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9. ABSTRACT

An analysis of various considerations involved in food aid. The report begins with an overview of the elimination of world hunger. The next chapter studies the establishment of sales terms and payment conditions for food aid. Here it is seen that while the U.S. relies upon a policy of using all its institutionalized land resources for either crop production or government-supported land retirement, the appropriate level of cost for P.L. 480 products is considerably below gross CCC costs. Given continued extensions of annual land retirement programs, objectives of and pricing for food aid programs should be re-evaluated. The report continues with a re-examination of the impact of food aid, and it is shown that food aid can be utilized without adverse effects on the incentives of domestic producers in recipient countries if proper distribution methods are adopted to shift the demand curve simultaneously with the shift in supply. The report concludes with a chapter on achieving economic development through food aid. The unprecedented increases in agricultural output have brought about a grain balance in food aid recipient countries at the existing level of development programs. But to achieve economic growth through food aid, either massive food distribution programs must be established or employment opportunities through rural works programs must be created. Both options are examined here.

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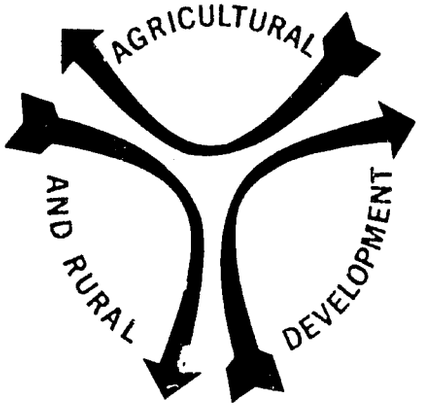
GROWTH AND DEVELOPMENTAL EFFECTS OF FOOD SHIPMENTS UNDER PUBLIC LAW 480

(Final Report)



CENTER FOR AGRICULTURAL AND RURAL DEVELOPMENT

IOWA STATE UNIVERSITY

AMES, IOWA

GROWTH AND DEVELOPMENTAL EFFECTS OF FOOD SHIPMENTS UNDER PUBLIC LAW 480

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CHAPTER I
TOWARD ELIMINATION OF WORLD HUNGER
An Overview

Introduction

During the four years in which this project has gone forward, the world food situation has changed dramatically. No longer do newspapers print everyday headlines of near-famine conditions in far-away areas of the world. Instead, the pressing problem of finding a minimum level of sustenance for millions of mankind's less fortunate human beings has been overcome, at least temporarily. Through a combination of fortuitous circumstances, the supply of food in India, the world's most food-short country, has been raised to a level where present population numbers can be provided a minimum level of diet, and even with reduced levels of imports. Famine as it was prophesied in various publications of less than a decade ago has been averted and the world's attention passes on to other more pressing matters.

But if history is any teacher, the decreased concern over adequate food supplies will not long continue. For absence of everyday reminders of the delicate balance between food supply and needs in population-heavy areas of the world does not eliminate the inevitable increase in food demand that arises from further population growth. That growth continues and within a decade or two at most will once again press against the discrete increase in food production which was achieved by the so-called "package programs" of agricultural development. The inevitability of this prospect weighs heavily on those policy makers and scientists who engineered the application of scientific knowledge to centuries-old food-producing areas

and thereby successfully raised total food production.

Despite the "green revolution" title given the most recent resolution of near-famine conditions, the elements underlying the increase in food production do not represent a scientific revolution. No scientific breakthroughs were achieved that will provide similar food increases over each of the next 100 years. Instead, increased food production came from adaptation and application of already-known production techniques to backward areas of agricultural production. And the resulting increase in food production is soothing only to those areas of the world where such backward conditions still exist. Increased production was accomplished in one or two countries where the prospect of famine was very real in the late 1960's. The problem of inadequate food supplies in these countries was temporarily alleviated; it was not solved. In fact, an appreciation of compound rates of growth, as underlies population expansion, cannot bring solitude to the leaders of nations where the population growth rate registers 2 percent or higher year after year. Such a relentless increase will cause an unending pressure on total food supplies in these countries. The result will be a need for a series of "green revolutions" or a greatly expanded program of food imports.[1/]

[1/] The implications of increased rates of population growth are important as Roger Revelle recently pointed out (12):

"Our species, homo sapiens, has lived on the earth for about a million years and during all but the last 1 percent of that time birth rates and death rates over any extended period must have been very nicely balanced, perhaps within a very small fraction of a percent.

"Around 8,000 B.C., at the time agriculture was invented, there were only about 5 million human beings, probably about the same number of people as there were lions. And this had been true for hundreds of thousands of years. But with the development of agriculture, there began a population explosion which may have lasted for two or three thousand years. During this period populations may have risen by 100 times. This could have

These issues are brought out here at the beginning of this report to ensure that world food problems are placed in proper perspective. Too often the problem is cast as only one of too little food, with inadequate description of the other issue, too many people. A critical need exists, as the President's Science Advisory Committee pointed out in 1967, for awareness of both issues. "Food shortage and rapid population growth are separate, but interrelated problems. The solutions, likewise, are separate but related. The choice is not to solve one or the other; to solve both is an absolute necessity. The current tendency to think of food production and fertility control as alternative solutions to a common problem is dangerously misleading" (11, p.4).

To date, the greatest emphasis in finding solutions to world food needs has been placed on advances in agricultural technology. Such an emphasis meshes well with mankind's desire to improve his living condition without imposing restraints on his personal actions. But the very nature of man and matter cause a continuation of this philosophy to result in too

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happened quite easily if the death rates were, say, 40 per thousand and birth rates were 42 per thousand. Such a very slight difference would cause a hundredfold increase in about 2,000 years. By the time of the birth of Christ there were perhaps 300 million people on the earth. Since there were no marked technical changes in the subsequent 16 or 17 centuries, human population grew very slowly until about 1650.

"Then there began a second population explosion which is now approaching a climax. The rate of population growth was about 0.5 percent a year from 1650 until about 1900, and nearly 1 percent a year from 1900 to 1950. Now in the world as a whole, rates of population growth are about 2 percent a year, and in the poor countries of the earth between 2.5 and 3 percent. This is, as I said, completely unprecedented in the history of mankind and it cannot continue very far into the future. Instead of doubling in 20 or 30 thousand years, the world's population now doubles in about 30 years. Such a short doubling time, as any of you who are familiar with exponential curves will realize, cannot continue for more than a century or so."

many men and too little matter. For the material resources are limited in population-heavy countries, but the procreative ability of man is unlimited, given time for compound growth rates to work their magic. This haunting fact has intermittently faced the world since Thomas Malthus first wrote of such morbid realities in the 18th century. While Malthus wrote only on the importance of food-population balances, the broader issue of resources for essential non-food items is also gaining in importance. On this issue we will have more to say later.

In more recent decades the world, and particularly food-short nations, has narrowly averted disaster from food shortages, first through expansion of the land base for producing food, next through importation of food on concessional terms when land expansion was largely completed, and finally through adoption and diffusion of scientific advancements in crop output per acre. The pressure for scientific improvements in agriculture came only after it became obvious that the remainder of the world would no longer supply unlimited quantities of food at less than market prices. Throughout this changing set of circumstances, only limited and sporadic attempts were made to slow the rate of population increase. Somehow the importance of exploding population size was not adequately impressed on the millions of citizens whose everyday decisions help ensure an eventual clash between food supplies and needs. The task of educating millions of citizens to their individual responsibility for the potential collision between man and matter awaits another day--or decade--when the harsh realities of population expansion become clearly evident.

Issues Involved in Eliminating World Hunger

Decision-makers who face the realities of inadequate food supplies and burgeoning population numbers must often ask themselves; "Why do we strive so hard to provide everyone with a minimum diet?" Given the vast expenditures already made by the United States for aid in the form of food, manpower and money, such a question seems almost trivial or an afterthought. Truly we have already proceeded on the assumption that an answer exists and that provider and recipient agree on this answer. But such may be less true than supposed. If one takes the world as his unit of analysis and recognizes the massive potential for increasing demand for food during another generation of population growth, the supplying of marginal amounts of food at this point in time may have quite inverse effects compared to those we might expect. This could be particularly true if these quantities of food simply facilitate the further expansion of population numbers.[2/] This reality leads us to seriously pose the question: What are the appropriate goals toward which our attempts to eliminate hunger from the globe are focused?

Human goals and human hunger

Food is a means to an end; that end involves the physical needs of the human body. Only a relatively few people eat quantities of food beyond physical needs. Physical needs for food are based first on a desire to survive as a human being, and second on a desire to utilize one's resources and talents to achieve a maximum measure of accomplishment as a man. Food to achieve the goal of survival requires some minimum level of subsistence that will allow continuation of life. Food to achieve the second goal contributes beyond the mere sustenance of body processes. It provides the

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[2/] While this view may sound severe, it is not a new view by any means. For other similar statements, see Gunnar Myrdal (8, pp. 1485-97).

human energy, will and desire to solve the problems that surround man. Without such a desire, man's actions are minimal, often based on superstition and tradition; ignorance and fear often form a basis for work and decision making.

With inadequate food, man lives from day to day, depending on instincts and passions to help him survive, or if not himself, at least for the survival of his race. Gone is the basic desire to challenge the restraints to human improvement formed by centuries of deprivation. Gone is the desire to gain control over one's own destiny. In the words of Kyle Haseldsen, editor of the Christian Century, "...the struggle to survive, if the conditions are too severe, can hinder man's struggle to be fully man. Where man's time and energy are pre-empted by his battle against hunger, nakedness, disease, cold, or heat, there is little opportunity to cultivate those human powers dormant in him" (4, p. 23).

Lacking the will to improve his position relative to his environment, man becomes a stagnant being, existing until time provides an alternative. His existence is characterized by a lack of concern for the future, the futile existence of an animal whose concealed hunger leaves little hope for a better tomorrow. In this type environment, the responsibility of nations is more than just to give people a minimum diet. As Haseldsen points out, "Unless the developed and the developing nations concentrate on the salvaging of human resources rather than merely on the rescue of famine-threatened bodies, they will in the end produce a much more critical problem than the one facing them now. The real problem is more complex than merely one of keeping human beings alive. It is to keep them alive without de-

stroying them as human beings. If we merely want to prevent starvation, technology may be able to solve the food shortage for several years to come. But this program will merely postpone the inevitable calamity if the developed and developing nations do not simultaneously remove those social, political, economic, and religious barriers which keep the people enslaved and dependent. We know how to multiply things but we do not know how to manipulate those cultural webs which snare and immobilize so many of our good intentions. If we do not fight the battle against poverty on this front the increasing of food supplies will be futile, perhaps even immoral" (4, p. 24).

Political goals and human hunger

A second issue involved in the attempt to eliminate hunger revolves around political stability. Hungry people have a tendency to be unhappy people. Unhappy people tend to look for ways to relieve their unhappiness. Their search tends to bring instability to democratically-elected leaderships whose base of power is established on votes of the masses. Even in non-democratically selected governments, the potential uprising of hungry masses is not a pleasant spectre to envision. While these latter countries generally have an abundance of internal peace-keeping forces to stabilize an uneasy population, their numbers are small compared to the potential numbers of poor, hungry and illiterate humans that would rise up in the event of a decrease in their already-meager food rations.

These political realities face nations where malnutrition is a constant reality. Such countries, poor by any modern standard of living, have a strong tendency toward nonpeaceful change in leaderships. Their

record of violent outbreaks was noted by former Secretary of Defense Robert McNamara in 1966: "Since 1958, only one of the 27 (rich) nations has suffered a major internal upheaval on its own territory. Among the 38 very poor nations--those with a per capita income of under $100 a year--not less than 32 have suffered an average of two major outbreaks of violence per country in the 8-year period. That is a great deal of conflict. What is worse, it has been predominately conflict of a prolonged nature. There is an irrefutable relationship between violence and economic backwardness. And the trend of such violence is up, not down."[3/]

This backwardness is closely associated with traditional agriculture. While traditional agriculture is only one cause of inadequate food supplies in rapid population growth countries, the relationship to malnutrition and hunger assumes increased importance for political instability. In these countries, an essential element for initiating the process of economic development is missing. That element is a national setting or economic environment in which investments can be made with some assurance of an adequate time dimension for return of capital and interest. Instead, the constant threat to internal peace from food shortages causes an overly-large allocation of scarce resources for internal peace-keeping forces and reduces the available resources for investment in the improvement of living conditions. Both domestic and foreign capital suppliers also are reluctant to assume the risk of investment under conditions of domestic instability. The result is a circuitous dilemma of poverty and malnutrition, outbreaks of violence, inadequate numbers of jobs and low, average incomes--

Robert McNamara as cited by Lester R. Brown, (3, p. 13).

the low incomes lead to further poverty and degradation of the human element.

Where such conditions exist, increasing the per capita supply of food is an essential prerequisite to encouraging agricultural and economic development. Political forces will find importation of food a necessity unless domestic sources can somehow overcome the inertia of tradition and break the molds which restrains food production. To an extent the package programs of recent years have given governments another chance to find a new combination of programs to keep population trends and food production levels in a favorable relationship. But population growth rates of 2 percent or more in heavily populated countries do not assist in this effort nor will it provide an environment for political stability.

Economic productivity and human hunger

Besides the human desirability and the political necessity of reducing malnutrition and hunger, another major purpose for improving nutritional standards is the positive relationship that exists between adequate nutrition and human productivity. Numerous studies in dietary-deficient countries have confirmed that productivity improves when human food intake is increased, even though as Lester Brown points out, it is not necessary to have formal studies to measure the impact. "The effect of low levels of food energy intake on the productivity of labor is easy to see. American construction firms operating in developing countries and employing local labor often find they get high returns in worker output by investing in a good company cafeteria that serves employees three meals a day" (2, p. 138).

Too often, of course, the effect of undernourishment is not fully appreciated. The tendency of workers in food-short countries to conserve energy through minimal amounts of activity is often interpreted as laziness, or worse, a lack of desire to improve their economic condition. Charles Kellogg points out, that in backward countries "most cultivators work hard to produce food and shelter for their families with the resources available to them. Hundreds of millions of them have inadequate resources and low diets. So they do not work when there is no point to it. The inexperienced traveler sees them resting and thinks they are lazy. People with poor diets do not exercise for fun" (7, p. 104).

To remove the reduced physical productivity which results from malnutrition requires more than a simple increase in total food production. It requires, as Scrimshaw notes, an increase in dietary intake of protein. "At an age when children require nutrients for growth, malnutrition inhibits both growth and development. This growth retardation, observed in the majority of young children in technically underdeveloped countries, is largely an adaptation to inadequate protein intake, combined with the adverse effect to infections on protein metabolism. There is extensive evidence from experimental animal studies and from field studies in Mexico, Guatemala, Peru, Uganda, and other developing areas that not only physical growth but also mental development, learning and behavior may be permanently impaired by early malnutrition. It should also be noted that much of the poor working capacity and presumed laziness of adults in these societies is a successful adaptation to insufficient food calories" (13, p. 37).

Further evidence of the impact of food shortages is the reduced physical size of the population in those countries where malnutrition occurs rather continuously. Data for food-short countries like India and northeast Brazil show male weights average substantially less than males in countries where food supplies are more adequate (Table 1.1). Overcoming the effects of inadequate nutrition will require a time lag of at least a generation for adequate food supplies to increase physical size and well being. Thus any economic effects of improved nutrition will not be immediately obvious. Only after youth raised in greater food abundance begin to enter the work force will the full effects in productivity of the labor force become evident.

Adequate food versus other goals

The goal of an adequate diet for an unlimited number of people has implications far beyond those we have listed above. Eventually, expanding food needs for a growing population must compete with other items for resources. When such a point is reached, a choice exists of allocating limited material resources (land, labor and capital) to the production of additional food for more people or the production of additional nonfood goods for a portion of the population. To use a larger proportion of total resources for producing additional food, given a fixed level of technology as exists in many countries, means fewer resources for producing other products. For example, more land for food production means less land for forest products for home building, or cotton fiber for cloth, or grass for milk, meat or wool products. The restraint may revolve around land as in these examples or it may more nearly revolve around labor and the need to keep large proportion of the population employed in the production of agricultural

Table 1.1 Comparison of average weights of males for different ages, Asian and Latin American Countries, for selected years.

Age Years	India 1960	Japan 1964	Uruguay 1962	N.E. Brazil 1965
			(Kilograms)	
1.5	8.3	11.5	12.3	8.9
6.5	15.8	20.0	22.5	17.7
11.5	25.6	32.5	36.8	28.2
16.5	41.8	54.8	56.0	47.8
20-24	48.2	56.7	65.5	55.0
30-34	N.A.	56.9	71.1	55.0
40-44	N.A.	56.8	75.6	57.6
50-54	N.A.	56.0	76.0	57.2

Source: U.S. Interdepartmental Committee for Nutrition and National Defense, U.S. National Center for Chronic Disease Control, Nutrition Surveys, Cited by the President's Science Advisory Committee, (11, Volume III, p. 25-27).

commodities, just to meet food needs. This latter requirement has been exhaustively studied, usually from the standpoint of finding ways of reducing the proportion of labor in farming. One method to achieve this end is to raise food production per man as has been successful in some countries. But where this process has not been successful, there has been a continuous need to add more resources to food production. The consequent increase in total resources required, the implications of skewing total resource use toward food production, and the consequent "fixed" combination of outputs required by the growing population has been inadequately analyzed.[4/]

Potential substitutions in product mix, given a fixed level of technology, are graphically illustrated in Figure 1.1. One axis of Figure 1.1 represents potential levels of food production and the second axis represents potential levels of nonfood production. Theoretically, some maximum level of production of each is possible. These are points A (where food production is maximized) and E (where non-food production is maximized). Other production combinations are also possible. Points B, C, and D represent three different combinations of food and non-food production. In population heavy countries, the particular combination chosen will largely be a function of the required amount of food production.

[4/] Edwin M. Martin in the 1971 Review of Development Assistance (9, p. 27) outlines his view on this issue, "From a much longer-term standpoint, there is evident a growing concern in some circles about the effect of a rapidly growing population and, even more serious, a rapidly expanding production of material goods, on the ability of mankind to continue to enjoy living on this planet. Some have been led to advocate "zero" population growth; others are beginning to discuss the need to restrain, if not reduce to "zero", the growth of GNP. From the standpoint of the people living in developing countries, it is vital that this debate does not overlook two points. The first is that the threat of exhausting resources and polluting the air and the seas by producing too many goods comes primarily from the developed countries whose current GNP totals five times that of the developing countries.

(footnote continued on page 15)

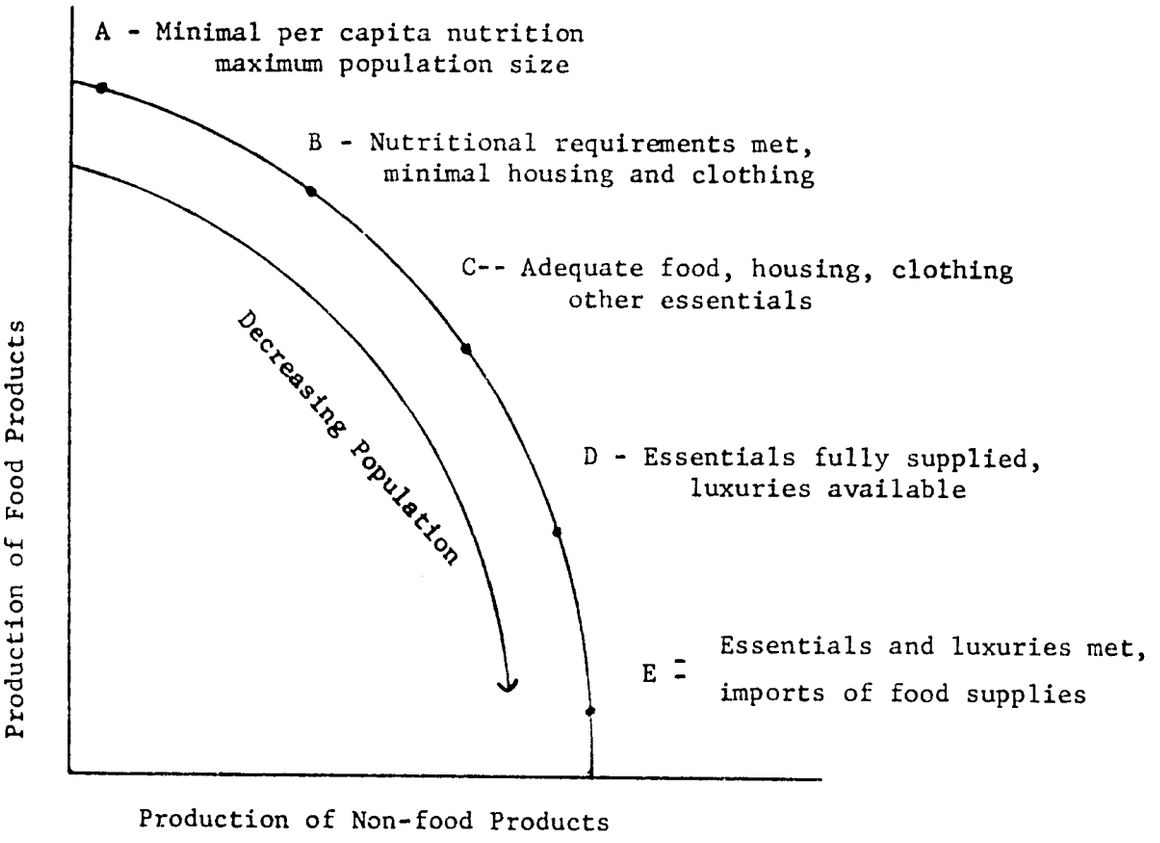

Figure 1.1 Substitution possibilities between food and non-food production for alternative population sizes, technology assumed constant

In some areas of the world, as Brown points out, this requirement has already had adverse effects. "As population grows, an ever-expanding area is cleared of natural cover as the land is used for cultivation. As a result of rising needs for fuel for heat and cooking, the forests are cut far in excess of natural replenishment. The areas thus stripped of forest include the Indian subcontinent, where much of the population must now use cow dung for fuel" (2, p. 127).

