commodities and services were emphasized, and the protection of labor markets via migration constraints requires attention even if it is to be maintained. The rent of the fence must be paid. Thus, the topic of international aid may well have a significant role to play on the international scene in the years ahead.

Second, the move toward disarmament, if pursued, will free economic resources to serve other ends. Poverty alleviation may then be given greater priority.

Third, the debt crisis experienced by developing countries in the 1980s has taught the donor nations that even the softest of loans may become an unbearable burden for recipients when expressed in currencies that keep on revaluating, or when the recipient regards them purely as grants until the day amortizations have to be paid. Aid grants pose fewer problems in this respect although even grants may burden the recipient with high recurrent costs for, say, the

maintenance of capital goods. The arguments calling for larger flows of grant aid to reduce poverty in the years to come may, however, not be strong enough to overcome forces tending in the other direction. One is that further integration of the European Community could lead to an inward orientation of the northern countries, focusing their development efforts on their southern partners within the region. The increased labor mobility inside Europe may create such serious internal adjustment problems that further migration from outside the EC would be out of the question for many years to come. Political changes in Eastern Europe will also draw resources away from the developing world.

The case for aid is further, and perhaps most importantly, supported by the possibility of increasing levels of food scarcity in many parts of the developing world. The objective of eradicating hunger is not the issue; rather, it is the way to achieving it. Should this be done in a world of mostly free markets, with only limited income transfers, or is the objective of such overriding importance that it justifies major transfers and interventions, even if this might imply a lower overall level of economic growth?

Our problem is that the route of restricted aid flows implies an unacceptable delay in meeting the food needs of the poor, a delay extending probably over two or three generations, despite the world's capacity in physical terms to meet all food needs adequately. In principle, the hunger problem can be solved much faster as the means to that end are available. Waiting longer increases the chances that inability to cope with population growth and environmental constraints to food production will overtake the opportunities that currently exist to eradicate hunger.

Although these aspects were not covered in our study, food scarcity may increase as a result of environmental problems and climate changes that may restrict the growth of agricultural production faster than demographic policies can contain the growth of the world's population. New technologies may provide some mitigation, but only where there is a minimum degree of water control, land development, and infrastructure. Many parts of the developing world, especially Africa, are deficient in this respect, yet the investments needed to bring about improvements carry significant environmental risks. In that sense environmental problems can create a poverty trap.

In this respect it may be worth mentioning that IIASA has recently engaged in a study entitled “Implications of Climate Change for International Agriculture: Global Food Trade and Vulnerable Regions,” utilizing an updated and adapted version of the BLS.

CHAPTER 7

Summary and Conclusions

The BLS reference scenario, with relatively optimistic growth rates, shows that although the numbers of hungry in the world will fall still larger numbers of people are likely to remain hungry in the year 2000.

Increased food supplies on the world market are absorbed into the system as producers, consumers, traders, and governments adapt their behavior, with negligible improvement in the consumption of poor consumers in poor countries.

Reduced meat consumption in the developed countries, as may be expected from a spread of vegetarianism, frees up resources from the production of animal feed that could, in principle, be directed to the provision of more food for the poor. However, this again has no significant impact on the levels of hunger in the world.

Reduced agricultural production in the OECD countries will increase world market prices, increase export opportunities for developing country exporters, and increase domestic agricultural prices in those countries, thus stimulating their production, which in the long run would benefit the poor. However, the results show that although domestic agricultural production does increase as expected, the calorie intake as well as other utility measures suggest that poor consumers are worse off not only in the short run but even after 15 years.

Agricultural trade liberalization does give incentives to increase domestic agricultural production in many developing countries, and the agricultural GDP also goes up in several of them. Yet the higher agricultural growth is brought about by diverting resources from the nonagricultural sector, and the aggregate GDP changes little. When the developing countries liberalize their agricultural trade but the OECD countries do not, there is a small reduction in hunger. This gain disappears when the OECD countries also liberalize. Thus, agricultural trade liberalization provides no solution to the hunger problem.

Therefore solutions that attempt to deal with hunger through the market mechanism, either through increasing supply on the world market or through increased agricultural production in the developing countries do not work well enough. The existing world food system is shown to be resilient for the rich but stubborn for the starving. The policies that work, according to our findings, are those that supplement national development efforts and improve the efficiency of international exchange with increased flows of aid to the poor. This conclusion was reached in several independent scenarios.

Food aid, although adequate and necessary when famines occur, is not a viable long-term solution to the chronic hunger problem since it results in production disincentives and the increased dependence of developing countries on food imports.

Obviously these are merely outcomes of scenario simulations using a model with distinct limitations. Technological breakthroughs and other unforeseen changes may drastically alter the picture. In spite of all this uncertainty the main conclusions seem robust and can also be understood on intuitive grounds.

The decolonization process after World War II led to a compartmentalization of the world into countries that have been expected to resolve their own difficulties. The diffusion of labor-saving technologies, fear of international terrorism, and improved capabilities to tighten national borders may lead to a further strengthening of this development where the rich may find that they can get by without the poor. The rich societies would turn into an interconnected network of fortresses. To avoid the "great migration" the world would enter the modern Middle Ages.

This could make the hunger problem even more difficult to solve in the future than it is today. It will often be unprofitable for capital to move to poor regions; neither can people leave to offer their labor where it can be used most productively. This imposes a constraint on their political power domestically as well as on their ability to improve their lot through emigration. It also reduces the bargaining strength of the poor countries and reduces potential welfare in the world.

The limitation of labor mobility can to a certain extent be justified on the ground that countries consist of communities with common cultures and identities. Communities have the right to restrict their membership. But they are not free to do so at the expense of other, larger, communities without some form of compensation. Increasingly, those wanting to restrict admission only because of the wealth they want to maintain will also become aware of the need to take common measures on a global scale to preserve their way of life. International agreements are needed for that purpose, and it will be impossible to reach common policy ground without facing the need to compensate weaker communities whose cooperation is required. These weaker communities gain in bargaining strength as the need for a web of international agreements increases. Issues of a common stand against terrorism, of disarmament, of the global environment, and the like may become the levers by which larger flows of aid are brought about. Sharing the costs and benefits and ensuring the reliability of the agreements unavoidably leads to introducing ethical notions of fairness, both between and within countries.

Moreover, agreements with respect to free trade often require their members to compensate outsiders for maintaining protection. The logic of these agreements implies that constraints on international mobility of labor must be compensated for by aid flows. The rent of the fence must be paid.

All this increasingly forces the participants to behave as a community with a common set of standards. The persistence of hunger conflicts with this need and market forces alone cannot be expected to solve the hunger problem. The creation of productive employment opportunities for the poor – the only long-run solution – will take a long time and may often fail. Short-term palliatives may remain necessary in the meantime to alleviate the immediate hunger

problem. Still, as the problems are resolved for some, new and unforeseen poverty may emerge. There will always be winners and losers. But over time one may expect, if our simulations are reasonably reliable, that winning and losing will take place at a level well above the minimum food needs of all human beings.

To alleviate the suffering of the present losers does not require much sacrifice on the part of the international community. Hunger may be beyond the *reach of the invisible hand*, but it is not beyond the reach of society.

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