The poor quality of fuel is only one type distress under which people live as population growth outstrips the material resources of a country. In general, the level of living is lowered in terms of housing, clothing, availability of hygienic facilities, possibilities for travel, education and other forms of human fulfillment. Increasing the food supply under these conditions does little to improve upon the conditions under which the majority of the population live. Most have little space to sleep in addition to too little food to eat. Most must use the open spaces for ridding the body of natural wastes. Inadequate food is only one of the many inadequacies. Others are housing, clothing, disease control, personal safety, mobility--all the elements necessary for life to be enjoyable. These same elements are taken for granted in less heavily populated countries where development has proceeded at a rapid pace.

These broader issues surrounding population size are of such importance that the goal of developing only an adequate food supply is insufficient.

The impact by 1980 of a similar rate of growth during the 1970's would be correspondingly different. It is a distinction not to be forgotten by the enthusiastic ecologists. The second is that the rate of population growth is much higher in developing countries than in our own and hence a threat to the quality of the global environment that is presented by too many people comes primarily from the developing countries. (In 1970, 85 percent of the world population growth took place in the developing countries)."

The goal should be broader, it should focus on upgrading the total complex of elements which determine how well people live. It requires that social scientists develop a clearer understanding of the role of population size as a limiting factor in the development of a nation's standard of living. What is needed is a "law of the maximum" regarding population size similar to Von Liebeg's "law of the minimum" regarding food production per acre.[5/]

Social scientists must come to grips with population growth policy as they have finally begun to examine other national policy issues like environmental effects of industrialization. There is a need to re-examine the issues relating to economic development, to redefine the set of relationships between available supplies of material resources and existing numbers of people who have claim to these resources. It has been pointed out by non-economists in recent years that high levels of per capita income and a high standard of living consume massive amounts of resources per capita. Fears are expressed that a similar standard of consumption cannot be provided for a majority of the world's population because inadequate supplies of resources are available. The essence of this argument is that the world's resource base is limited and discrete. It will support a smaller population at a high standard of living or a larger and larger population at a lower standard of living. While the arguments are speculative and unproven at this point, there is reason for scientists and political decision makers to increase their awareness of these issues. Population size is an important element in determining both

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[5/] For a discussion of Von Liebeg's "law of the minimum", see Heady and Dillon, (6, p. 10).

food needs and the availability of resources to raise living standards. It should become an endogenous variable in economic development plans rather than an exogenous variable or simply another parameter.

Allocation of World Food Supplies

The importance of population size in determining food needs is not to be underestimated; neither should the importance of controlling growth in population be placed second to other aspects of world food balances. But, control of population growth as a means to overcome world food problems is a long-term solution--one which will require decades to fully accomplish. In the meantime, other solutions must be found which will reduce suffering and distress among the masses of poor, illiterate, and hungry people covering streets and roadsides in backward countries. Programs of population control cannot save their suffering, although their suffering and its eventual conclusion represent one very direct means of population control. The solution to their hunger problems must be found in other programs, programs which concentrate on improving the allocation of existing food supplies among the nations of the world. We examine these needs below.

Past and future levels of agricultural trade

The one aspect of world food problems which causes most concern is the inequity of food distribution which exists between different areas of the world. Some areas face constant or reoccurring food shortage due to various causes--the niggardliness of nature, an inability to organize agriculture to achieve greater food output, constant social turmoil, inadequate resources to engage in food production or human reproduction rates that raise food demand more rapidly than production. In other areas of the

world, the success of agricultural production brings such large output relative to domestic and export needs that the result is an "embarrassment of plenty."[6/] These two situations exist simultaneously even though supersonic travel has reduced world time-travel distances to fractions of former requirements. But while the world has been reduced in size so far as travel is concerned, the real distance between the haves and have nots in terms of food distribution remains large. The result is that national and international organizations have continually attempted to improve the allocation of world food supplies. Some programs have succeeded in improving the general food situation, particularly in those countries where over-production has proven an embarrassment to political leaders. But the impacts in recipient countries has not been as easily measured or proven to be positive in terms of long term economic development.[7/]

If lack of adequate food supplies were the single largest restraint to underdevelopment, the magnitude of food shipments over the past two decades should have removed that restraint in many countries. With this restraint removed, the idealist expected development to proceed in an almost self-perpetuating fashion as experienced in other countries, most notably the United States, Canada, Australia, and even Japan. But such is not the case in most countries where food shortages frustrate the most well-designed plan of development. Instead, projections of future food needs in these countries imply increasing levels of food imports. One such set of food projections provided to the President's Science Advisory Committee by the

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[6/] During the surplus production era of the 1950's in the United States, a well-known Pulitzer prize-winning author wrote a book with this title. See Soth, (14).

[7/] For a review of studies evaluating the effects of U.S. attempts at reducing world food disparities, see Heady and Timmons (5, pp. 188-195).

U.S. Department of Agriculture in 1967 divided the world into two groups of countries, one group labeled developed where average per capita incomes exceed $100 and the second group labeled developing because incomes were below $100 per capita. The results, shown in Table 1.2, suggest that until 1980 developed countries will continue to increase net exports of major grain commodities. The developing countries by contrast, will increase their levels of grain imports. These projections suggest that imbalances in food production and needs will grow in the next decade. These trends indicate a further increase in the proportion imports and exports are of domestic production in each group of countries. For example, in 1959-61, the developed countries exported 3.7 percent of total grain production; by 1980 these countries are projected to export 7.2 percent of their grain production. Similarly, developing countries are projected to increase imports from 5.4 percent of their production in 1959-61 to 10.4 percent by 1980. In absolute terms, the quantity of grain traded will triple, rising from near 18 million tons to over 55 million tons. Rising population numbers and increasing income levels cause total food needs to expand substantially over this period. With uneven rates of growth in food production and needs, trade in these commodities must grow if deficit nations are to balance their food needs.

While most projections of food supplies and needs lead to the conclusion that increased trade will be necessary, this does not mean that food shortages will grow over the next three decades. Indeed, most studies of world food balances projects positive outcomes to exist through year 2000. One such study projected food gaps for 1985 and 2000 under several different

Table 1.2 Total grain production, disappearance, net trade, and percent trade is of production for developed and developing countries, 1959-61 actual and 1980 projected.

Region	1959-61				1980 Projected			
	Production	Domestic Disappearance	Net Imports	% Imports/ Production	Production	Domestic Disappearance	Net Imports	% Imports/ Production
	(thousand metric tons)			(percent)	(thousand metric tons)			(percent)
Developed	490,767	466,600	18,175	3.7	767,690	712,290	-55,400	7.2
United States	170,751	134,761	-27,570	15.0	288,970	205,450	-83,520	28.9
Canada	21,774	15,121	- 9,653	44.3	41,800	23,350	-18,450	44.1
Mexico	6,895	6,992	- 105	1.5	16,980	16,390	- 590	3.5
N. Europe	64,049	84,567	21,051	32.9	97,320	124,320	27,000	27.7
S. Europe	24,687	29,593	4,457	18.0	29,300	46,650	17,350	59.2
E. Europe	59,217	64,749	6,263	10.6	64,200	74,050	9,850	15.3
U.S.S.R.	97,828	92,158	- 6,387	6.5	156,000	149,000	- 7,000	4.5
Japan	15,509	19,542	4,585	29.6	16,500	41,000	24,500	148.5
Developing	317,883	336,400	17,287	5.4	532,500	587,900	55,400	10.4
C. America	2,655	3,987	1,324	49.9	3,900	7,900	4,000	102.5
S. America	17,626	20,805	3,351	19.0	35,900	44,100	8,200	22.8
N. Africa	14,498	16,857	2,021	13.9	22,700	29,400	6,700	29.5
W. C. Africa	11,579	12,224	645	5.6	18,300	21,000	2,700	14.8
E. Africa	9,257	9,529	262	2.8	15,400	15,700	300	1.9
W. Asia	22,397	25,024	2,609	11.6	33,000	41,850	8,850	26.8
S. Asia	84,579	87,884	6,245	7.4	147,800	164,150	16,350	11.1
E. Asia	36,212	36,255	115	0.3	72,000	71,300	- 700	0.9
World Total	808,650	803,000	- 888	-	1,300,190	1,300,190	--	--

Source: (11, Volume II. Tables 2-19 and 2-23).

alternative growth rates in population and income. The results for the 96 countries included are summarized in Table 1.3 for low, medium and high income countries.

The results clearly indicate that low income countries are the serious probable areas of the world food needs. Depending on the income and population growth variant chosen, the cereal gap varies in 1985 from 35.8 million metric tons to 130.3 million metric tons. By the year 2000, these import needs more than double. However, the medium and high income nations are projected to more than offset these deficits in cereal production. High income country balances vary in 1985 from 226 million metric tons down to 157.1 million metric tons, which easily covers the deficits in low income countries. Similar results are projected for 2000.

The general indication of this study is that the world as a whole will not face widespread hunger even if incomes increase slowly and populations grow relatively quickly. Only under high per capita income growth and high population growth (a situation not likely to occur since these are generally inversely related) would there be a likelihood of world-wide excess demands by 1985, and only then in the absence of growth in land under cultivation and specialization in appropriate crops.

The picture differs for developing and developed countries, however. The results of this study again show that developing countries continue to be importers of food while developed countries will continue to export. For the developing countries, "the growing gap between production and consumption can be met in three ways. Either (a) the developing countries

Table 1.3 Cereal requirements and gaps in low, medium and high income countries, 1985 and 2000.

Countries, income and population variant	1985		2000	
	Total dis-appearance[a]	Cereal gap[b]	Total dis-appearance[a]	Cereal gap[b]
	(millions of metric tons)			
Low Income				
lo inc[c] lo pop	402.5	-35.8	528.3	-87.8
lo inc, med pop	426.7	-60.0	588.7	-148.2
lo inc, hi pop	445.1	-78.4	639.9	-199.4
hi inc[d] lo pop	462.0	-95.3	640.7	-200.2
hi inc, med pop	482.2	-115.5	696.2	-255.8
hi inc, hi pop	497.0	-130.3	741.1	-300.6
Medium Income				
lo inc, lo pop	173.4	7.5	193.6	17.0
lo inc, med pop	181.0	0.0	211.5	0.0
lo inc, hi pop	188.5	-7.6	230.5	-19.9
hi inc, lo pop	196.9	-16.1	228.4	-17.8
hi inc, med pop	204.7	-23.8	247.6	-37.0
hi inc, hi pop	212.2	-31.3	267.6	-57.0
High Income				
lo inc, lo pop	413.5	226.2	455.3	373.1
lo inc, med pop	438.8	200.9	520.9	307.5
lo inc, hi pop	463.2	176.5	565.8	262.6
hi inc, lo pop	434.1	205.6	493.3	335.2
hi inc, med pop	458.6	181.1	558.5	269.9
hi inc, hi pop	482.6	157.1	603.5	225.0
Net World				
lo inc, lo pop	989.4	197.8	1,177.2	302.2
lo inc, med pop	1,046.4	140.9	1,321.1	158.3
lo inc, hi pop	1,090.8	90.5	1,436.2	43.2
hi inc, lo pop	1,093.0	94.3	1,362.3	177.1
hi inc, med pop	1,145.5	41.8	1,502.4	-23.0
hi inc, hi pop	1,191.8	-4.5	1,612.2	-132.8

Source: (1, ch. 10, tables 10.9-10.20).

a/ Includes direct consumption and feed.
b/ Assumes the low land variant, the high land variant give somewhat more optimistic projections.
c/ Lo inc. designates maintained 1964-66 per capita incomes.
d/ Hi inc. designates growing per capita income on historic trends.

will have to divert an increasing proportion of their limited foreign exchange earnings from capital goods and industrial raw materials to food purchases, or (b) foreign food aid will have to expand, or (c) indigenous food production will have to increase at a faster rate"(11, p. 178). Which of these three alternatives is followed will differ in each importing country. Adopting the first alternative will substantially slow the development process in countries where imports of industrial products are necessary. The second alternative, "food aid, has a vital role to play as a transitional measure over the next decade, but we must move as rapidly as possible to a stiuation in which the developing countries are not dependent on it as a regular feature of the landscape"(11, p. 180). The third alternative is more nearly the optimal plan of development. It has both the features of increasing the per capita supply of food and increasing total incomes of the rural population. "Rising agricultural incomes can bring dramatic improvements in the rural employment situation. Actually, direct employment in farming is unlikely to rise with improved productivity... however, many kinds of public works activities which are important to the improvement of agriculture and which have very substantial employment potential can be organized in the rural setting" (11, p. 182). The effect of increased food supplies from domestic production thus contributes to both the goal of improved nutrition and to the goal of achieving a greater measure of self-satisfaction for the individuals involved. Both goals are necessary if man is to progress beyond minimum levels of human existence.

Prospects of solving world food needs through commercial trade

The prospect of greatly enlarged imports of grain commodities by developing countries over the next decade raises the serious question of how

these countries will manage to fill their growing food requirements. As we show later in this report, the developing countries are already heavily indebted to other nations for past purchases of food commodities. Their future ability to enter commercial markets for purchase of food grain is already in question because of past purchases on credit terms. At present, reduced imports have given these countries time for planning future trade negotiations. But the ongoing rates of population and income growth will not long allow this luxury. Hence, these countries must soon face up to the need for additional imports of these commodities.

Ideally, imports of food commodities would be provided through the export of other commodities. But for many population-heavy countries, the prospects of offsetting exports are not bright. Many of these countries must depend upon exports of raw materials for which (a) developed countries also produce sizeable portions of their total needs, and (b) substitutes growing out of technological developments are reducing the size of the total market. Under these circumstances, developing countries find not an expanding market for their products but stiff competition for a declining or at best, a slowly expanding market. One area of the world where this is particularly true is South Asia. Myrdal outlined the complex picture on trade for South Asia and evaluated the prospects for enlarged exports of raw materials over the next decade.

"In the first place, as a general rule, demand for food tends to lag increases in income per head. This is true especially of basic foodstuffs such as cereals, but at higher income levels the demand per head for sugar also levels off. A similar situation exists in textile fabrics. As a result, the demand for four of South Asia's major exportable

items--rice, sugar, cotton, and jute--has lagged well behind economic growth in the West. Only for beverages (including tea) and copra has demand expanded at a substantially faster pace than demand for foods in general, but in neither case is there evidence that dynamic growth is in store. In addition to a certain natural sluggishness in the demand for all these items, the region has been adversely affected by the increase in substitutes for textile fibres. The use of synthetic fibres, the substitution of sack paper for jute, and technological advances that reduce the primary fibre content of finished products have combined to bring about a decline in textile fibre consumption per head in both the United States and Western Europe since the 1920's. South Asia has also been affected by the rise of competing exporters, notably Japan, and by protectionist policies in the West designed to support a faltering domestic textile industry. Exports of textiles and other important commodities from South Asia have thus been faced with increasing competition at a time when substitutes, rising efficiency, protectionism and surpluses, especially in the United States and Canada, have reduced the rate of increase of total consumption in the major markets. Indeed, a study projecting exports from countries in South Asia to 1980 suggests that the outlook is positively gloomy for such commodities as tea, sugar, cotton and jute" (8, pp. 596-7).

Given pessimistic prospects for expanding exports to allow heavier food imports, these nations face a continuing need to increase domestic production of food or to reduce the rate of growth in food consumption. That growth, which arises primarily from increases in population size but also from growth in per capita income, will continue to raise food needs at 3 to 4 percent annually. Increasing food production at a similar rate is

highly unlikely for any long period of time, especially in countries where weather fluctuations play such an important role in year-to-year variations in food supplies. Another series of years like 1965-67 would lead India to near catastrophe in that area of the world. Political prospects would dim, economic development would terminate, and millions of people would reach an early end to a life best known for its degree of misery. These prospects press hard on leaderships in countries where annual population growth rates continue at 2 to 3 percent.

Prospects of solving world food needs through food aid

Commercial trade prospects appear quite favorable over the next decade, from the point of view of high income countries. For these countries free trade policies have considerable appeal although their historical record on trade barriers and national farm policy distortions indicates it is unlikely that free trade will occur. Studies reviewed above, however, suggest that developed countries, with a few exceptions, are likely to remain the major exporters of grains. The major export competitors of developed countries selling grains are other developed countries. The importing countries are likely to be both developed and developing countries. Both groups of importers will probably attempt to reduce their imports; the developed countries will try through farm income policies and trade diversion activities and the developing countries will try through economic growth and development policies.

Each set of countries has different objectives in mind relating to trade. The developed countries wish to attain high food exports to support farm incomes (10). The less-developed countries wish to attain self-sufficiency or export food to save or earn foreign exchange. For security reasons, no country wishes to depend on foreign food. Other objectives may be present, but these are certainly important and typify the conflict.

To maintain farm incomes, the developed countries may wish to export food on concessional terms to developing countries as long as such sales are less burdensome on the national budget than other farm income maintenance policies. But, because of the foreign exchange shortages and self-sufficiency motives, concessional sales in the future may have to include such a large grant element that the expense would be greater than alternative programs of farm income maintenance, if a significant quantity is to be exported.

The identification of the countries bearing the burden of the costs of past and present food aid was summarized by the 1971 Review of the Development Assistance Committee (9). The members of the Development Assistance Committee (DAC) include all major non-centrally planned developed countries which provide foreign aid. The history of food aid by the DAC countries for the last 10 years is given in Table 1.4. The real value of food aid rose 65 percent between 1960 and 1970. In turn, the index of food prices fell by 6 percent. Information on the proportion of total aid which is provided through food aid by member countries is provided in Table 1.5. Food aid varies from a low of 3.2 percent of total aid for Australia to a high of 31.3 percent for the United States. The average is 18.7 percent for all DAC countries. The United States is also the largest food aid donor, providing 78 percent of total food aid in 1969.

In 1969 the United States shipped $1,018 million of exports under the P.L. 480 program (15, p. 95). In addition, the United States contributed an estimated $113 million of food aid through the Food Aid Convention of the International Grains Agreement (9, p. 23). Of this, $49 million was channeled through

Table 1.4 Development Assistance Committee, 1960-1970[1]

Year	Food Aid Value (million $)[3]	Index of Food Prices[4]	Food Aid Valued at 1960 Prices (million $)	Index of Real Food Aid (at 1960 Prices)
1960	945	100	945	100
1961	1,296	101	1,283	136
1962	1,255	103	1,218	128
1963	1,451	104	1,395	147
1964	1,498	110	1,362	144
1965	1,495	98	1,526	161
1966	1,495	105	1,424	151
1967	1,475	106	1,392	147
1968	1,485	101	1,470	156
1969	1,396	96	1,454	154
1970[2]	1,480	94	1,575	165

Source: (9, p. 75)

[1]Secretariat estimates

[2]Preliminary estimates

[3]Current prices

[4]Based on wheat prices

Table 1.5 Office Development Aid in 1969

Country	Official Aid million $	Food Aid million $	Food Aid as % of Official Aid
Australia	174.6	15.1	8.6
Austria	15.5	0.5	3.2
Belgium	116.1	5.0	4.3
Canada	245.2	63.3	25.7
Denmark	54.3	8.4	15.4
France	955.2	24.2	2.5
Germany	579.3	42.7	7.4
Italy	129.6	4.5	3.5
Japan	435.6	59.9	13.7
Netherlands	143.1	13.8	9.6
Norway	29.5	6.3	21.4
Portugal	58.3	0.1	0.3
Sweden	120.5	4.7	3.9
Switzerland	29.5	9.2	31.0
United Kingdom	431.3	17.4	4.0
United States	3,092.0	967.0	31.3
Total DAC	6,609.6	1,242.1	18.7

Source: (9, p. 76)

government to government arrangements and $64 million through voluntary agencies (15, p. 142). Further, there was $89 million of food aid channeled through voluntary agencies including the World Food Program, UNICEF and UNRWA.

Altogether, the U.S. provided $1,220 million of food aid in 1969. While a large amount was given, the intent and impact of this aid was not always well understood. The 1971 DAC Report (9, p. 82) noted that: "More than perhaps any other form of aid, food aid has been the subject of misunderstanding and criticism in recent years. It was criticised by some, for example, for not being "real" aid, apparently on the grounds that real aid should not in any way benefit the donor, and, further, should add to the capital stock of the recipient country, rather than simply be consumed. It was criticised by others for distorting world trade in foods and affecting adversely food production in recipient countries. These criticisms, in the more extreme forms in which they were often expressed, were only partially valid. Nevertheless, food aid, like almost any form of aid, can have undesirable consequences which can only be avoided, or at least minimized, by careful handling."

Food aid has the several objectives noted and these are not always compatible. At times the benefits to the donor have ranked foremost in consideration, and at other times the emphasis was on assisting the recipient country to expand national production, especially of food commodities. How successful these efforts have been is also subject to some debate. After reviewing several in-country analyses of food aid, Heady and Timmons were somewhat pessimistic in 1967.

"Our net appraisal of U.S. food aid is summarized as follows. Its main impacts are short-run and make extremely little, if any, direct con-

tribution to long-run solutions of food and population problems in developing countries. It has had benefits mainly in alleviating or forestalling consumer misery. It is largely a short-run consumer program whose net effects have been to greatly promote food demand relative to food supply in developing countries. To the extent that it has substituted for foreign exchange that would have gone for food, it contributed somewhat to general economic development, since it improves trade balances and allows importation of industrial inputs. To the extent that it has aided general economic growth, peoples of the cities have somewhat higher incomes and greater demand for food. The possibility of negative long-run impacts on the population-food complex, based on positive short-run consumer gains, arises since presence of our food now lifts from planners the burden of "doing something" about the future.

"Its contribution to agricultural development per se, at least, has been nil, and more likely negative. We, of course, can find individual positive elements. Examples are use of counterpart funds to initiate a needed research project, to set up a productive demonstration, and to provide a seed expansion and distribution center. In the past, however, explicit restraints were placed on using counterpart funds for purposes which increase food production in the recipient country. The negative elements are spread more widely over the world and are more complex to measure. The net effect can't be measured by studies in a few scattered countries, but must reflect the aggregative outcome through world markets and feedback effects on supply and development of agriculture in third countries" (5, p. 191).

Since 1967, several changes have been made in the administration of food aid. Some of these have clearly placed pressure on recipient countries to provide more self help to their own agricultures. Given the success of the green revolution programs, one might speculate that conditions have improved in the last five years. But such a judgment may be hasty since demand expanding factors for food aid have similarly gone forward. Also, other issues related to food aid are still unsettled. The proportion of grant element in food aid is still open for consideration as are the alternative uses of local currency funds which have accumulated from past food aid shipments. Further, the impact of food aid on development plans requires further analysis.

Summary and Prospects

In the remainder of this report we attempt to draw together the several diverse considerations involved in food aid. We analyse these in great depth because the growth in food import requirements over the next several decades will bring severe strains on several low income countries. These strains have been postponed temporarily by success in expanding food production in these countries over the past five years. But population and income growth will bring a reappearance of these issues well before the end of this century. In terms of a planning horizon, this is a very short time period to affect trends as stable and insensitive to change as birth and death rates.

Finally, the importance of improving other aspects of living conditions besides food supplies should not be understated. Food is only one element of life and though essential to life, it alone does little to contribute to a satisfying existence beyond meeting nutritional requirements. Increasing

food supplies through food aid programs have a large element of simply meeting minimal nutritional food supplies. Such a goal is clearly inadequate in the modern world where communications allow all nations and populations to become aware of improved living possibilities. These broader issues should be kept in mind as detailed aspects of P.L. 480 programs are examined in the remainder of this report.

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ESTABLISHING SALE TERMS AND PAYMENT CONDITIONS FOR FOOD AID

Shipments of a significant portion of U.S. farm production to other nations under P.L. 480 have become a relatively permanent feature of domestic U.S. farm policy. But the terms of sale and the number of restraints underwent considerable change as stocks of grain reached more moderate levels in mid-1960's. A major change contributing to the hardening of the terms for P.L. 480 came from the 1966 amendment of the Food Aid Act. This amendment required a gradual shift from sales for local currencies to sales for dollars. An immediate result of this change was an increase in long term dollar and convertible foreign currency credit sales and a marked decline in sales for local currencies (Table 2.1). For the first time, sales for dollars exceeded sales for local currencies in 1969. At the same time both total sales under P.L 480 and the percentage P.L. 480 exports are of total agricultural exports also dropped. These changes caused a substantial increase in net returns to the United States from P.L. 480 sales; that is, on a present value basis, long term dollar repayable loans increased the net returns to the United States from P.L. 480 sales.

If the objective of P.L. 480 was to encourage sales until stocks were reduced, the change in terms of sales was appropriate as carryovers of grains fell. But considerable debate has taken place in recent years on the question whether or not this type of adjustment is appropriate and if this type of adjustment is not appropriate, the question then arises as to what are the appropriate terms of sale for future shipments

Table 2.1. Value of U.S. farm products shipped under Public Law 480 compared with total exports of U.S. farm products, July 1, 1954, through Dec. 31, 1969[1]

(In millions of dollars)

Calendar year	Public Law 480				
	Sales for foreign currency	Long-term dollar and convertible foreign currency credit sales	Government to-government donations for disaster relief and economic development	Donations through voluntary relief agencies	Barter[2]
1	2	3	4	5	6
1954, July-December	----------	----------	28	20	22
1955	263	----------	56	186	262
1956	638	----------	65	187	372
1957	760	----------	39	175	244
1958	752	----------	43	159	65
1959	732	----------	32	111	175
1960	1,014	----------	49	124	117
1961	878	1	93	151	181
1962	1,006	42	81	178	137
1963	1,161	52	99	160	37
1964	1,233	97	62	186	43
1965	899	152	73	180	19
1966	815	239	79	132	41
1967	736	193	108	179	13
1968	540	384	101	150	3
1969	335	427	103	153	---------
July 1, 1954, through Dec. 31, 1969	11,762	1,587	1,111	2,431	1,731

Source: (14)

[1]Export market value.

[2]Annual exports have been adjusted for 1963 and subsequent years by deducting exports under barter contracts which improve the balance of payments and rely primarily on authority other than Public Law 480. These exports are included in the column headed "Commercial sales."

		Total agricultural exports			
Total Public Law 480	Mutual security (AID)[3]	Total Government programs	Commercial sales[4]	Total agricultural exports	Public Law 480 as percent of total
7	8	9	10	11	12
70	211	281	1,304	1,585	4
767	351	1,118	2,081	3,119	24
1,262	449	1,171	2,459	4,170	30
1,218	318	1,536	2,970	4,506	27
1,019	214	1,233	2,622	3,855	26
1,050	158	1,208	2,747	3,955	27
1,304	157	1,461	3,371	4,832	27
1,304	179	1,483	3,541	5,024	26
1,444	35	1,479	3,555	5,034	29
1,509	11	1,520	4,064	5,584	27
1,621	23	1,644	4,704	6,348	26
1,323	26	1,349	4,880	6,229	21
1,306	47	1,353	5,528	6,881	19
1,229	33	1,262	5,118	6,380	19
1,178	11	1,189	5,039	6,228	19
1,018	(5)	1,018	4,918	5,936	17
18,622	2,223	20,845	58,901	79,746	23

[3]Sales for foreign currency, economic aid, and expenditures under development loans.

[4]Commercial sales for dollars include, in addition to unassisted commercial transactions, shipments of some commodities with governmental assistance in the form of short-and medium-term credit, export payments, sales of Government-owned commodities at less than doemstic market prices, and, for 1963 and subsequent years, exports under barter contracts which benefit the balance of payments and rely primarily on authority other than Public Law 480.

[5]Not available.

under P.L. 480. Further, the problems associated with the gorwing local currency counterpart funds and debt service structure arising out of the past shipments are also to be resolved.

This chapter is divided into three parts. Part I deals with the problems associated with the accumulating local currency counterpart funds out of the past sales. Part II deals with debt service structure of the recipient countries and consequences of change over to dollar sales. Finally, alternative pricing policies for future shipments corresponding to various objective functions of food aid are outlined in Part III.

Local Currencies Problems in Recipient Countries

Pricing policies for exports of agricultural products under P.L. 480 (both under local currency sales and dollar credit sales) have generally meant that the U.S. charges world market prices. Consequently, a large volume of sale proceeds has accrued over the years, especially under local currency sales. These sale proceeds, in the form of local currencies of recipient countries, were to be disbursed for four types of uses: (a) Loans to recipient countries, (b) grants to recipient countries, (c) Cooley loans to private firms, and (d) for U.S. uses. There has been a considerable time-lag (often several years) in the accrual of foreign currencies and their disbursement, with the result that a large amount of undisbursed balances have been accumulating in the U.S. Embassy Accounts in the respective recipient countries (Table 2.2).

Apart from initial allocations, the U.S. use funds also accrue from (a) the loan repayment by recipient Governments, (b) the interest payments by the recipient Governments, (c) the loan repayments by private

Table 2.2. Title I, Public Law 480--Status of foreign currencies as of June 30, 1969

(In million dollar equivalents)

Country	Agreement amounts through June 30, 1969	Collections through June 30, 1969[1]		Disbursements by agencies through June 30, 1969[3] [4]
		Sales proceeds	Other proceeds[2]	
Afghanistan	1.0	1.0	--------	1.5
Argentina	30.5	30.5	0.4	20.7
Australia				1.0
Austria	40.1	40.1	--------	41.8
Belgium				6.0
Bolivia	37.1	36.9	2.3	33.8
Brazil	503.4	503.4	9.6	317.8
Burma	45.8	45.8	6.8	42.5
Canada				.7
Ceylon	31.5	31.5	2.2	27.4
Chile	85.2	85.2	9.0	70.4
China (Taiwan)	238.4	229.3	10.5	208.0
Colombia	66.2	66.2	12.5	61.4
Congo	85.0	85.0	.7	62.1
Costa Rica				.1
Cyprus	2.1	2.1	.1	2.4
Denmark				1.3
Dominican Republic				.7
Ecuador	11.5	11.5	1.4	12.2
El Salvador				(5)
Ethiopia	.8	.8	(5)	1.7
Finland	43.0	43.0	5.1	40.5
France	35.7	35.7	5.5	45.0
Germany	1.2	1.2	--------	20.2
Ghana	36.5	23.7	.3	17.0
Greece	127.8	127.8	24.6	147.2
Guatemala				.3
Guinea	30.7	30.7	.5	4.7
Honduras				(5)
Hong Kong				4.0
Iceland	16.3	16.3	1.9	17.5
India	3,996.1	3,910.9	253.8	3,236.8
Indonesia	291.9	291.1	4.6	71.7
Iran	61.1	61.1	7.7	67.1
Ireland				.1

Table 2 (continued).

Country	Agreement amounts through June 30, 1969	Collections through June 30, 1969[1]		Disbursements by agencies through June 30, 1969[3 4]
		Sales proceeds	Other proceeds[2]	
Isreal	334.2	334.2	76.3	337.6
Italy	144.2	144.2	4.4	158.3
Ivory Coast	3.1	3.1	.1	2.8
Jamaica				.1
Japan	146.3	146.3		157.8
Jordan	5.9	5.9	.1	3.2
Kenya				.6
Korea	704.4	644.8	1.3	607.8
Lebanon				2.7
Liberia				(5)
Luxembourg				(5)
Malaysia				1.8
Mali	.6	.6		.3
Mexico	25.2	25.2	5.8	31.7
Morocco	73.1	65.3	3.2	51.6
Nepal			.3	1.3
Netherlands	.3	.3		8.2
Nicaragua				(1)
Nigeria				1.1
Norway				1.0
Pakistan	1,248.3	1,237.6	68.8	1,188.0
Panama				.2
Paraguay	16.0	16.0	1.3	13.3
Peru	40.0	39.9	4.1	40.1
Phillippines	53.2	53.2	3.3	53.7
Poland	519.5	519.5		44.9
Portugal	7.1	7.1		7.8
Senegal	3.3	3.3		2.7
Sierra Leone				.2
Singapore				(5)
South Africa				.7
Spain	488.0	488.0	29.1	428.5
Sudan	26.4	26.4	.2	18.4
Sweden				2.3
Switzerland				14.1
Syrian Arab Republic	34.9	34.9	1.2	25.4
Thailand	4.3	4.3	.3	10.8
Tunisia	91.1	85.3	4.5	72.0
Turkey	501.4	501.4	65.9	471.5
United Arab Republic (Cairo)	798.7	798.7	78.8	544.3

Continued on next page

Table 2.2 (continued).

Country	Agreement amounts through June 30, 1969	Collections through June 30, 1969[1]		Disbursements by agencies through June 30, 1969[3] [4]
		Sales proceeds	Other proceeds	
United Kingdom----------	48.5	48.5	---------	57.6
Uruguay----------	36.2	36.2	2.8	21.1
Venezuela----------				1.2
Vietnam----------	615.4	557.8	.6	602.7
Yugoslavia----------	619.8	619.8	61.9	489.1
Total	21,408.3	12,159.4	773.8	10,064.1

Source (14).

[1]Calculated at the collection rates of exchange.

[2]Public Law 480 104 (e) and (f) loan interest and repayment of principal and proceeds from sales of 104 (g) commodities.

[3]Prior to July 1, 1961, disbursements under sec. 104 (c), (g), and (f) grants were calculated at collection rates; sec. 104 (a) sales at current Treasury selling rates; sec. 104 (f) loans at loan agreement rates; sec. 104 (b)(1), (e) loans, (b)(2) through (b)(5) at the weighted average rates at the end of the month in which transfers were made to agency accounts for the balances remaining in the accounts. Subsequent to June 30, 1961, disbursements under sec. 104 (a) through (j) are calculated at either the current Treasury selling rates or the end-of-the-quarter market rates.

[4]Disbursements exceed collections in some countries because of conversions from other currencies.

[5]Less than $50,000.

firms under Cooley agreements, (d) the interest payments by private firms, and (e) interest payments by the banks holding the undisbursed amount in the U.S. Embassy account. The largest amounts of undisbursed U.S. owned local currency funds are in the U.S. Embassy account in India. Recently a study (11) projected that U.S. use funds would continue to accrue long after P.L. 480 imports stop (Table 2.3). In fact, recent Indian success in increasing domestic production of food has allowed food imports under P.L 480 to stop. But U.S. use counterpart funds will continue to accrue up to year 2010 (a detailed projection is presented in Table 2.4), according to one study (11). These accumulated balances represent a significant portion of total money supply in India also in other recipient countries.

The U.S. use of these local currencies for country use projects has been limited in the past years (2) because of two reasons: One reason is that U.S. authorities in the recipient countries must request dollar appropriation from the Congress and then substitute dollar funded projects for local currency financed projects. Congress considers such appropriations as additional aid and therefore, acts accordingly. Second, local currencies are highly overvalued when converted at going market exchange rate in terms of dollars; therefore, the U.S. authorities in recipient countries are reluctant to release dollar funded projects for local currency funded projects. Consequently, excess currencies have continued to accumulate in U.S. accounts in recipient countries.[1]

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[1] Excess currency countries are defined (for P.L. 480 operations) as those countries where the accumulated balances of U.S. owned local currencies are more than the U.S. needs for the next two fiscal years.

Table 2.3. Long Term Projections of U.S. Use Rupee Funds in India

U S. Fiscal Year	Fiscal pal Cooley loans	Interest payment Cooley loans	Princi-pal re-payment 104 (f)	Interest payment 104 (f)	Interest by RBI on special securi-ties	Non-PL 480 loan repay-ment and interest payment	Interest on non-PL 480 by RBI	Grand total
1	2	3	4	5	6	7	8	9
1969	11.92	13.71	5.38	125.43	33.85	229.63	54.09	474.01
1970	17.04	17.94	8.66	158.50	37.39	269.35	58.94	567.82
1971	23.32	22.21	13.06	192.65	41.67	308.61	64.39	665.91
1972	30.46	26.62	18.59	226.64	46.74	345.72	70.41	761.85
1973	36.96	31.32	25.26	260.44	52.59	381.04	76.96	954.57
1974	45.60	35.60	33.09	294.01	59 27	415.15	84.03	966.75
1975	58.41	39.34	42.80	327.31	66.77	446.76	91.59	1067.26
1976	60.88	42.48	52.25	360.31	76.09	475.98	99.59	1166.58
1977	68.66	45.03	63.76	392.98	84.24	500.02	107.96	1262.65
1978	75.41	47.01	80.61	425.73	94.27	522.33	116.67	1361.72
1979	81.43	48.48	102.94	459.94	105.28	541.47	125.67	1465.21
1980	85.94	49.52	127.77	493.54	117.26	557.87	134.92	1566.82
1981	89.22	50.23	155.15	526.86	130.23	573.74	144.41	1677.84
1982	92.11	50.69	184.62	559.38	144.19	586.10	154.06	1771.15
1983	95.00	50.92	216.20	591.09	159.16	595.74	163.69	1871.80
1984	95.60	50.97	249.91	621.93	175.13	603.40	173.64	1970.58
1985	95.90	50.98	285.78	651.83	193.88	611.14	183.70	2073.21
1986			323.82	680.73	209.87	618.95	193.88	2174.13
1987			364.07	708.59	228.90	626.85	204.14	2279.43
1988			406.54	735.35	248.98	634.83	214.56	2387.14
1989			451.27	760.95	270.13	642.87	225.11	2497.21
1990			498.27	785.34	292.37	651.00	235.78	2609.64

Table 2.3 (continued)

U.S. Fiscal Year	Fiscal pal Cooley loans	Interest payment Cooley loans	Princi-pal re-payment 104 (f)	Interest payment 104 (f)	Interest by RBI on special securi-ties	Non-PL 480 loan repay-ment and interest payment	Interest on non-PL 480 by RBI	Grand total
1	2	3	4	5	6	7	8	9
1991			547.58	808.45	315.71	659.19	246.58	2725.29
1992			599.22	830.24	340.17	667.46	257.50	2841.47
1993			653.22	850.66	365.76	675.81	268.55	2960.88
1994			709.61	869.60	392.50	684.22	279.73	3082.54
1995			787.42	887.02	420.69	692.71	291.03	3227.75
1996			829.45	902.86	449.77	698.49	302.43	3330.11
1997			893.45	917.05	480.03	704.06	313.92	3455.39
1998			959.70	929.53	511.49	708.34	325.47	3581.41
1999			1028.52	940.23	544.16			3693.60
2000			1094.28	949.14	577.97			3802.08
2001			1156.07	956.41	612.83			3906.00
2002			1211.21	962.31	648.92			4003.13
2003			1265.86	967.02	685.62			4099.19
2004			1319.79	970.62	723.20			4194.30
2005			1368.48	973.19	761.20			4136.63
2006			1412.03	974.97	800.61			4368.30
2007			1452.74	976.05	840.28			4449.76
2008			1469.71	976.52	880.24			4507.16
2009			1472.00	976.64	920.24			4549.57
2010			1474.36	976.69	960.27			4592.01

The cumulative figure of interest paid by RBI on accumulated funds at the end of FY 1969 has been divided between PL 480 and non-PL 480 on the basis of proportion of these cumulative funds. The separate figures on these not available. Subsequently the rate of interest of 1½% has been applied on accumulated funds.

Source: (11).

The use of U.S. owned foreign currencies for meeting direct U.S. needs in recipient countries is very limited and strictly controlled by the U.S. Office of Management and Budget where legal formalities have restricted the use of accumulated local currencies. But despite legal restrictions on their use, the inflationary implications of the expenditures out of these currency balances have been widely debated. It has been alleged that any use of P.L. 480 counterpart funds in inflationary due to the time lag involved between the flow of food supplies under P.L. 480 and the disbursement of counterpart funds. This argument is essentially based on the case of a single trade transaction. It has been shown (11) that in the case of a continuous flow of commodities under P.L. 480, the sale proceeds (including the unused balances) have lent a positive support to the Indian budget.

But this argument will not hold when imports of agricultural commodities come to an end. In this case the lagged withdrawals of P.L. 480 counterpart funds for U S. uses after food imports are stopped, would be just as inflationary as the recipients borrowing of its own currency from its central banks (6,7,8,). No longer will P.L. 480 shipments act as a counter inflationary device while P.L. 480 counterpart funds continue to accumulate. This phenomenon is not confined only to the Indian case which has been studied in detail (6,11); it is a general case in most of the recipient countries (7). It is this fact which makes the problem of using these accumulating balances very complex.

In order to solve the problem, it is necessary to recognize that the accumulating local currency balances no longer represent real resources and if they are used for projects other than what are already planned

by the recipient countries, inflationary pressure will be aggrevated or a diversion of resources from projects already planned will occur. Since the countries where the problem of excess currencies is most acute also have surplus labor resources, P.L. 480 funds could be used to finance highly labor intensive projects if these countries also have surplus supplies of foodgrains. But a detailed projection of food balances for India does not reveal any such evidence despite the green revolution and marked increases in domestic production in recent years. It is also the case in most other recipeint countries.

Further question which arises is whether it is worthwhile to insist on creation of new projects for financing with counterpart funds in view of the fact that these resources do not add to the existing development program in the recipient countries. Further, financing new projects with counterpart funds involves an extra administrative burden for keeping track of such finances. In view of these facts, excess supplies of P.L. 480 counterpart funds could better be linked with projects in existing development plans of recipient countries. Such a linking amounts to a freezing of funds in the final analysis.

Implications of Changing to Long Term Dollar Credit Sales

The shift to dollar credit sales requires repayments of dollars and concessional interest rates over 20 and 40 year periods. This change has meant that the aid component[2] of these sales has come down sharply; in essence, a hardening of the terms of P.L. 480 A recent study (13) estimated the aid component in a sale agreement to be -6.8 cents per

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[2]The concept of grant element was first introduced by Pincus (10). Anderson and Tweeten (13) have also written the aid component of long term dollar credit sales, incorporating transportation costs.

Table 2.4. Diet service productions for aid recipient countries: Gross Aid Constant

Country	Interest	Amortization	Total Debt Service	Index of Debt Service	Year
	1	2	3	4	5
		($ million)			
India	147.6	211.1	358.7	100	1967
	324.2	377.6	701.9	196	1972
	428.8	595.2	1024.0	286	1977
	519.9	758.2	1278.2	356	1982
	596.1	927.4	1523.6	425	1987
	649.2	1050.2	1699.5	474	1992
Pakistan	44.0	58.1	102.1	100	1967
	116.9	97.4	214.3	210	1972
	169.4	207.4	376.9	369	1977
	211.3	312.6	523.9	513	1982
	240.9	386.4	627.3	614	1987
	261.7	436.8	698.5	684	1992
Brazil	116.1	360.1	476.3	100	1967
	147.0	225.1	372.1	78	1972
	167.0	232.8	399.8	84	1977
	191.5	264.6	456.1	96	1982
	210.7	295.8	506.5	106	1987
	226.0	332.8	558.8	117	1992
Mexico	101.7	353.2	454.9	100	1967
	168.9	289.1	458.0	101	1972
	196.8	422.5	619.3	136	1977
	197.4	463.9	661 3	145	1982
	195.1	442.3	637.4	140	1987
	195.6	442.6	638.2	140	1992
Indonesia	62.7	68.1	130.8	100	1967
	145.0	172.6	326.7	250	1972
	181.2	179.4	360.6	276	1977
	263.8	287.4	551.2	421	1982
	126.1	175.5	301 6	231	1987
	130.9	220.4	351.3	269	1992

Table 2.4 (continued).

Country	Interest	Amortization	Total Debt Service	Index of Debt Service	Year
	1	2	3	4	5
		($ million)			
Argentina	104.1	351.5	455.6	100	1967
	67.0	188.0	255.0	56	1972
	46.1	116.5	162.5	36	1977
	45.7	108.9	154.6	34	1982
	46.7	111.5	158.1	35	1987
	48.2	120.3	168.4	37	1992
Turkey	46.9	105.4	152.3	100	1968
	52.7	73.8	126.5	83	1972
	65.5	74.7	140.2	92	1977
	80.5	104.1	184.6	121	1982
	93.9	134.8	228.7	150	1987
Chile	37.7	86.1	123.8	100	1967
	73.1	120.7	193.8	157	1972
	94.4	158.9	253.3	205	1977
	107.1	186.7	293.8	237	1982
	114.5	203.6	318.1	257	1987
	119.2	221.4	340.6	275	1992
Colombia	26.3	60.0	86.4	100	1967
	46.1	50.7	96.8	112	1972
	55.5	77.3	132.8	154	1977
	60.3	95.9	156.2	181	1982
	63.1	92.6	155.7	180	1987
	67.3	103.7	171.0	198	1992
Israel	29.9	71.9	101.7	100	1967
	57.4	86.4	143.8	141	1972
	75.1	206.3	281.4	277	1977
	78.9	187.1	266.0	262	1982
	80.4	201.0	281.8	277	1987
	80.2	200.0	280.2	276	1992

Continued on next page

Table 2.4 (continued).

Country	Interest	Amortization	Total Debt Service	Index of Debt Service	Year
	1	2	3	4	5
		($ million)			
Peru	21.0	66.2	87.2	100	1967
	54.1	91.5	145.6	167	1972
	64.5	117.1	181.6	208	1977
	69.0	131.7	200.7	230	1982
	74.4	147.0	221.4	254	1987
	77.4	167.7	245.2	281	1992
Korea	8.1	22.9	31.0	100	1967
	37.7	63.1	100.7	325	1972
	47.3	100.5	147.9	455	1977
	51.6	108.8	160.4	517	1982
	54.0	116.7	170.7	551	1987
	55.6	119.8	175.4	566	1992
Iran	20.7	51.0	71.7	100	1967
	33.9	69.4	103.3	144	1972
	35.7	73.0	108.7	152	1977
	37.6	80.6	118.1	165	1982
	39.4	81.9	121.3	169	1987
	40.9	84.2	125.1	175	1992
Nigeria	13.2	24.9	38.1	100	1967
	40.1	36.0	76.1	200	1972
	51.1	71.4	122.5	322	1977
	54.9	96.8	151.7	398	1982
	55.3	108.7	164.0	430	1987
	54.6	111.1	165.7	435	1992
Tunisia	9.3	27.6	36.9	100	1967
	20.3	37.8	58.1	157	1972
	24.5	45.3	69.8	189	1977
	29.2	51.4	80.6	218	1982
	32.9	54.9	87.8	238	1987
	35.9	60.6	96.5	262	1992

Source: (3)

dollar of aid assuming (a) a 20 year repayment, (b) a grace period of 10 years, (c) a down payment of 5 percent of total value of commodities, (d) the interest rate of 2 percent during the grace period and 2.5 percent of the unpaid balance during the remaining years, and (e) the transport cost paid by the aid recipient countries. This means that the recipient countries paid about 7 cents more for each dollar worth of food than its value at world market prices It was also estimated that the aid component in such a sale would become zero if the recipient countries paid back only three-fourths of the total value of shipment which implies a default of 25 percent.

In order to examine the implications of such a changeover in a long term perspective, we examine below the long run projections of external debt service obligations of some recipient countries. A recent USAID study (3) projected debt service obligations of some aid receiving countries on the basis of a set of assumptions of gross aid inflow, terms of repayment, grace period, interest rate and so on. These projections, presented in Table 2.4, indicate that the index of debt service charges is projected to increase very rapidly in most P.L. 480 aid recipient countries, and the increase is expected to continue to the end of the century.

Increases in debt service charges must be viewed in the light of present debt service ratios[3] which are already beyond critical levels in some countries. For example, the ratios of debt service payment to gross aid received for India shown in Table 2.5 indicate that the ratio has already reached 42 percent compared to 27 percent in 1961-62. Thus, nearly half of all exports sales are used to service the debt of past imports, a level considered critical by the USAID study. In that study, debt service

[3]Debt service ratios are defined as the ratio of total debt service payments (interest and amortization) to exports.

Table 2.5. Ratios of Debt Service Payments to Gross Aid Received and Exports

Years	Gross Aid Disbursement	Total Debt Service Charges	Exports	Percentage of col. 3 to col. 2	Percentage of col. 3 to col. 4
1	2	3	4	5	6
			($ million)		
1961-62	711	191	1390	26.86	13.74
1962-63	933	182	1400	19.50	13.00
1963-64	1239	209	1630	16.86	12.82
1964-65	1520	255	1750	16.78	14.57
1965-66	1622	303	1693	18.68	17.90
1966-67	1509	363	1534	24.06	23.66
1967-68	1570	438	1673	27.90	26.19
1968-69	1088	458	1811	44.12	25.29
1969-70	1203	506	1844	42.06	27.44

Source: (11).

ratios were presented on the basis of two assumptions about export growth rate: (a) a 4 percent rate, and (b) an 8 percent rate Until recently, a number of international agencies were quite apprehensive of the very slow rate of export growth in less developed countries But a recent study of export trends of less developed countries shows that these countries have maintained a very encouraging rate of export growth, and that export earnings increased from 5 to 7 percent annually (2). Even if we take a very optimistic view and put the rate of growth of exports at 8 percent the debt service ratio remains at critical levels up to 1982 in many P.L. 480 receiving non-oil producing countries (Table 2.6).

In view of the above projections the additional burden imposed by the changed terms of P.L. 480 aid may prompt recipient countries to take drastic restraining measures. In view of the very low net gain from food aid (at present prices) and the much higher growth promoting effect of dollar aid, recipient countries may be encouraged to do away with food imports as soon as possible by resorting to some combination of rationing and price increases even at the cost of widespread malnutrition. They may try to stop imports as soon as they are able to just balance minimum food needs with domestic supplies.

Given a different pricing policy for P.L. 480 food, there are opportunities not only for increasing total food supplies but also for increasing supplies of foods which are critically short, for example, by augmenting supplies of protein and fat by utilizing inferior quality foodgrains as raw material for milk cows. Israel (4) is an example of such a transformation of P.L. 480 imports into animal products. But at present prices, the clamour for self-sufficiency is very strong; particularly in the Indian case. Despite the green revolution and remarkable

Table 2.6. Projections of Debt Service Ratios: Gross Aid Constant

Country	1960-196/ Growth Rate	Export Growth Rate: 4 per cent	Export Growth Rate: 8 per cent	Year
1	2	3	4	5
		(per cent)		
India	22.2	22.2	22.2	1967
	37.9	35.7	29.6	1972
	48.1	42.9	29.4	1977
	52.3	44.0	25.0	1982
	54.3	43.1	20.3	1987
	52.8	39.5	15.4	1992
Pakistan	17.1	17.1	17.1	1967
	26.6	29.5	24.5	1972
	34.6	42.7	29.3	1977
	35.7	48.8	27.7	1982
	31.6	48.0	22.6	1987
	26.1	44.0	17.1	1992
Brazil	28.8	28.8	28.8	1967
	18.7	18.5	15.3	1972
	16.6	16.3	11.2	1977
	15.8	15.3	8.7	1982
	14.5	14.0	6.6	1987
	13.3	12.7	4.9	1992
Mexico	38.8	38.8	38.8	1967
	28.8	32.1	26.6	1972
	28.7	35.7	24.5	1977
	22.6	31.3	17.8	1982
	16.0	24.8	11.7	1987
	11.8	20.4	8.0	1992
Indonesia	20.4	20.4	20.4	1967
	62.5	41.4	34.7	1972
	84.6	38.0	26.1	1977
	158.6	47.7	27.1	1982
	106.5	21.5	10.1	1987
	152.1	20.6	8.0	1992
Argentina	31.1	31.1	31.1	1967
	14.0	14.3	11.9	1972
	7.2	7.5	5.1	1977
	4.6	n.a.	n.a.	1982
	3.9	5.3	1.7	1987
				1992

Table 2.6 (continued).

Country	Export Growth Rate: 1960-1967 Growth Rate	4 per cent	8 per cent	Year
1	2	3	4	5
		(per cent)		
Turkey	29.1	29.1	29.1	1968
	17.4	20.7	17.8	1972
	12.8	18.8	13.4	1977
	11.1	20.4	12.0	1982
	9.1	20.8	10.1	1987
Chile	12.8	12.8	12.8	1967
	12.3	16.5	13.6	1972
	9.8	17.7	12.1	1977
	7.0	16.9	2.6	1982
	4.6	15.0	7.1	1987
	3.0	13.2	5.1	1992
Colombia	16.9	16.9	16.9	1967
	17.8	15.6	12.9	1972
	22.9	17.6	12.1	1977
	25.2	17.0	9.7	1982
	23.6	13.9	6.5	1987
	24.3	12.6	4.9	1992
Israel	15.9	17.5	16.9	1967
	11.5	20.4	16.2	1972
	11.5	32.8	21.6	1977
	5.5	25.4	13.9	1982
	3.0	22.2	10.0	1987
	1.5	18.1	6.8	1992
Peru	11.3	11.3	11.3	1967
	12.3	15.5	12.8	1972
	10.1	15.8	10.9	1977
	7.3	14.4	8.2	1982
	5.3	13.1	6.1	1987
	3.8	11.9	4.6	1992
Korea	9.7	9.7	9.7	1967
	9.9	25.9	21.4	1972
	4.5	31.2	21.4	1977
	1.5	27.8	15.8	1982
	0.5	24.3	11.4	1987
	0.2	20.6	8.0	1992

Continued on next page

Table 2.6 (continued).

Country	Export Growth Rate: 1960-1967 Growth Rate	4 per cent	8 per cent	Year
1	2	3	4	5
		(per cent)		
Iran	3.7	3.7	3.7	1967
	3.0	4.4	3.6	1972
	1.8	3.8	2 6	1977
	1.1	3.4	1.9	1982
	0.6	2.9	1.3	1987
	0.4	2.4	0.9	1992
Nigeria	5.6	5.6	5.6	1967
	8.6	9.2	7.6	1972
	10.7	12.2	8.3	1977
	10.3	12.4	7.0	1982
	8.6	11.0	5.2	1987
	6.7	9.1	3.6	1992
Tunisia	24.8	24.8	24.8	1967
	33.3	32.0	26.5	1972
	34.2	31.6	21.7	1977
	33.7	30.1	17.1	1982
	31.4	26.9	12.6	1987
	29.5	24.3	9.5	1992
Bolivia	10.3	10.3	10.3	1967
	4.8	7.9	6.5	1972
	3.4	8.9	6.1	1977
	2.2	9.3	5.3	1982
	1.3	9.2	4.3	1987
	0.7	7.7	3.0	1992
Dominican Rep.	9.4	9.4	9.4	1967
	9.3	7.9	6.5	1972
	19.3	13.9	9.6	1977
	23.4	14.3	8.1	1982
	21.0	10.9	5.1	1987
	20.1	8.9	3.5	1992

Source: (3).

increases of food grain output in recent years and optimistic projections of growth in food grain output, calorie and proteins availability remains depressed in 1969 as illustrated in Table 2.7. Even by 1981, the projected level of per capita per day availability of calories and proteins is also below the level of minimum nutritional target. Yet imports of commodities under P.L. 480 have been stopped. Furthermore, after the changeover to dollar sales, India must soon start repaying principal on past loans plus the interest on these balances. These additional debt service obligations may further accentuate the already critical debt service ratios. In the light of USAID projections of debt service obligations, these additional debt service obligations may considerably reduce the net availability of foreign exchange resources for these countries. This would further add to the pressure for the debt rescheduling and debt postponement problems.

Pricing Policy for Future Exports of Agricultural Commodities

The choice of pricing policy for exports under P.L. 480 is directly related to the objective functions associated with food aid and also U.S. domestic policy with respect to supply control in the United States. There are trade-offs between increased shipments of food aid and increased retirement of cropland to control crop production. One such set of trade-offs exists between the objective of maximizing economic development through food aid and minimizing the cost of operations of CCC. Recently, several studies have emphasized the point that if the efficiency of food aid as a tool of economic development is to be preserved there has to be a change in the pricing policy of P.L. 480 shipments in view of the fact that world market prices are much higher than the cost to

Table 2.7. Availability of Calories and Proteins per capita per day.

Type of Food Commodity	Base level 1969	Projected 1981	Minimum Nutritional Target by Sukhatme (F.A O.)
1	2	3	4
Total Calories	1,965	2,300	2,370
Vegetable Proteins (gms.)	45.5	54.4	55.6
Animal Proteins (gms.)	5.2	6.3	10.0
Total Proteins (gms)	50.7	60.7	65.6
Percentage of animal protein to total protein	10.3	10.3	15.2

Source: Sharma, J.S. (5).

CCC (12). In the past, there were few estimates available to form a basis for pricing food aid to eliminate the conflict between the two objectives of food shipments: to maximize economic development of the recipient countries and minimize economic development of the recipient countries and minimize the net cost to CCC. This gap has been bridged more recently by a study which estimated the net cost per unit of food aid at different levels of shipments and under alternative supply control policies (9). To examine food aid and supply control in a single framework, parametric programming techniques provided two types of simultaneous variation: one variation allowing a discrete change in the food aid demand vector; the second variation allowed a discrete change in the shipping cost vector. The practical significance was that this combination of change in the model allows simulation of real world conditions for production, government purchase, and eventual shipment of commodities to overseas destinations under P.L. 480 programs.

Estimated net government costs for food aid are reported from that study in the next three sections. These estimated costs include the "savings" that result when cropland is no longer retired under a government program but instead is used to produce for shipment under P.L. 480 programs. Per-unit costs are derived for the marginal unit of production, that unit produced after domestic and commerical export demand is satisfied. The type of land retirement program is important because differences exist between programs for costs of retiring an acre of cropland. Three types of land retirements are considered.

Long-term land retirement, no restrictions on location

Per-unit costs of wheat, feed grains and cotton for P.L. 480 programs

are first estimated assuming a long-term land retirement program. No restriction is placed on the proportion of acres retired in any production area; acres are retired in the most marginal areas of production with program payments based on the estimated net return above all costs of crop production except land taxes.

Net costs per unit of commodity for each shipment level are specified in Table 2.8. At the initial level of 75 million bushels, wheat for P.L. 480 programs costs an estimated $1.40 per bushel. As shipments increase, cost per bushel rises. The cause of this increase is explained as follows: total government cost for purchase and shipment of a unit of a commodity is maintained at a constant level (i.e. the support price) by the model. To hold this cost constant, the differential between the support price and production costs is reduced as the cost of producing a unit increases (Figure 2.1). Consequently, since this cost is constant, the variation in cost shown in Table 8 results from the change in cost per acre of land retirement. As production is expanded, more marginal cropland is returned to production. It has a lower net return and therefore a smaller cost for retiring it from production. Hence, as it returns to production, the "saving" from removing this cropland from the government land retirement program diminishes and the cost of each additional unit shipped increases.

The net cost of providing wheat in this economic environment increases to $2.01 when 525 million bushels of wheat are shipped, compared with a gross Commodity Credit Corporation (CCC) cost of $2.30 per bushel for the wheat shipped under P.L. 480 programs during 1966-68. The increase from $1.40 at 75 million bushels of wheat to $2.01 at 525 million bushels

Table 2.8 Estimated net government cost per unit for commodities provided under P.L. 480 programs assuming the United States employs a long-term land retirement program with no restrictions on location

Recipient country or area	Level of P.L. 480 shipments[1]						
	1	2	3	4	5	6	7
Wheat (dollars per bushel)	1.40	1.60	1.71	1.74	1.80	1.89	2.01
Feed Grains (dollars per bushel)[2]	1.57	1.58	1.59	1.61	1.67	1.68	1.68
Cotton (cents per pound)	20.0	20.6	20.6	21.5	22.2	22.8	25.5
[1]Quantities are (Million bushels wheat; million tons feed grains; million bales cotton):							
Wheat	75	150	225	300	375	425	525
Feed Grains	1.5	3.0	4.5	6.0	7.5	9.0	10.5
Cotton	1.0	2.0	3.0	5.0	5.0	6.0	7.0

[2]Feed grain price is per bushel of corn or equivalent nutritive value of other feed grain.

Source: (9)

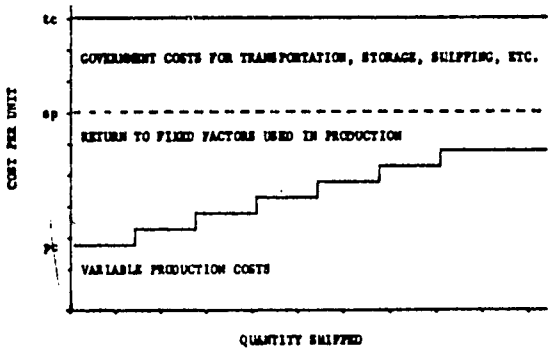

Figure 2.1. Cost structure for P.L. 480 commodities

indicates the magnitude of decrease in land retirement costs as shipments of wheat are increased. At the lower level of shipment, the net cost to the U.S. government is substantially less than CCC figures indicate. As shipments expand, net costs rise and if shipments were expanded far enough so that no land retirement acres remained, net costs would approach gross CCC costs.

The cost of feed grains is estimated at $1.57 per bushel of corn equivalent when 1.5 million tons are shipped and rises to $1.68 when a total of 10.5 million tons are shipped. This cost compares with an average total CCC cost of $1.93 per bushel incurred for feed grains shipped for the years 1966-68. The small change in net cost per bushel of feed grains indicates that land retirement costs remains relatively constant over this magnitude of change in acreage harvested. One reason for this is the relatively small size of feed grain shipments. Even at the maximum level, 10.5 million tons, less than 6 percent of total food grain production would be exported under P.L. 480 programs.

The net cost of cotton ranges from $0.20 per pound for 1.0 million bales of cotton to $0.25 per pound for 7.0 million bales. This compares with an average cost of $0.279 per pound of shipments from 1966 through 1968. The greater percentage rise in cost per unit of cotton than for feed grains indicates land retirement costs in cotton areas varies over a wider range than it does in feed grain areas. Also, 7.0 million bales of cotton represent 70 percent of total production. This level is well in excess of recent levels of cotton exports under P.L. 480 programs. It requires nearly all land available for cotton to be returned to production. At this point almost no savings would be realized from reduced

land retirement, and hence, the cost of cotton per pound of lint approaches the gross cost of these shipments.

Long-term retirement, with restrictions on location

A second type of government program examined would ship the same quantities of wheat, feed grains, and cottonlint with this limitation placed on the land retirement program: no more than 50 percent of total cropland can be retired in any production region. Acres retired are spread over more productive areas; these acres have a higher net return from crop production (and a higher cost for retirement). Consequently, the cost of retirement is higher at each level of shipment, but this results in a lower cost (compared with the previous program) per unit of commodity.

Estimates of net cost per unit of wheat, feed grains, and cotton are specified in Table 2.9. The net cost of wheat is $1.29 per bushel (compared with $1.40 with the previous program) with shipments of 75 million bushels. As shipments expand, the cost per bushel increases and reaches $1.71 at 525 million bushels.

Feed grain costs are lower than those in the previous model, increasing from $1.43 per bushel to $1.57 per bushel as shipments increased from 1.5 million to 10.5 million tons. Costs for cotton for this type of program rose from $0.189 per pound to $0.234 per pound.

Costs of cotton under P.L. 480 programs have a somewhat different composition than costs of wheat or feed grains. Transportation and other costs for cotton are a smaller proportion of total costs than for other commodities. Wheat costs in 1966-68 were broken down as 74.3 percent commodity purchase and 25.7 percent transporation and costs. Feed grains costs were similar with commodity purchase accounting for 73.1 percent

Table 2.9 Estimated net government cost per unit of commodities provided under P.L. 480 programs assuming the United States employs a long-range retirement program with a 50 percent limit on retirement in any production area

Recipient country or area	Level of P.L. 480 shipments[1]						
	1	2	3	4	5	6	7
Wheat (dollars per bushel)	1.29	1.34	1.47	1.59	1.59	1.61	1.71
Feed Grains (dollars per bushel)[2]	1.43	1.46	1.48	1.49	1.56	1.56	1.57
Cotton (cents per pound)	18.6	20.0	20.0	20.6	20.6	21.4	23.4

Source: (9)

[1]Shipment levels are the same as shown in Table 8.

[2]Feed grain price is per bushel of corn or equivalent nutritive value of other feed grain.

of total costs per unit. But cotton has a lower proportion of costs for transportation and other items. For cotton, 91.8 percent of all costs in 1966-68 were for commodity purchase and only 8.2 percent for transportation, export payments, and other costs. The lower percentage of costs for these other items in the case of cotton results primarily because support prices for cotton are competitive with world market prices. Only minor export payments are required for sale of cotton under P.L. 480 programs. In addition, costs for transportation for all commodities have been reduced because "an amendment to Public Law 480 signed October 8, 1964, included a provision eliminating local currency financing of ocean transportation in U.S. flag vessels. Now only the differential between U.S. and foreign flags rates is paid by CCC where commodities are required to be transported in U.S. vessels" (11).

Annual land retirement--direct payment type programs

The final policy analyzed assumes land retirement programs that individually retire cropland from wheat, feed grains, and cotton on an annual basis with direct payments to producers on a portion of production as an incentive to participate. This program was based on actual land retirement cost figures from programs in effect for these crops in 1966.

Cost per retired acre is higher than in the previous programs. These higher costs result primarily because under an annual program producers have tendency to retain all factors of production (land, labor, and capital items) necessary to operate their firms at full capacity. Retaining these factors of production results in producers' incurring fixed costs for depreciation and underemployed labor. Payments for land retirement must cover these costs to gain participation of producers. Hence, payments per acre for this type of program will be larger than those for a long-

range program under which excess factors of production can be sold and excess labor employed elsewhere.

Costs of P.L. 480 programs for wheat and other commodities with this type of land retirement program in effect are given in Table 2.10. The first 75 million bushels of wheat are estimated to cost $0.08 per bushel. Costs rise with shipments. At 150 million bushels, cost is $0.50 per bushel. At the maximum level considered, 525 million bushels, the net cost per bushel is $1.31. These data indicate net costs of wheat shipments under P.L. 480 programs are relatively low when measured against the high cost of retiring land under this type of program. Likewise, these costs indicate shipments of wheat have a much lower net cost than gross costs incurred by CCC would suggest. While the gross cost for each bushel of wheat shipped under P.L. 480 in 1966-68 was $2.30, there is a clear indication that retiring these same acres would have cost nearly as much had these shipments not been made, particularly for the initial 75 million bushels. At the average level of shipment for 1966-68, 373.4 million bushels, the average net cost is estimated at $1.13 per bushel, approximately 49 percent of the gross cost of shipment.

Estimated costs for feed grain shipments with annual land retirement programs are lower than for either program considered previously, although not as significantly as for wheat. At an initial level of 1.5 million tons, the cost is estimated at $1.08 per bushel, approximately 75 percent of the previous program. As shipments increase, reaching $1.34 per bushel at 10.5 million tons of feed grains.

Table 2.10 Estimated net government cost per unit for commodities under P.L. 480 programs assuming the United States employs annual land retirement programs for wheat, feed grains, and cotton.

Recipient country or area	Level of P.L. 480 shipments[1]						
	1	2	3	4	5	6	7
Wheat (dollars per bushel)	0.08	0.50	0.87	1.05	1.13	1.27	1.31
Feed Grains (dollars per bushel)[2]	1.08	1.10	1.15	1.17	1.32	1.34	1.34
Cotton (cents per pound)	13.8	16.8	17.2	17.2	17.7	18.2	19.2

Source: (9)

[1]Shipment levels are the same as shown in Table 8.

[2]Feed grain price is per bushel of corn or equivalent nutritive value of other feed grain.

Guidelines for Pricing P.L. 480 Commodities

The estimated per-unit government cost of P.L. 480 shipments specified for each alternative land retirement program above is based on actual costs incurred for commodities programmed under these programs during 1966-68 and estimated costs for each type of land retirement program. These costs are subject to change over time due to changes in price support levels, proportion of international transportation costs borne by the CCC, and world prices of these commodities. The world price determines to a large extent the level of export subsidy necessary to make these commodities competitive in export markets.

To develop a general set of guidelines for pricing future food shipments, the estimated net average cost for commodities for each alternative land retirement program is compared with the gross CCC costs for the period 1966-68. This ratio,

$$\frac{\text{Estimated Net Cost}}{\text{Gross CCC cost}} (100) = \text{pricing coefficient}$$

provides an estimate of the percentage of gross costs to be charged for P.L. 480 shipments, given (a) the type of land retirement program actually in use at a particular time and (b) the actual CCC costs of food aid commodities.

Pricing coefficients are summarized in Table 2.11 for the three types of land retirement programs examined. They vary according to the level of shipment, the particular commodity shipped, and the type of land retirement program. For wheat, the pricing coefficient varies from 3.5 percent, with an annual land retirement program and a shipment of 75

Table 2.11. Estimated net costs as a percentage of gross CCC costs for P.L. 480 shipments of wheat, feed grains, and cotton during 1966-68, under alternative supply control programs

Type of land retirement program	Level of P.L. 480 shipments						
	1	2	3	4	5	6	7
				Wheat			
Long-range retirement No restrictions	60.9	69.6	74.3	75.7	78.3	82.2	87.4
Long-range retirement 50 percent restrictions	56.1	58.3	63.9	69.1	61.9	70.0	74.3
Annual land retirement Direct payments	3.5	21.7	37.8	45.7	49.1	55.2	57.0
				Feed Grains			
Long-range retirement No restrictions	81.3	81.9	82.4	83.4	86.5	87.0	87.0
Long-range retirement 50 percent restrictions	74.1	75.6	76.7	77.2	80.0	80.0	81.3
Annual land retirement Direct payments	56.0	57.0	59.6	60.6	68.4	69.4	69.4
				Cotton			
Long-range retirement No restrictions	74.6	76.9	76.9	80.2	82.8	85.1	95.1
Long-range retirement 50 percent restrictions	70.5	74.6	74.6	76.9	76.9	79.8	87.3
Annual land retirement Direct payments	51.5	62.7	64.2	64.2	66.0	67.9	71.6

Source: (9).

million bushels of wheat, to 87.4 percent, with a long-range retirement program and 525 million bushels. The pricing coefficients are considerably lower for all levels of wheat shipments for annual programs than for other programs.

The pricing coefficients for feed grains and cotton are generally higher than for wheat for a similar shipment level and land retirement program. These results suggest, given the criteria explained earlier, that shipments of feed grains are optimally priced if the return is 81.3 percent of the CCC cost when 1.5 million tons are shipped and a long-range land retirement program is used or 56.0 percent of their CCC cost if annual programs with direct payments are used to control production. For these respective programs, these percentages rise to 87.0 percent and 69.4 percent of CCC costs at the maximum level of shipments.

For cotton the estimated net cost of a 1.0 million-bale shipment varies from 74.6 percent of CCC costs with a long-range land retirement program to 51.5 percent with an annual land retirement program. These coefficients increase to 95.1 with the long-range program when 7.0 million bales are shipped and 71.6 when annual programs are used with this level of shipment. During the period 1966-68, an average of 1.0 million bales of cotton were programmed for shipment to recipient countries under P.L. 480 programs.

To conclude this discussion on pricing levels and provide comparisons with actual data, the actual levels of cost recovery were calculated for commodities programmed for shipment between 1966-68. While data are not available for the individual commodities as might be preferred, data are available on the proportion of gross CCC costs recovered in contracts

signed between 1966-68. To calculate these proportions the estimated export market value of P.L. 480 shipments is compared with the CCC costs of these shipments. These results indicate a sharply rising trend after 1965. From a level of 60 percent in 1965, the level of cost recovery rose to 69.5 in 1966, to 80.9 in 1967, and 84.7 in 1968.

To test these recovery rates against those that would exist if the pricing levels derived earlier in this study were used, the level of recovery with the concept of net cost applied to pricing was calculated for wheat, feed grains, and cotton. For these estimates, pricing coefficients from Table 2.11 were weighted with the proportion of wheat, feed grains, and cotton actually programmed for shipment in each year between 1966 and 1968. The following comparisions were derived:

	Estimated	Actual
1966	54.9	69.5
1967	50.0	80.9
1968	39.4	84.7

The proportions derived indicate that as costs for land retirement rose in 1967 and 1968, the net costs of potential food shipments declined. Actual recovery rates went up, however.

Concluding Remarks

There has been a gradual changeover from local currency to dollar sales under P.L. 480 since 1966. In many countries the process is either already complete or nearing completion. Yet stocks of U.S. owned local currencies under P.L. 480 will continue to accumulate in some cases until the end of the century because of loan repayments and interest payments or previous loans. In past years, disbursement out of these U.S. owned funds have always lagged behind accruals. Two main reasons have been

advanced for such a phenomenon: (a) U.S. authorities abroad are required to seek appropriations from the Congress to use these currencies and Congress considers these appropriations as additional aid. In such a situation U.S. authorities abroad can use more local currencies only by giving up some of the dollar funded projects, and (b) these local currency balances are highly overvalued in terms of dollars.

In past years, the deflationary effect of these accumulations has been mullified by the fiscal policies followed. However, future use of these accumulated balances (lagged withdrawals) can be as inflationary as recipient countries borrowing from their own central banks. If this inflationary effect is to be avoided, the excess funds must be linked with existing development projects of the recipient countries. Such a linking would also have incidental advantage in terms of saving administrative costs. Such a linking process can be encouraged by revaluing local currency balances in terms of dollars and by relaxing appropriation requirements for these balances.

Further, the changeover to dollar sales is likely to have two implications for the development in the recipient countries: (a) they will contribute to a further lessening of net aid and (b) it will compel recipient countries to reduce P.L. 480 imports even at the cost of malnourishment and undernourishment. If so, it may retard long run economic development of these countries.

Since estimated net costs of P.L. 480 shipments are much lower than world market prices, using world market prices to establish dollar credit sales can be seriously criticized. In the above analysis we have provided a set of cost guidelines for future pricing of food aid.

These cost estimates provide a "lower bound" for pricing P.L. 480 commodities since, of course, any lower return would mean the United States could manage its agricultural capacity in a cheaper manner by retiring the land instead of producing and shipping the commodities. In contrast, an "upper bound" is established by gross CCC costs for these commodities, and this price level would be relevant if the alternative use for agricultural resources was idleness with zero cost, or even alternative employment.

Given the empirical results and the pricing considerations outlined, the following points may be made:

1. For the time interval during which the U.S. continues to rely upon a policy of using all its institutionalized land resources for either crop production or government supported land retirement, the appropriate level of costing for P.L. 480 products is considerably below gross CCC costs. Given continued extensions of annual land retirement programs, pricing for food aid programs should be re-evaluated.

2. The major benefit of such a policy change will accrue to the recipient nations who will require reduced amounts of long-term credit. The realities are probably such that many countries will eventually find present prices and associated credit terms a heavy burden on limited foreign exchange earnings.

3. Finally, the objective of aid-in-kind should always be kept in mind. Such aid must have as its goal an improvement in welfare of recipient nations' consumers, both in the short term through consumption of food and in the long term through positive effects on economic develop-

ment. To the extent that food shipments represent a larger proportion of aid-in-kind and a smaller proportion of commercial sales for credit, recipient nations may be genuinely helped to improve the lot of their poorer strata of consumers.

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CHAPTER III

IMPACT OF FOOD AID RE-EXAMINED

American agriculture has faced a basic structural disequilibrium for the last several decades. There has been a large scale substitution of capital for labor and land (2) and this has lead to fewer farms each with larger fixed costs. This in turn created an intense need for each farm to produce larger quantities of output to hold down per unit costs of production. Further, the larger quantities led to an over capacity to produce certain types of commodities. The increased capacity on the supply side generally faced a lack of sufficient demand (domestic and export) to give prices acceptable to the farm sector. To improve incomes, a national commitment was made to guarantee a set of minimum prices to the farm sector. This commitment lead to a set of policy measures which comprised both long term land retirement programs to control supply, and government purchase of excess supplies to expand demand. As this set of programs was placed in operation, a large volume of stocks began to accumulate and costs for storage and transportation began to mount. It was this situation primarily that lead to the enactment of P.L. 480. The exports of food on concessional terms under P.L. 480 have helped recipient countries in the early stages of economic growth and these exports also brought some benefits to donor countries. The division of gains, however, has been changing with the terms of aid.

Impact on the United States

The benefits to the United States from the export of surplus commodities have been of two types: one is domestic and the other is

balance of payments. A recent study measured the benefits of food aid using a concept of average and marginal net social gain. "The average net social gain expressed the net addition to social output obtained by maintaining food aid programs during 1964-66 rather than allocating food aid commodities to the best alternative use." (4) These estimates are presented in Table 3.1.

According to the study reported in Table 3.1 the average net social gain of food aid to the United States was 38.9 percent and 45.6 percent of the face value of 20-year and 40-year dollar credit sale terms. The average net social gain in nonconvertible local currency sales to the United States was -3.0 percent of the face value. This means that

Table 3.1 Estimated average and marginal net social gain of food aid in percent of face value and their distribution between donor and recipient countries, 1964-1966[a]

Type of aid programs	Average net social gain			Marginal net social gain		
	Total	Aid recipient	Donor	Total	Aid recipient	Donor
Sales on dollar credit						
20-year terms	38.8	-6.8	45.6	26.1	-9.5	35.6
40-year terms	39.3	0.4	38.9	26.6	-2.3	28.9
Nonconvertible currency	33.7	36.7	- 3.0	21.0	34.0	-13.0
Grants	33.7	79.6	-45.9	21.0	76.9	-55.9

Source: (4)

the United States incurred an additional cost of 3 percent over the best alternative supply control by providing food aid. However, P.L. 480 local currencies have brought balance of payments gains in the form of reduction in the U.S. spending for its needs abroad (Table 3.2). These are included in the calculations of net gain.

But, this method of looking at net social gain of food aid ignores the benefits accruing to the U.S. economy in terms of resource utilization of less mobile resources like labor. The land retirement programs compensates the farmers in terms of their profits but it acts unequally for the small business which declines in the process and also for labor uses. It results in multiplier effects through out the farm community as the farm based volume of capital and consumption decline (1). These secondary costs have been saved to the extent land has remained in production to meet the food aid needs.

If we take into account these secondary benefits (although no direct estimate is available), the net social gain may not have been negative under local currency sales. Moreover, the accounting of these secondary benefits would increase the average net social gain to the United States under dollar credit sales (over the figures present in Table 2). The pricing policy suggested in the previous chapter, based on the net cost concept, divides the total gains out of the aid between the recipient countries and the United States more evenly and the efficiency of food aid as a tool for long run economic development will be preserved.

Price, Production and Income Impacts of Food Aid

Food aid financed under P.L. 480 has helped bridge the food gap in recipient countries. It has helped avoid alternative measures such as

Table 3.2. Title 1, Public Law 480--Status of foreign currencies as of June 30, 1969

(In million dollar equivalents)

Uses as specified in sec. 104	Transfer to agency accounts	Disbursements by agency
104 (c) Common defense	1,344.2	1,289.1
104 (c) Procurement and rehabilitation of vehicles for Asian countries	2.9	2.9
104 (e) Loans to private enterprise	539.0	305.6
104 (f) Grants for economic development	1,843.5	1,628.9
104 (f) Loans to foreign governments	5,562.6	4,880.9
104 (h) Finance programs related to population growth problems	30.7	25.9
Total, U.S. uses	2,960.0	2,013.6
Total	12,882.9	10,146.6
United States uses:		
Agency for International Development:		
104 (d) Emergency relief grants	6.5	5.4
104 (g) Purchase goods or services for other friendly countries	128.0	98.1
Agriculture: 104 (a) trade fairs; 104 (b)(1) agricultural market development; and 104(b)(3) scientific activities	446.(	151.6
Commerce: 104 (a) trade fairs; 104 (b) (1) agricultural market development; and 104 (b) (3) scientific activities	8.(	11.5
Defense:		
104 (a) Military family housing	98.(	91.3
104 (a) Other programs	8.1	3.9
Health, Education, and Welfare: 104(b) (2) International educational and cultural exchange activities; and 104(b)(3) scientific activities	101.7	52.6

Source: (9).

continued on next page

Uses as specified in sec. 104	Transfer to agency accounts	Disbursements by agency
Interior: 104(b)(3) scientific activities	1.7	1.5
Library of Congress: 104(b)(5) evaluating foreign publications	11.2	8.5
National Science Foundation: 104(b)(3) scientific activities	11.9	8.7
Smithsonian Institution: 104(b)(3) scientific activities	7.7	5.7
State:		
104(a) American-sponsored schools and studies; 104(b)(2) international educational and exchange activities; 104(b)(3) preservation of ancient Nubian monuments; and 104(d) emergency relief grants	341.8	178.9
104(b)(4) Acquisition and maintenance of buildings for U.S. Government purposes abroad	43.3	31.8
Treasury:		
104(a) Payment of U.S. obligations	1,620.4	1,263.9
104(j) Sales for dollars to U.S. citizens and nonprofit organizations	14.5	14.5
U.S. Information Agency:		
104(a) Translation of books and periodicals, American-sponsored schools and centers, trade fairs, and audiovisual materials	111.2	85.7
Total, U.S. use	2,960.0	2,013.6

(a) higher prices and/or rationing to adjust to existing food supplies and/or (b) use of more foreign exchange earnings for purchase of imported foods (19). But the beneficial effects of food aid have been clouded in the controversy over its potential negative impacts on domestic agricultural production in recipient countries.

Schultz has expressed apprehension about price disincentive effect of food aid on agricultural production in recipient countries (7). Others have disagreed with him by either (a) denial of production responsiveness to price changes in developing countries which rules out any disincentive effect, or (b) acceptance of production responsiveness, but disagreement on the degree of such response.[1] The recipient countries have absorbed food aid commodities either under a program approach or under project approach. Therefore, we will examine the price, production and income impacts of food aid in recipient countries under these two approaches.

Impact of Food Aid Under a Program Approach

Estimation of negative production impacts resulting from imports of surplus agricultural commodities from abroad rests heavily on measurement of price changes and related production response. Only a few quantitative studies have been made to test the hypothesis put forth by Schultz. One such study by Mann used an econometric model to test the price and production effects of P.L. 480 impacts on the Indian economy (2). Mann's model consisted of a system of six simultaneous equations as follows: (1) a supply equation, (2) a demand equation, (3) an income generation

[1]For a detailed discussion of the literature, see (5).

equation, (4) a commercial-import equation, (5) a withdrawal from stocks equation, and (6) a market-clearing equation. By solving the system Mann concluded "If the per capita import of P.L. 480 cereals is increased by one pound, the total decline in domestic production over the following two years will be 0.48793 pounds, over the following four years 0.21360, over six years 0.36784, and so on" (2, p. 143).

Thus Mann's model confirmed a negative impact of food aid on prices and agricultural production in Indian case. But it has been recently demonstrated that Mann's model has overstated the price and production impact of P.L. 480 imports by implicitly assuming P.L. 480 demand to be homogenous with demand for domestic commodities and that P.L. 480 commodities enter the market in the same way as domestically produced commodities (6). On the contrary, P.L. 480 commodities enter the market in many countries through a concessional agency. The availability of food to some consumers at a lower price represents an increase in real income to consumers in the aggregate and implies a shift in the aggregate demmand curve. In Figure 3.1, for example, P.L. 480 imports equal to Q_1Q_2 would depress prices from P_1 to P_2 without a demand shift. However, if demand shifts from D to D', due to the income effects of food aid, price is not depressed. Such a possibility has been investigated by modifying the model to include market differentiation.

The model includes (a) a supply equation, (b) an open market demand equation, (c) a concessional market distribution equation, (d) an income equation, (e) a commercial import equation, (f) a withdrawal from stocks equation, and (g) an excess demand equation. The functional form of the equations and the specification of these relationships are discussed in detail elsewhere (6). The variables are defined as follows:

Endogenous variables:

Q_t^s = per capita quantity of cereals available per domestic production for consumption in period t.

Q_t^d = per capita quantity of cereals demanded in the open market for consumption in period t.

Q_t^c = per capita quantity of cereals distributed through the concessional market in period t.

P_t^c = the index of deflated wholesale prices of cereals in period t.

Y_t = the deflated per capita consumer income in period t.

M_t^o = per capita quantity of commercial import of cereals in period t, and other variables as defined above.

W_t = per capita net withdrawals of cereals from government stocks in period t.

Exogenous Variables:

T_{t-1} = Cereal yields as a proxy for other factors affecting adoption of technology.

R_{t-1} = a rainfall index as a poxy for whether conditions during the producing season.

P_t^r = the deflated price of non-cereal foods in price t-1.

P_t^p = predetermined cereals price charged in the concessional market (deflated by a consumer price index) in period t.

C_t^p = per capita internal procurement of cereals by the government in period t.

M_t^p = per capita quantity of concessional imports of cereals under P.L. 480 in period t.

G_t = deflated per capita government expenditure in period t.

Q_t^i = the value of per capita industrial output (deflated by consumer price index).

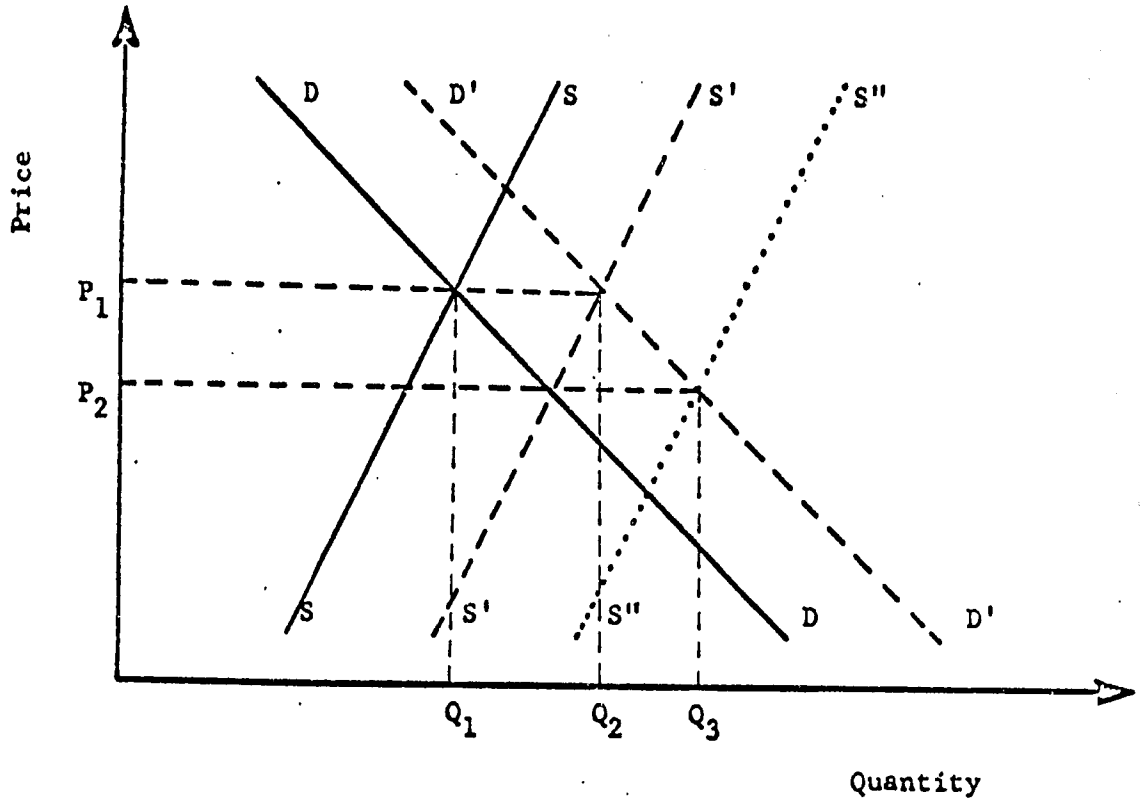

Figure 3.1 Aggregate food supply and demand equilibrium

Source: (6).

The model consists of seven equations and sixteen variables. Since the purpose of this model was to evaluate the economic impact of P.L. 480 imports on prices and domestic supply of cereals, certain variables were treated as predetermined or given outside the system. The structural equations of model have been estimated using data from the Indian economy during 1956-67, collected from a number of published sources. The seven structural equations provide the joint interactions of the variable in the system.

For examination and analysis of the jointly determined variables, the system is solved to obtain each independent variables and the constraints of the system in the derived reduced form (Table 3.3). To summarize the results, based on impact multipliers, a one unit increase in P.L. 480 imports in India between 1956 and 1967 was associated with a decrease of 0.0119 units of commercial imports and a net increase in supply of 0.9881 units. The increase in supply resulted in an additional 0.0727 units being demanded on the open market, an additional 0.8557 units being demanded from the fair price shops, and 0.0597 units accumulating in government buffer stocks. The new equilibrium price was reduced by 0.1314 units on a price index with a mean of 89.12, or less than two tenths of one percent.

The delay multiplier of cereal price has a two year lag. Therefore, the delay multiplier for cereal price is 0.020039 in the second year, -0.003056 in the fourth year and 0.000466 in the sixth year. The first delay multiplier represents a change of less than three hundredths of one percent, using the mean values of the price index, and the multiplier values in the succeeding years are essentially zero. Corresponding de-

Table 3.3. Estimated reduced form coefficients to measure impact of P.L. 480 imports on the Indian economy, 1965-1967.

	Intercept	T_{t-1}	R_{t-1}	P_t^r	P_t^p	C_t^p	M_t^p	G_t	P_{t-2}^c	Q_t^i
Q_t^s	-13.8934	0.0912	0.5681	0.0	0.0	0.0	0.0	0.0	0.2442	0.0
Q_t^d	- 5.9595	0.0847	0.5275	0.0168	0.0054	-1.5250	0.0727	0.0	0.2268	-0.0043
Q_t^c	7.2528	-0.0349	-0.2173	0.0162	-0.2250	0.7989	0.8557	-0.0001	-0.0934	0.0391
P_t^c	133.6264	-0.0569	-0.3547	0.5578	-0.0098	2.7561	-0.1314	-0.0012	-0.1525	0.3815
Y_t	107.7947	0.0730	0.4547	0.0	0.0	0.0	0.0	-0.0009	0.1955	0.2839
M_t^o	24.1866	-0.0158	-0.0985	-0.0368	-0.0009	0.2493	-0.0119	0.0	-0.0424	-0.0070
W_t	56.2758	-0.0256	-0.1593	-0.0038	-0.2189	-0.9754	-0.0597	-0.0001	-0.0685	0.0418

Source: (6).

lay multipliers of the impact of prices on production in second, fourth and sixth years are -0.032088, 0.004893, and -0.000746 respectively.

The net impact on supply is measured by the cumulative multipliers over several years. On the basis of cumulative multipliers, each kilogram of P.L. 480 cereals is estimated to have depressed domestic production of cereals by 0.027841 kilograms so that for each 450,480 metric tons of imports, production was depressed by 12,600 metric tons over a 14 year period with the major impact coming as a result of the first and second round of price changes. Thus the analysis indicates that the distribution of P.L. 480 commodities resulted in a net supply increase to the extent of 93 percent of the amount imported. Since fair price shop distribution is at a lower price than the open market price, distribution through these shops has increased consumer welfare by increasing consumption and lowering price.

The analysis of price, production and income impact in a program approach presented above, does not highlight an important role played by food aid in terms of lessening the regional inequalities of per capita supplies in the recipient countries during the program period. It has been observed that the coefficient of variation in per capita availability of cereals over the states and over time within the states have come down considerably during the program period. This can be seen for Indian case from the data presented in Table 3.4.

In order to see the contribution of P.L. 480 imports in bringing down the coefficient of variation a recent study fitted the following equation (8):

Table 3.4. State-wise variation in per capita availability of cereals (including imports) during 1957-1968 (kg/year).

Years	Andhra Pradesh	Assam	Bihar	Gujrat	Keyala	Madhya Pradesh	Maharastra
1957	120.8	139.9	100.5	61.9	60.8	184.6	137.2
1958	126.6	133.0	89.3	77.2	62.0	153.7	129.8
1959	144.1	132.2	118.5	108.4	65.4	194.2	148.5
1960	144.4	132.5	117.9	105.4	64.8	184.9	146.9
1961	149.4	137.1	126.5	81.1	69.6	211.9	163.9
1962	176.0	137.8	122.4	106.0	65.1	197.5	138.3
1963	139.5	125.9	119.6	93.3	65.5	179.9	133.7
1964	151.4	139.8	125.0	113.9	81.5	194.5	149.1
1965	145.7	136.8	123.1	136.9	118.7	193.5	151.0
1966	132.4	138.6	112.4	109.9	103.9	139.2	120.7
1967	155.6	116.4	91.6	106.5	102.8	131.1	126.4
1968	141.5	134.0	127.9	126.9	98.8	185.6	139.0
Coefficient of Variation (percent)	10.57	18.64	13.66	20.56	25.65	13.17	9.15

Source (8)

Table 3.4 (continued)

Years	Mysore	Orissa	Punjab & Hariyama	Rajastram	Tamil Nadu	Uttar Pradesh	West Bengal	Coefficient of Variation
1957	117.4	150.2	159.4	149.7	120.9	115.8	129.4	24.42
1958	127.5	157.6	163.4	147.0	122.1	113.2	127.9	24 74
1959	134.5	164.5	196.8	159.4	122.4	121.0	132.6	22.77
1960	140.8	171.1	160.6	160.4	132.2	122.7	149.4	21.70
1961	135.7	189.9	206.9	145.4	141.2	131.5	154.6	26.42
1962	138.7	187.7	200.5	174.9	150.6	133.0	139.7	24.37
1963	139.4	184.6	184.9	159.0	144.2	121.4	140.7	23.28
1964	144.0	207.1	201.1	146.9	148.1	117.7	149.9	15.22
1965	150.7	196.5	195.7	162.7	142.5	130.8	157.6	16.27
1966	116.5	152.1	174.3	138.1	134.5	113.2	150.8	14.25
1967	131.3	169.6	160.2	143.7	134.6	112.7	133.2	16.58
1968	144.3	172.3	185.8	175.2	143.6	132.4	147.8	16.14
Coefficient of Variation (percent)	7.74	10.31	9.91	7.74	7.58	6.53	7.17	

Source (8)

$$C_v = 29.635 - 1.3671\ I_t - 0.9330\ O_t \qquad R^2 = 0.99$$
$$(3.534)^* \quad (3.691)^*$$

* figures in the parenthesis denote T-statistics

where C_v = coefficient of variation of the net per capita availability of cereals among states over the years,

I_t = P.L. 480 supplies of cereals in million tons for time period t, and

O_t = supplies from the other sources in million tons. Other sources include non-P.L. 480 imports, domestic procurement, plus or minus changes in stocks.

It will be seen in the above equation that the effect of P.L. 480 supplies on the state-wise coefficient of variation in cereal availability has been highly significant in reducing the coefficient of variation. If there had been no release of supplies from the fair price shops, the coefficient of variation would have been 29.64 percent. An additional one million tons of cereals under P.L. 480 brought down the coefficient of variation by 1.37 percent while the increase of one million tons of non-P.L. 480 supplies brought down the coefficient of variation by 0.9330 percent. Since P.L. 480 supplies have been concentrated in the deficit states, in their absence consumption in these states would have been much lower than the recommended.

Impact of Aid Under Project Approach

So far we have discussed the impacts of food aid in a case where food was absorbed in the framework of a development program of the recipient country. There are some recipient countries where the available food supplies were used for financing particular work projects. Most of the recipient countries have surplus supplies of labor resources which can be used for capital formation if the additional resources additional resources

are available. Since most of the recipient countries have low incomes per capita, 50 to 60 percent of additional incomes are spent on food. This increased food demand can be directly met by food aid without significantly affecting domestic market for foodgrains. Again the price, production and income impacts of the aid depends on the shifts in demand for food in relation to supplies.

The multiplier effects of such projects depends on the income level of the recipient country. A recent study classified the major recipient countries into three groups for the analysis of multiplier effect (5). This classification is as follows:

Low Income Recipients: defined as those countries whose per capita incomes are close to $75. These countries are:

Congo ($87), Kenya ($100), Nigar ($73), Nigeria ($62), Sierra Leone ($111), Somali ($62), Afganistan ($52), India ($73), Pakistan ($108), Indonesia ($95), Korea ($140), South Vietnam ($108).

Medium Income Recipients: defined as those countries whose per capita incomes are close to $250. These countries are:

Honduras ($209), Ecuador ($199), Peru ($241), Algeria ($207), Malasia ($171), Ivory Coast ($203), Liberia ($154), Rhodesia ($217), Saudi Arabia ($288), Iran ($235), Jordon ($235), Syria ($203).

High Income Recipients: defined as those countries whose per capita incomes are close to $450. These countries are:

Mexico ($478), Costa Rica ($359), Panama ($477), Argentina ($519), Chile ($464), Uruguay ($526), and Barbados ($410).

In the multiplier analysis, total expansion of spending and respending is limited by the "leakage" out of consumers' hands. The usual leakages result from savings, taxes and imports. The income multiplier is defined $\frac{1}{s+t+i}$ where s, t, and i represent marginal savings, taxation, and import

rates. The larger the sum of these three variables, the greater the leakage during each round and consequently the lower the multiplier effect. The values of these parameters are different for the above mentioned three groups of countries because of differences in income elasticities. Furthermore, since the purpose was to investigate multiplier effect in the context of food aid it was assumed that food demand would be satisfied with surplus food aid which also represents an import and further reduces the increased income at each round. On the basis of empirical evidence, the values of relevant parameters are assumed to be as follows:

Low Income Recipients: Savings = 9%, taxes = 9% imports = 8%
mpc-food = 0.55%, marketing costs = 15%.

Medium Income Recipients: Savings = 9%, taxes = 9%, imports = 8%,
mpc-food = 0.34%, marketing costs = 20%.

High Income Recipient: Savings = 9%, taxes = 9%, imports = 8%
mpc-food = 0.26%, marketing costs = 25%.

On the basis of the above assumptions, the total multiplier effect is worked out for a development project financed partly from the food aid. The development project assumed was an irrigation project which requires 100 units of investment to construct a reservoir and irrigation canals in order to increase agricultural production. The aggregate impact of this investment is presented in Tables 3.5, 3.6, and 3.7 for low, medium and high income groups of aid recipients, first by assuming that the project inputs consist of 70 percent direct labor, 20 percent goods and services which can be purchased locally, and 10 percent materials and equipment imported.

It can be seen from the Tables 3.5, 3.6, and 3.7 that the multiplier

Table 3.5. Aggregate impact of 100 units investment on selected economic variables in low income countries[a].

Round	Gross domestic income	Savings	Taxes	Imports	Disposable income	Derived demand: Retail food	Derived demand: Wholesale food	Derived demand: Goods and services
1. (wages)[b]	70.00	6.30	6.30	5.60	51.80	28.49	24.22	27.58
(other)[c]	20.00	1.80	1.80	1.60	14.80	8.14	6.92	7 88
2.	35.46	.19	3.19	2.84	26.24	14.43	12.27	13.97
3.	13.97	1.26	1.26	1.12	10.34	5.69	4.83	5.50
4.	5.50	.50	.50	.44	4.07	2.23	1.90	2.17
5.	2.17	.20	.20	.17	1.61	.88	.75	.86
6.	.86	.08	.08	.07	.64	.35	.30	.34
7.	.34	.03	.03	.03	.25	.14	.12	.13
8.	.13	.01	.01	.01	.10	.05	.04	.05
9.	.05	0.00	0.00	0.00	.04	.02	.02	.02
10.	.02	0.00	0.00	0.00	.01	.01	.01	0.00
Total	148.50	13.37	13.37	11.88	109.90	60.43	61.38	58.53

[a]Statistics: Savings = 9 percent, taxes = 9 percent, imports - 8 percent, mpc-food = 0.55, marketing costs = 15 percent.

[b]First round impact of project expenditures directly for wages.

[c]First round impact of project expenditures for domestic goods and services.

Source: (5).

Table 3.6. Aggregate impact of 100 units of investment on selected economic variables in medium income countries[a].

Round	Gross domestic income	Savings	Taxes	Imports	Disposable income	Derived demand		
						Retail food	Wholesale food	Goods and services
1. (wages)[b]	70.00	6.30	6.30	5.60	51.80	17.61	14.09	37.71
(other)[c]	20.00	1.80	1.80	1.60	14.80	5.03	4.03	10.77
2.	48.48	4.36	4.36	3.88	35.88	12.20	9.76	26.12
3.	26.12	2.35	2.35	2.09	19.33	6.57	5.26	14.07
4.	14.07	1.27	1.27	1.13	10.41	3.54	2.83	7.58
5.	7.58	.68	.68	.61	5.61	1.91	1.53	4.08
6.	4.08	.37	.37	.33	3.02	1.03	.82	2.20
7.	2.20	.20	.20	.18	1.63	.55	.44	1.19
8.	1.19	.11	.11	.10	.88	.30	.24	.64
9.	.64	.06	.06	.05	.47	.16	.13	.34
10.	.34	.03	.03	.03	.25	.08	.07	.18
Total	194.70	17.53	17.53	15.50	144.08	48.98	39.20	104.88

[a]Statistics: Savings = 9%, taxes = 9% imports = 8%, mpc-food = .34, marketing costs = 20%.

[b]First round impact of project expenditures for domestic goods and services.

[c]First round impact of project expenditures for domestic goods and services.

Source: (5).

Table 3.7. Aggregate impact of 100 units of investment on selected economic variables in high income countries[a].

Round	Gross domestic income	Savings	Taxes	Imports	Disposable income	Derived demand: Retail food	Derived demand: Wholesale food	Derived demand: Goods and services
1.(wages)[b]	70.00	6.30	6.30	5.60	51.80	13.47	10.10	41.70
(other)[c]	20.00	1.80	1.80	1.60	14.80	3.85	2.89	11.91
2.	53.61	4.82	4.82	4.29	39.67	10.31	7.74	31.94
3.	31.94	2.87	2.87	2.56	23.64	6.15	4.61	19.03
4.	19.03	1.71	1.71	1.52	14.08	3.66	2.75	11.34
5.	11.34	1.02	1.02	.91	8.39	2.18	1.64	6.76
6.	6.76	.61	.61	.54	5.00	1.30	.98	4.03
7.	4.03	.36	.36	.32	2.98	.77	.58	2.40
8.	2.40	.22	.22	.19	1.78	.46	.35	1.43
9.	1.43	.13	.13	.11	1.06	.28	.21	.85
10.	.85	.08	.08	.07	.63	.16	.12	.51
Total	221.39	19.92	19.92	17.71	163.83	42.59	31.97	131.90

[a]Statistics: Savings = 9%, taxes = 9% imporst = 8%, mcp-food = 0.26, market costs = 25%.

[b]First round impact of project expenditures directly for wages.

[c]First round impact of project expenditures for domestic goods and services.

Source: (5).

effect is exhausted in about 10 rounds. The multiplier effect per year depends on the assumptions about the income-expenditure lag. For example, if the income-expenditure lag is assumed to be 3 months there will be four rounds of expenditure in one year. In low income countries an initial investment of 100 units generates income of 148.50 units, and retail food demand of 60.43 units (Table 3.5). In medium income countries an initial investment of 100 units generates income of 148.50 units, and retail food demand of 60.43 units (Table 3.5). In medium income countries an initial investment of 100 units generates income of 194.70 units and the retail food demand of 48.98 units (Table 3.6). In high income countries an additional investment of 100 units generates income of 221.39 units and the retail food demand of 42.59 units (Table 3.7). Thus, as the income level rises the proportion of food aid required to finance same level of investment declines. A composition of foreign assistance to maximize use of commodity aid in development investments is shown in Table 3.8.

Table 3.8. Composition of foreign assistance to maximize use of commodity aid in development investments

Income group	Food aid	Nonfood Imports	Supporting capital
Low	57.6%	21.9%	20.5%
Medium	44.0%	25.6%	30.4%
High	36.5%	27.7%	35.8%

Source (5)

It can be seen in Table 3.8 that the component of dollar aid increases as the income level goes up because the marginal propensity to consume food declines. Therefore, the role of food aid as a tool of economic development is less effective in high income countries.

Moreover, the income multiplier varies with the type of project financed by food aid and also the assumptions about the marginal savings and taxation rates. Two illustrative cases are presented in Tables 3.9 and 3.10. In Table 3.9 income multipliers are calculated on the assumptions that 50 percent of the initial investment goes for direct labor, 35 percent goes to buy goods and services domestically and 15 goes for the equipment which is to be imported. The income multiplier has been worked out for low, medium and high income countries (as defined before).

Income multipliers presented in Table 3.9 are lower in general for low, medium and high income countries as compared to income multipliers worked out in Tables 3.5, 3.6, and 3.7. Therefore, in this case food demand created by the additional projects would be smaller than the cases worked out previously. On the contrary, income multipliers would be larger if we use lower assumptions about marginal tax or savings rate. An illustrative case is presented in Table 3.10.

Obviously in the case of lower marginal savings and taxation rates demand for food aid supplies would be larger.

Effects of Alternative Distribution Methods

The primary impact of food aid on the recipient economy depends on the distribution methods used. These in turn are closely related to the specific consumer group which is reached and the extent to which produc-

Table 3.9. Income multiplier under resource input of 50:35:15

Round	Income generated by income group		
	Low	Medium	High
1	0.8500	0.8500	0.8500
2	0.3349	0.4579	0.5063
3	0.1320	0.2567	0.3016
4	0.0520	0.1329	0.1797
5	0.0205	0.0716	0.1070
6	0.0081	0.0386	0.0637
7	0.0032	0.0208	0.0379
8	0.0013	0.0112	0.0226
9	0.0005	0.0060	0.0135
10	0.0002	0.0032	0.0080
Total	1.4027	1.8389	2.0903

Source: (5)

Table 3.10. Impact of 100 unit investment with 70:20:10 distribution and marginal tax or savings rate of 7 percent

Income group	Income multiplier	Savings or tax	Wholesale food
Low	1.512	10.6	53.7
Medium	2.009	14.1	41.5
High	2.302	16.1	34.1

Source: (5)

tive resources are activated. Considerable similarity exists among the three distribution methods most widely used for P.L. 480 commodities in recipient countries--grants, wages-in-kind, and open market sales. Wages-in-kind programs are similar to food stamp plans since both are designed to distribute commodities at some cost to the consumer. On work projects the recipient is required to work in order to receive food or other commodities which is also similar to a food stamp plan where the recipient is required to a pay a percent of his income to participate in the program. In open market sales, commodities are not linked with any particular project but can be bought by any one with money incomes. The impact of various distribution methods on prices, production and incomes depends on the price charged for the P.L. 480 commodities as compared with the price of similar domestic commodities, and the projects undertaken or under program approach--the total volume of program.

Rogers (5) has developed a simplified partial equilibrium model[2] to evaluate the impact of supply and demand shifts in analyzing the aggregate impact of various distribution methods on market conditions for food. On the basis of this model the impact on prices, supply and incomes is presented in Tables 3.11 and 3.12, respectively for work-in-kind type projects and open market sales with no market differentiation.

The figures presented in Tables 3.11 and 3.12 are worked out on the basis of the following assumptions: (a) two alternative assumptions about the composition of projects in agriculture and outside agricultural sector, 50% projects in agriculture and 100% projects in agriculture; (b) three assumptions about the expected supply increase, a 2% increase,

[2]The model is described as in (5).

a 5% increase, and a 10% increase; and (c) three income levels of labor force, $75, $250, and $450.

The use of P.L. 480 commodities to finance work projects is estimated to have a negative impact on income to agricultural producers ranging from 2.4 to 9.9 percent depending on the location and productivity of projects (Table 3.11). Domestic supply increases in all cases where 100 percent of the work projects are in agriculture except where labor comes from the high income group and the work project only shifts supply upward by 2.0 percent. For all of the other cases the quantity of domestic commodities supplied increases so that if prices were supported for the producer, agricultural income would be maintained or increased. The decline in agricultural sectors if the gain in real income is reallocated to non-food commodities.

For the analysis of open market sales it was also assumed that the government does not raise taxes and consequently does not provide any direct income effect on consumers. On this basis a food aid contract amounting to 5 percent of present supply combined with reinvestment in projects using labor from the $75 class and resulting in a 2 percent shift in supply would cause a 4.8 percent decline in prices and a corresponding 0.2 percent decline in domestic supply. The resultant loss of income for the agricultural producers would be about 5 percent. Comparatively, financing projects in the same way, but drawing labor from the $250 class, would increase the price decline to 6.0 percent and the supply reduction to 0.6 percent for about a 6.5 percent income loss for agricultural producers. Use of labor from the $450 class would cause an even greater decline of about 7.2 percent for prices and 1.2 percent for supply so that

Table 3.11. Impact of work projects on agricultural prices, supply, and income.

Income level of labor force	Impact variable	50% of projects in ag. Expected supply increase 2(1)%	5(2½)%	10(5)%	100 % of projects in ag. Expected supply increase 2%	5%	10%
	Price	-2.4	-3.4	-5.1	-3.1	-5.1	-8.3
$ 75	Supply	0.0	1.0	2.7	0.7	2.7	6.1
	Income	-2.4	-2.4	-2.5	-2.4	-2.5	-2.7
	Price	-3.7	-4.9	-6.9	-4.5	-6.9	-10.6
$250	Supply	-0.2	0.4	1.9	0.0	1.9	5.0
	Income	-3.9	-4.5	-5.1	-4.5	-5.1	-6.1
	Price	-4.9	-6.4	-8.7	-5.9	-8.7	-13.1
$450	Supply	-1.1	-0.3	1.0	-0.6	1.0	3.7
	Income	-6.0	-6.7	-7.8	-6.5	-7.8	-9.9

Source: (5).

Table 3.12. Impact of open market sales on agricultural prices, supply, and income.

Income level of labor force	Impact variable	50% of projects in ag. Expected supply increase 2(1)%	5(2½)%	10(5)%	100% of projects in ag. Expected supply increase 2%	5%	10%
	Price	-4.4	-5.4	-7.1	-4.8	-7.1	-10.2
$ 75	Supply	-0.9	0.1	1.9	-0.2	1.8	5.3
	Income	-5.3	-5.3	-5.3	-5.0	-5.4	-5.4
	Price	-5.2	-6.4	-8.3	-6.0	-8.3	-11.9
$250	Supply	-1.2	-0.3	1.3	-0.6	1.3	4.3
	Income	-6.3	-6.6	-7.1	-6.5	-7.1	-8.1
	Price	-6.3	-7.7	-10.0	-7.2	-10.0	-14.4
$450	Supply	-1.7	-0.9	0.4	-1.2	0.4	3.1
	Income	-7.9	-8.5	-9.7	-8.4	-9.7	-11.8

Source: (5).

income would fall by 8.4 percent. Scanning down the other columns of Table 3.12, similarities are found with the wage-in-kind projects. The higher the income level of the group which supplies the labor, the greater the negative impact on prices, supply and income for the agricultural sector. Similarly, scanning across Table 3.12 the price impact increases as investment in agricultural projects increases and as productivity of a project increased. Although a declining price level results in a movement down the domestic supply curve, the investment in overhead projects results in an upward shift of the supply curve so that domestic supply decreases less with investments in more productive projects.

Thus in both types of distribution the price of food is driven down and domestic supply forced below preprogram levels in most cases. In the open-market sales case, the income loss exceeds 5 percent in all cases so that even if all work projects utilized labor from the agricultural sector, the total income to the sector would be lower than preprogram levels. Regardless of who received the extra income from the projects, it is consumers who realize improved welfare through lower food prices, and the nonagriculture sector which increases its total sales. But if these two cases are compared with the price, production and income impacts of open market sales under program approach but with a concessional distribution of P.L. 480 imports, the latter turns out to be the least price depressing for the domestic producers and thus it maximizes the beneficial effects of food aid.

Impact on Third Countries

In the initial years of concessional export sales, it was widely debated whether P.L. 480 aid reduced the exports of third countries.

This debate led F.A.O. to set guidelines for programming surplus commodities which require all possible caution be exercised to protect third country trade. These guidelines have been complied with by the United States by establishing a minimum commercial import requirements in P.L. 480 contracts.

From the point of view of optimum development planning strategy, the thrid country restriction established by F.A.O. is inappropriate since recipient countries suffer from serious foreign exchange constraints on economic development and stand to gain in both the short and long run by reducing commercial imports. Moreover, since most of the third country exporters are developed nations, the consequence of reducing commercial imports may not be totally undesirable, at least in a global welfare sense. However, as this question has been discussed elsewhere, it may be useful to mention the benefits accrued to third country exporters in terms of price stability and protected markets because of U.S. exports under P.L. 480.

The structure of world wheat (a major commodity exported under P.L. 480) has been duopolistic in nature with Canada as price leader and the U.S. as a silent partner. Similarly, Australia, Argentina, France, and the small exporters constitute a fringe of price followers (3). The third countries have enjoyed a considerable price stability primarily because the U.S. is taking a silent partner position. But the U.S. has the potential to take a leadership role. In the absence of P.L. 480, assuming accumulating CCC stocks, the U.S. would have been compelled to take an aggressive role and in a duopoly framework. It can be conjectured that price warfare would have become inevitable. Furthermore, P.L. 480

excluded any aid to the communist block countries and therefore, left a vast growing market to the third countries. Thus, even if there has been some decline in the commercial exports of third countries due to P.L. 480 in the recipient countries, it has been more than offset demand in the communist block countries.

Concluding Remarks

In this chapter, it has been shown that food aid can be utilized without adverse effects on incentives of domestic producers in recipient countries if proper distributional methods are adopted to shift the demand curve simultaneously with the shift in supply. Among methods of distributing aid within the recipient countries, a differentiated market turns out to be the least depressing on prices and production of agricultural commodities. This method helps to promote larger development with food aid without perpetuating the need of such aid in larger and larger magnitudes. However, the efficiency of food aid in maximizing economic development depends on the division of total net social gain out of aid between the donor and the recipient countries. This in turn depends on the pricing policies followed by the United States in case of P.L. 480 exports. This aspect was discussed in the previous chapter.

Finally, the issue of potential effects on third-country exporters was discussed and evaluated. While initially there was potential harm to third countries from concessional sales under P.L. 480, other offsetting aspects of U.S. trade policies have generally provided positive gains to these countries. As a result, the more important consideration is the impact on recipient countries in terms of their long term economic development. We explore that aspect of food aid in the next chapter.

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CHAPTER IV

ACHIEVING ECONOMIC DEVELOPMENT THROUGH FOOD AID

A World Food Program study (2) conducted in mid-60's stressed the necessity of distinguishing between two rather different circumstances in which food aid might be given to a recipient country. First, food aid might be given to a recipient country under conditions of acute food shortage which would otherwise jeopardize or retard the existing development program. Second, food aid might be given to a recipient country which might have positive grain balances at the existing level of effective demand, but a large portion of population does not have nutritionally adequate diets because of ineffective market demand. Under this classification most P.L. 480 recipient countries fell in the first category during the 1960's. Food aid primarily helped to maintain the existing development program by containing the inflationary rise in grain prices.

However, the last few years have witnessed a marked technological breakthrough in the form of spread of high yielding varieties which has been termed the green revolution. There have been sustained rapid increases in the total production resulting in positive grain balances in many recipient countries with existing development programs. In the years to come it is expected that more and more recipients of food aid are likely to undergo a change in the conditions under which food aid is received. In view of this change of conditions in recipient countries, the role of food aid in the development programs of the recipient countries may also have to undergo a change in coming years. Food aid

may still remain a growth-promoting tool, provided it is absorbed by converting unsatisfied nutritional requirement into effective demand.

The Green Revolution: Income Distribution and Nutritional Demand

The green revolution has increased output and incomes of the agricultural sector because net profit is much larger, as illustrated in Figure 4.1, with the high yielding varieties. Figure 4.1 shows total cost, total revenue and total output with old and new techniques for agriculture taken as a single industry. The curve TR represents total revenue, C_1 represents per unit cost before the innovation and C_2 represents per unit cost after the innovation. Per-unit costs are lower with C_2 than with C_1, as shown by the lesser slope of OC with respect to OA. Assuming the normative profit maximization motive prevails, the equilibrium for the industry, total cost, total revenue, and total output are U_1A, U_1B and OU_1 respectively before the innovation. Total revenue increases as might total cost, at equilibrium under the new technique (C_2) but net profit (CD) is much larger than profit under the old technique (AB). Thus, the agricultural sector increases its output and improves its income because of the new technology.

But recent evidence in many of the countries shows that the main benefit of the green revolution has accrued to large farmers. For example, a cross-section of evidence on the spread of high yielding varieties in India suggests a positive relationship between farm size and adoption rates (6). Therefore, the green revolution is often charged with creating problems of inter-farm income disparities(7). We examine these conditions on the following page.

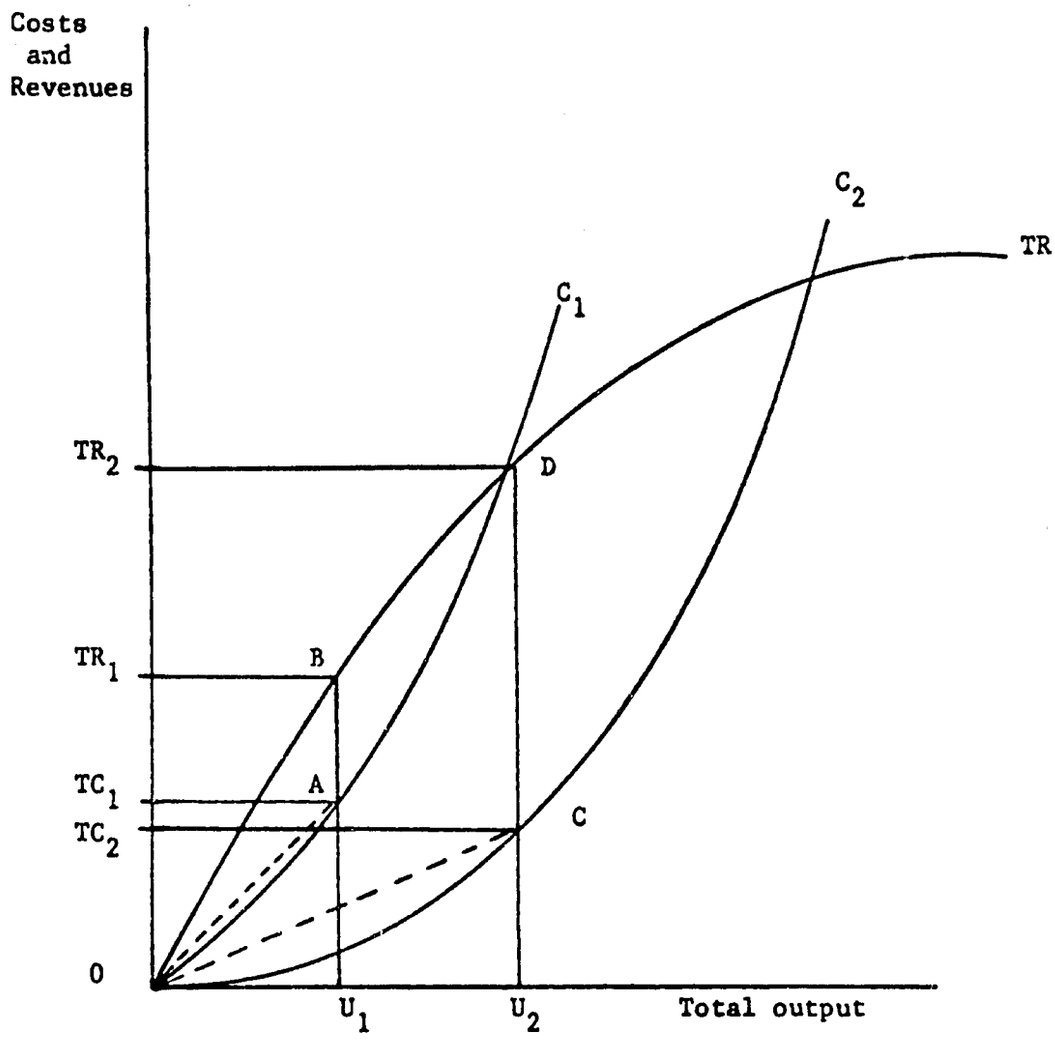


Figure 4.1. Change in net revenue, (TC - TR), with technological change. (Source [7]).

For this analysis, we depart from the usual macroeconomic definitions and distinguish between embodied and disembodied technological change for a specific farm firm. Technical change is disembodied when the farmer is constrained from using it only by his personal, noneconomic characteristics, or through his ignorance. In contrast, an embodied technical change is one that cannot be adopted by a farmer because of economic constraints. The farmer's current income and asset position is the most likely economic constraint, since "embodiment" implies a purchase of inputs to employ the technology. The economic status of the farm is binding because the farmer cannot finance new purchases and/or the basic production structure cannot profitably incorporate the new input.

Because of past decisions, a predetermined distribution of wealth, and so on, a wide disparity in farm income level prevails. Thus, farmers face a technological change such as the green revolution on unequal footing. Further, in different income groups might be expected to exhibit diversity in behavior since (a) the marginal propensity to consume could decline at higher incomes, (b) the marginal propensity to invest in new productive inputs might rise with higher incomes and (c) the items for which the investments are made could differ among income classes, and so on.

Basic economic grounds to explain variance in adoption rates of green revolution technology thus, are affected by (a) the fact of embodiment, (b) the initial diversity of incomes in the farm community, and (c) variance of absolute and marginal spending behavior at different income levels. Further, as we will now demonstrate, variance in adoption rates ensures that the initial income spread in the farm sector will widen.

First, we assume the absence of government programs to make credit available at noncommercial rates for low-income farmers. The allocation of loans then will be based on risk-aversion and potential profit motives of lenders. If government credit programs require collateral or a demonstration of near-term profitability before loans are made, the program is commercially based. As will be discussed later, credit programs of noncommercial nature are necessary to reduce the extent to which technical change is embodied for the firm. We now use a generalized algebraic example to prove that the income gap will widen under these postulates and assumptions.

Increase in output vis-a-vis farm size groups

Let P_y,P_x,Y and X be the output price, the input price, the level of output, and the level of inputs used, respectively, expressed in index form. Let R be the ratio of output to input prices, P_y/P_x, so that R portrays the real profitability of production; it is a proxy for net revenue. R is also in index form.

The elasticity of supply with respect to the profitability of production can be written in the following identity:

$$\frac{dY}{dR} \cdot \frac{R}{Y} = \left(\frac{dY}{dX} \cdot \frac{X}{Y}\right) \cdot \left(\frac{dX}{dR} \cdot \frac{R}{X}\right)$$

In this expression, $\left(\frac{dY}{dX} \cdot \frac{X}{Y}\right)$ is the elasticity of production, and $\left(\frac{dX}{dR} \cdot \frac{R}{X}\right)$ is the elasticity of demand for inputs with respect to the profitability of using them. When a production function for a specific farm is derived, the elasticity of production will be uniquely determined as will the elasticity of demand for inputs. The elasticity of demand for inputs

as given here incorporates both the income effect and the price effects with qualitative signs as recognized in consumer behavior. A change in productivity of inputs can be reflected in the decline in real price per unit of input.

Now we subdivide total inputs (X) into two classes, traditional, X_t, and new, X_n. The profitability of employing these classes of inputs are R_t and R_n respectively. Therefore, $X = X_t + X_n$, $R = P_y/\frac{1}{2}(P_{x_t} + P_{x_n})$, (where the denominator is the average cost of inputs) and $R_t = P_y/P_{x_t}$, $R_n = P_y/P_{x_n}$.

The elasticity of supply can be given as:

$$\frac{dY}{dR} \cdot \frac{R}{Y} = \left(\frac{dY_t}{dX_t} \cdot \frac{X_t}{Y} + \frac{dY}{dX_n} \cdot \frac{X_n}{Y}\right) \cdot \left(\frac{dX}{dR_t} \cdot \frac{R_t}{X} + \frac{dX}{dR_n} \cdot \frac{R_n}{X}\right)$$

which is reduced to the following expression after dividing by R/Y.

$$\frac{dY}{dR} = \left(\frac{dY}{dX_t} \cdot \frac{X_t}{X} + \frac{dY}{dX_n} \cdot \frac{X_n}{X}\right) \cdot \left(\frac{dX}{dR_t} \cdot \frac{R_t}{R} + \frac{dX}{dR_n} \cdot \frac{R_n}{R}\right)$$

To take an extreme case where the small farmer (a low-income farmer) does not purchase the new inputs, $X_n = 0$; hence $\frac{dX_n}{dR_n} = 0$, $\frac{dX_t}{dR_n} = 0$, and $\frac{dX_n}{dR_t} = 0$. His change in supply is then given by:

$$\frac{dY}{dR} = \left(\frac{dY}{dX_t} \cdot \frac{X_t}{X}\right) \cdot \left(\frac{dX_t}{dR_t} \cdot \frac{R_t}{R}\right) = \frac{dY}{dX_t} \cdot \frac{dX_t}{dR_t} \qquad (X_t = X,\ R = R_t)$$

If in addition, productivity of traditional input is not affected by the green revolution (another extreme assumption since it excludes in-farm economies of scale, but is totally consistent with the embodiment postulate)[3], and input and output prices do not avry significantly, the profitability of traditional inputs remains constant and thus $\frac{dX_t}{dR_t} = 0$.

Hence, the small farmer's level of production before and after the technological change should be the same.

By contrast, the larger farmer (a high-income farmer) is not financially constrained from buying the new inputs if their purchase is profitable. If he uses them, the following relations hold in general:

$$1 > \frac{X_t}{X} > 0 \qquad \frac{dX_n}{dR_n} > 0$$

$$1 > \frac{X_n}{X} > 0 \qquad \frac{dX_t}{dR_t} > 0$$

The new inputs can be either complements or substitutes for traditional inputs. In the situation where the farmer views the new inputs as strict supplements to traditional inputs (that is, cross effects with respect to the profitability of other inputs is zero), the expression for his addition to gross output will be:

$$\frac{dY}{dR} = \left(\frac{X_t}{X} \cdot \frac{dY}{dX_t} \cdot \frac{dX_t}{dR_t} \cdot \frac{R_t}{R}\right) + \left(\frac{X_n}{X} \cdot \frac{dY}{dX_n} \cdot \frac{dX_n}{dR_n} \cdot \frac{R_n}{R}\right)$$
$$+ \left(\frac{X_t}{X} \cdot \frac{dY}{dX_t} \cdot \frac{dX_n}{dR_n} \cdot \frac{R_n}{R}\right) + \left(\frac{X_n}{X} \cdot \frac{dY}{dX_n} \cdot \frac{dX_t}{dR_t} \cdot \frac{R_t}{R}\right)$$

This expression for the growth of output is clearly greater than that of the small farmers, because the individual terms on the right-hand side are all positive. Where there are no externalities, so that the traditional inputs do not gain greater productivity and when prices remain constant, $\frac{dX_t}{dR_t} = 0$. Thus, the output of the large farmer grows. This is in contrast to the small farmer's output which remains constant.

In the more likely event, however, the new inputs substitute in part for the traditional inputs. The outcome then is less clearly defined. The existence of substitution is *prima facie* evidence that $R_n > R_t$, where P_y is constnat. The signs of the cross effects will be ..... $\frac{dX_n}{dR_t} < 0$ and $\frac{dX_t}{dR_n} < 0$. For output to increase, (that is for $\frac{dY}{dR} > 0$), the following inequalities would have to be true.

$$\left| \frac{dX_n}{dR_n} \right| > \left| \frac{dX_t}{dR_n} \right| \quad \text{and} \quad \left| \frac{dX_t}{dR_t} \right| > \left| \frac{dX_n}{dR_t} \right|$$

Given a constant P_y, the inequalities state that high-income (large) farmers would increase output if the growth in the demand for one type of input (say new inputs in this situation) resulting from a growth in its own profitability exceeded the desire to reduce the use of a competing inputs when the profitability of the farmer input grows. These two forces tend to work against each other; the profitability of employing X_n leads to its greater use at the expense of X_t, but the marginal profitability of employing an additional unit of X_n will decrease (we suppose that the producer is in the economic range of declining elasticity for X_n). The decrease in productivity of X_n implies increasing relative profitability of marginal units of X_t. Hence, a growing resistance to further substitution of X_n for X_t will prevail. The economic restraints in employing more X_n intensify, because of its declining relative profitability vis-a-vis X_t.

The relative strengths of the conflicting forces can be observed in part by considering the elasticity of substitution of X_n for X_t.

Being newly employed, it is likely that X_n is used more closely to its extensive margin than is X_t. (Figure 4.2). That is, $\frac{X_t}{X} > \frac{X_n}{X}$, or traditional inputs still dominate the input mix even though both types are used. But this implies that the elasticity of substitution, X_n for X_t, exceeds unity. Under these conditions it is expected that:

$$\left| \frac{dX_n}{dR_n} \right| > \left| \frac{dX_t}{dR_t} \right|$$

Further, if we maintain the hypothesis that traditional inputs are virtually fixed in the farm sector; that is, labor will not easily be retired from agriculture, land will not be quickly withdrawn, and traditional capital will still be largely employed, then traditional input employment will at least be constant. Thus,

$$\left| \frac{dX_t}{dR_t} \right| \geq \left| \frac{dX_t}{dR_n} \right|$$

Lastly, it seems intuitively true that the potential for a rise in new input productivity to negatively influence the use of traditional inputs would quantitatively exceed (in absolute terms) the potential for changes in traditional input productivity to negatively influence the use of new inputs. Institutional pressure to expand new input use say through government programs, not easily solved or reversed once started, might in itself be enough to make this true. Thus,

$$\left| \frac{dX_t}{dR_n} \right| > \left| \frac{dX_n}{dR_t} \right|$$

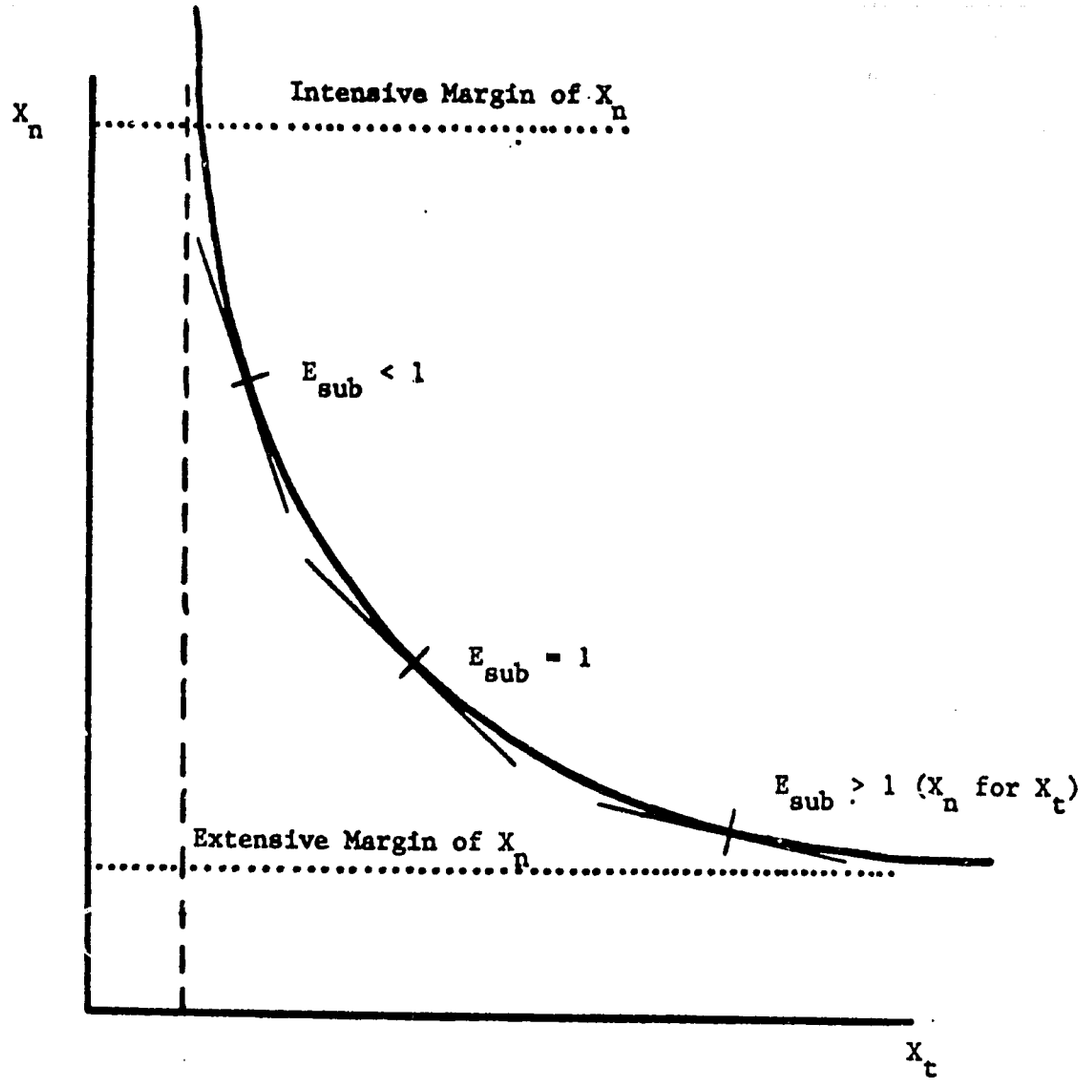


Figure 4.2 Isoquant, showing relative magnitudes of the elasticity of substitution (E_{sub}) X_n for X_t. (Source [7]).

Under these conditions, therefore, output would expand even when X_t and X_n were partial substitutes. What is more, the expansion of output would be due to the activity of the adoption of technology who, in the situation now discussed, would be the large farmer.

Net income effect of increased output by farm-size groups

We now consider the income distribution effects of the relative increases in output on low and high-income farms when consumer demand is price elastic, $\left|\frac{dY}{dP_y} \cdot \frac{P_y}{Y}\right| > 1.0$, and price inelastic, $(0 < \left|\frac{dY}{dP_y} \cdot \frac{P_y}{Y}\right| < 1)$. Under the price elastic conditions, an increase in output will increase total revenue depending on the degree of demand elasticity. The increase, however, will reduce the price per unit of output. For the small farmer who does not increase output, total revenue will fall. Also, if the small farmer does not alter the input of traditional resources, $\frac{dX_t}{dR_t} = 0$, total cost (imputed as well as incurred) will not decline, and realized net income will decline. Initially the same income effect will prevail for the small farmer when consumer demand is inelastic with respect to price.

Yet, even lower product price can lead to higher total revenues for the large farmers. Although his total cost will increase as more inputs are used, the rational producer will restrain input purchases so that the marginal revenue is not exceeded by marginal cost. His net income will rise (or at worst stay constant). Income disparity between large and small farmers, thus will widen. These qualitative relationships are shown in Table 4.1.

Table 4.1. Qualitative summary of logic of net income disparity growth.

Demand elasticity w.r.t. product price		Change in Total Rev.	Change in Total Cost.	Change in Net Rev.
$\infty > \frac{dY}{dP_y} \cdot \frac{P_y}{Y} > 1.0$	Large	> 0	> 0	≥ 0
	Small	< 0	$=0$	< 0
$0 < \frac{dY}{dP_y} \cdot \frac{P_y}{Y} < 1.0$	Large	< 0	> 0	≥ 0
	Small	< 0	$=0$	< 0

Source: (7).

Small subsistence farmers face a number of constraints which inhibit them from the adoption of new inputs. These constraints are elaborately discussed in an integrated framework by Hexem (3). Most important among these constraints is the working capital constraint. In order to adopt new inputs it is necessary to expand the capacity of the most critical input, i.e., means of irrigation. A number of policy measures could be taken which have the effect of relaxing inhibiting constraints faced by small farmers. In this connection, the use of food aid as one means for augmenting productive capacity of small farmers and facilitating the process of making him a market-oriented producer has been discussed by Hexem (3). This aspect of food aid will be taken up in a later section.

Rural Poverty and Landless Agricultural Laborers

Besides small farmers, landless agricultural laborers form a bulk of rural population whose incomes are below the abject poverty line. There is a strong positive correlation between levels of income and food consumption (8). Some interesting evidence has been recently compiled to

give a statistical outline on the magnitude of rural poor in the case of India. A Study Group set up by the Government of India recommended a per capita consumption of Rs. 240 (at 1960-61 prices) per year as a bare minimum. On the basis of this and an alternative poverty line of consumption below Rs. 200 per capita per annum, Minhas (5) has recently worked out the percentage of rural population living in abject poverty. These estimates are given in Table 4.2.

Table 4.2. Percentage and Numbers of People Below Minimum Level of Living: Rural India.

Year	Below Rs. 240 per annum		Below Rs. 200 per annum	
	%	millions	%	millions
(1)	(2)	(3)	(4)	(5)
1956-57	65.0	215	52.4	173
1957-58	63.2	212	50.2	169
1960-61	59.4	211	46.0	164
1961-62	56.4	206	43.6	159
1963-64	57.8	221	44.2	169
1964-65	51.6	202	39.3	154
1967-68	50.6	210	37.1	154

Source: (5).

It can be seen in Table 4.2 that the percentage of people below the poverty line has continuously declined in recent years, under both definitions of poverty, because of improvements in output. But these estimates have been disputed by Bardhan (1). Bardhan presents alternative estimates (based on poverty line set at Rs. 180 per annum) which show that the percentage of rural population below the poverty line has considerably increased in recent years despite the marked increase in agricultural output. These figures are presented in Table 4.3.

Table 4.3. Percentage of Rural People Below Rs. 15 Per Month or Rs. 180 Per Annum at 1960-61 Prices: Rural India

	1960-61	1964-65	1967-68
1. Consumer Price Index	100.0	144.0	199.5
2. Current Value of Goods Worth Rs. 15 at 1960-61 Prices (Rs.)	15.0	21.6	29.9
3 Percentage of Rural People Below (approx.) Rs. 15 Per Month at 1960-61 Prices:			
(a) Unadjusted	38.0	44.6	73.2
(b) Adjusted	38.0	31.8	63.1

Source: (1).

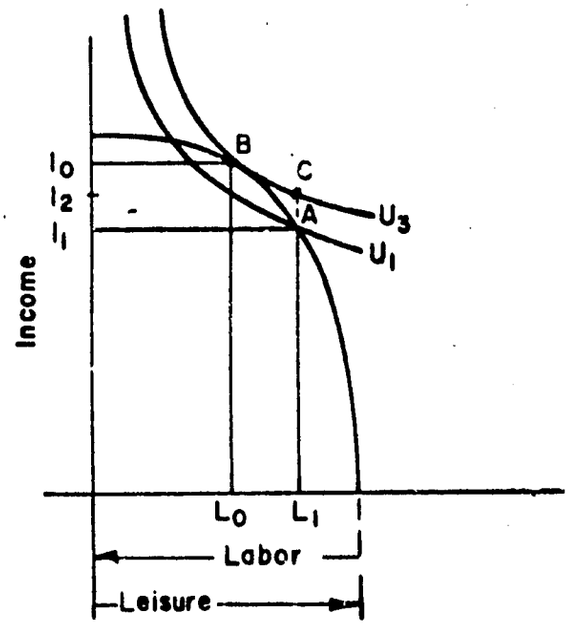
Bardhan's calculations show that the percentage of rural people below the poverty line was 63.1 in 1967-68 as compared to the figure of 50.6 arrived at by Minhas. However, the exact percentage is really academic; the fact is that a majority of rural population in India has incomes below the abject poverty level despite the so-called green revolution. Similar evidence is available for many other Asian, African and Latin American countries (4,8). Thus, when such a large proportion of population in these countries does not have enough incomes to buy adequate food to meet the required calorie intake, there are two possibilities: (a) setting up of large public food distribution programs, and (b) increasing employment and incomes of the poor.

Public Distribution of Food Aid Commodities and Output Increasing Consequences

Hexem has demonstrated that food aid could be used to relieve the budget constraint for the small subsistence producers and consequently increase the output of these farmers (3). Such a policy could also have the effect of reducing the inequality of incomes resulting from the green revolution. This possibility is demonstrated with the help of Figure 4.3.

In Figure 4.3 the income possibility curve presents a maximum amount of income obtainable with various levels of labor inputs. For a subsistence producer, an increase in labor use and a higher output level does not affect price relationships. In Figure 4.3, subsistence farmer maximizes his total utility from labor use (L_o) at point B on the income possibility curve. But, if the supply of working capital with the pro-

Figure 4.3. Optimum labor-use level for maximizing individual utility.



Source: (3).

ducing unit is only sufficient to permit labor use of L_1 and realize I_1 of income, point B is not feasible. Consequently, this producing unit has L_oL_1 units of labor involuntarily unemployed. Correspondingly, utility derive from L_1 labor use is A on the curve U_1 which is smaller than any point on the curve U_3 and point B lies on U_3. Under these circumstances, if food is provided in the form of a grant to this producing unit there are two possibilities: (a) the producer may continue to employ only L_1 of labor input but increase direct consumption of food, or

(b) the producer may increase labor use on the farm without significantly increasing the consumption level per labor input so as to achieve point B on the income possibility curve. Hexem demonstrated that the alternative (a) has only temporary effect on incomes but the alternative (b) may have longer term consequences on output and incomes of the producer.

In the alternative (a), a food grant of the value of I_1I_2 permits the producers to reach point C on the curve U_3. The utility derived at point C is equivalent to that at B. But this new equilibrium is only temporary unless food grant is sustained in subsequent periods. The producer goes back to original equilibrium point at A if food grant is not sustained in subsequent periods. In alternative (b), a food grant equivalent of I_1I_2 helps employ more labor and income is increased to I_o. The long term impact of this increase in income depends on whether the producer uses his increased income to augment his working capital so as to increase his future consumption or just to increase his present consumption. If the producer merely increases his present consumption, the impact of a food grant will be for just one period and will not be sustained in subsequent periods without additional food grants. But if the producer allocates his increased output to augment working capital, it will increase output of the producer in the subsequent periods without sustained need of food aid. Thus the long term effects depend on the changes brought about by food grants in terms of lengthening of planning horizon of the producer. The alternative (b) is preferable to the alternative (a) from the standpoint of increasing agricultural output. There-

fore, Hexem suggests that planning authorities in the recipient countries should be motivated to structure food distribution programs such that the alternative (b) is realized. Hexem (3) also suggests a program to ensure that food distribution results in alternative (b) by the farmers. It is in the form of use of food grants as a revolving "working capital". Since small farmers are forced to secure credit in kind from the local merchants in order to sustain their consumption until the next harvest period, food given in the form of loan and collected at the time of harvest should induce producers to produce at point AB rather than at point C in Figure 4.3. Hexem, however, mentions that such an investment requires a continuing source of food for public distribution.

Limitation of Food Distribution Schemes

Hexem's proposal for utilization of food aid to enhance agricultural production of subsistence farmers has a number of limitations in practice. First, food aid itself is not certain. In fact, uncertainty of food aid in past years has built up a tremendous pressure for economic self sufficiency from within recipient countries. Second, Hexem's proposal in no way ensures that food aid commodities will not be absorbed by displacement of demand for domestic production. This aspect has become very critical in the circumstances in which food aid will be granted in coming years. The effective implementation of minimum price guarantees to farmers in recipient countries are crucial to sustain the momentum gained by the green revolution. Third, the administrative costs of implementing Hexem's proposal are going to be enormous because subsistence farmers are spread in every part of recipient countries. It will be difficult to

bear such an enormous fiscal burden, particularly in view of the fact that the agricultural sector in these countries contributes very little to the tax revenues.

An alternative to a massive food distribution program is to use food aid for starting work type projects in rural areas in slack seasons. Work type projects have the advantage of absorbing additional food by creating demand for it through increased incomes and thereby raising the effective demand for food. These labor intensive projects in surplus labor regions and slack seasons of the year could help build infrastructure like minor irrigation means, reclamation of waste land, storage and marketing facilities. The additional investment in infrastructure can help smaller farmers in adopting high yielding varieties and also it can help them get better prices for their produce. Also this can increase the incomes of landless agricultural laborers who constitute the bulk of rural poor. A detailed discussion of the multiplier effects of such a project approach was given in a previous chapter.

Any large scale rural works program, however, involves a number of difficulties which have to be taken into account before using food aid for the purpose. First, even the most labor intensive projects need supplementary materials and supplies. Since it is assumed that the use of food aid for employment generation is to be over and above the existing program in the present conditions, these supplementary material supplies are often not available domestically. If the supplies of scarce materials like cement, steel, technical and engineering goods are diverted from other planned projects, it would amount to a reallocation of resources which may not be desirable. Second, when workers are paid partly in cash

and partly in food under the program, they spend most of cash incomes on consumer goods and a whole range of multiplier effects follows. Unless this additional demand for consumers goods can be met from an excess supply of these goods, work projects would raise prices of consumer goods and thereby produce a wide range of cost raising effects for the existing development program in the recipient countries.

Concluding Remarks

To sum up, the unprecedented increases in agricultural output has brought about a grain balance in food aid recipient countries at the existing level of development program. But a large proportion of the rural population has income levels below the abject poverty line. Consequently, the nutritional requirement in terms of calorie intake is much larger than the economic demand which is determined by the income levels. Furthermore, the problem of income disparity between the smaller farmers and landless laborers on the one hand and large commercial farmers on the other, has become very acute in the early phase of the green revolution. In these circumstances, there are two options open to achieve economic growth through food aid: (a) to set up massive food distribution programs for smaller subsistence farms and landless agricultural laborers, and (b) to create employment opportunities through rural works programs. A massive food distribution program is infeasible because (a) uncertainty about the flow of food aid, and (b) price depressing effects of such a distribution for the domestic producers. Price incentives are crucial for sustaining the momentum gained in increasing agricultural production

in the recipient countries. Similarly, a large rural works program to provide employment opportunities raises questions because even most labor intensive projects need supplementary resources in terms of scarce materials and supplies like cement, steel, engineering goods and additional incomes raise additional demands for consumer goods. Since we have assumed that the absorption of food aid has to be in addition to the existing development program, supplementary supplies and materials are not readily available over and above the plan requirements. But food aid can be used for increasing the supply of protein rich foods like dairy products and perhaps poultry. The demand for these foods is going to increase rapidly with the increase in incomes and living standards in most recipient countries.

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