

AGENCY FOR INTERNATIONAL DEVELOPMENT  
 WASHINGTON, D. C. 20523  
**BIBLIOGRAPHIC INPUT SHEET**

FOR AID USE ONLY  
*Batch # 34*

1. SUBJECT CLASSIFICATION	A. PRIMARY Serials	TEMPORARY
	D. SECONDARY	

2. TITLE AND SUBTITLE  
 Growth and developmental effects of food aid shipments under the Food for Peace Act of 1966; progress report, May 1971

3. AUTHOR(S)  
 (101) Iowa State Univ. Center for Agr. and Rural Development

4. DOCUMENT DATE 1971	5. NUMBER OF PAGES 17p.	6. ARC NUMBER ARC 338.19.164
--------------------------	----------------------------	---------------------------------

7. REFERENCE ORGANIZATION NAME AND ADDRESS  
 Iowa State

8. SUPPLEMENTARY NOTES (Sponsoring Organization, Publishers, Availability)  
 (Activity summary)

9. ABSTRACT

(Development R&D)

10. CONTROL NUMBER PN-AAC-032	11. PRICE OF DOCUMENT
	12. DESCRIPTORS
	13. PROJECT NUMBER
	14. CONTRACT NUMBER CSD-2163 Res.
	15. TYPE OF DOCUMENT

CSD-2163 Res.  
338.19.I64  
PIN-AB-032

PROGRESS REPORT

CONTRACT NO. AID 2163

WITH IOWA STATE UNIVERSITY

Earl O. Heady  
Executive Director

Leo V. Mayer  
Project Director

Iowa State University  
Center for Agricultural and  
Economic Development

May 1971

## INTRODUCTION

Progress on this contract has been excellent during the six month period covered by this report. As outlined in previous reports the total contract project is broken down into subproject areas to allow manageable application of scientific analysis. In large part this report summarizes progress on the major research areas outlined previously--developmental aspects of food aid, consumer welfare aspects of food aid and methodological measurement of food aid effects on recipient countries. However, one new area approved recently by AID/Washington is outlined and progress is reported on activities over the last two months. This additional area covers the development of administrative guidelines for P.L. 480 programs.

## STUDIES COMPLETED

Seven studies are now completed and in various stages of review, revision, reproduction, or have already been submitted to AID/Washington.

Report No.	Author	Report Title
1.	Uma K. Srivastava	Impact of P.L. 480 aid on India's supply and balance of payments position: a look ahead
2.	Leo V. Mayer	An analysis of costs incurred and prices charged for food shipments under Public Law 480
3.	National Council of Applied Economic Research	Demand and supply projections of food grains for India, 1971-1986

4. Walter W. Haessel An intersectoral model of agricultural development for a dual economy
5. Lee Blakeslee, Charles Framingham and Earl O. Heady Projections of World Food Demand and Production Potentials, 1970, 1985 and 2000
6. Keith D. Rogers Utilization of Food Aid in Economic Development
7. Roger W. Hexem Factors affecting the Economic and Social Well-being of Agriculturalists in Less Developed Countries

#### SUMMARY OF PROJECTS COMPLETED BUT REPORTS NOT SUBMITTED

Two projects have recently been completed but preliminary reports have not yet been submitted to AID/Washington. Each is being reviewed and will be sent as soon as revisions and reproduction is complete. Each is summarized below.

#### Utilization of Food Aid in Economic Development

This study focuses on the conditions under which food can be utilized as an instrument of foreign assistance to (a) promote economic development and improve general welfare conditions in the recipient country while (b) avoiding negative impacts on prices and production in recipient countries. The study measures the interaction of alternative distribution procedures with consumer and producer behavior patterns at various levels of development. Although welfare benefits gained from distributing food aid commodities to consumers at concessional

prices may be more direct than from selected development investments. the benefits may be temporary and contribute little to long run improvement in welfare. Alternatively, augmenting the domestic food supply with food aid commodities can constrain or depress food prices sufficiently to produce an increase in real income which, in turn, increases consumer welfare and raises demand for products of other sectors.

The first section of this study concentrates on investment aspects of food aid. Based on a multiplier analysis, estimates are made of the impact of development investments on final demand for food and other commodities. Foreign assistance packages consisting of food, other commodities, and supporting capital are defined for countries at various stages of development. The composition of the foreign assistance package, which makes maximum use of commodity aid without having a negative impact on the recipients domestic prices, shifts (as shown in Table 1) from over 57 percent food in countries with annual

Table 1. Composition of foreign assistance to maximize use of commodity aid in development investments

Income Group	Food Aid	Nonfood Imports	Supporting Capital
Low (\$75)	57.6%	21.9%	20.5%
Medium (\$250)	44.0%	25.6%	30.4%
High (\$450)	36.5%	27.7%	35.8%

per capita income of \$75 to 36 percent food in countries with annual per capita income of \$450. The formal model used to estimate the optimum aid package can be applied to a specific country simply by supplying parameter estimates for a few basic economic variables in the particular economy.

The second major section of the study concentrates on an analysis of price and production impacts of food aid when sold through differentiated markets. First, an econometric model is specified by defining several a priori functional relationships which are presumed to exist, based on theoretical considerations. The model is tested using empirical data from India for the period from 1956-1967. Based on market differentiation through the use of fair price shops in India, the negative impact of food aid on prices was found to be minimal. The differentiated market allowed for lower prices to be charged for P.L. 480 commodities than domestic commodities, and produced a real income effect which increased consumer welfare and expanded effective demand for food. The shift in demand compensated for an exogenous shift in supply and minimized downward pressure on domestic prices. A historical review of past U.S. food distribution programs indicates that similar methods could be used to create a differentiated market in other countries to minimize the price depressing effects of food aid.

The third section of the study analyzes characteristics of alternative distribution procedures and analyzes ways to adapt them to specific uses or stages of economic development. Combined with consumer

and producer behavior patterns, basic distribution procedures create a two way classification of impact on agricultural income. Along a continuum of distribution from grants to sales at domestic prices, the negative impact on agricultural income increases; likewise, as the income level of recipients increases under each of the distribution procedures, the negative impact on agricultural income increases. Collectively the interaction specifies a pattern of income redistribution which should not be ignored when programming food aid.

The final section of the study integrates the theory of food aid into applicable policy guidelines for efficient use of food commodities as a source of foreign assistance.

#### Factors Affecting Agricultural Growth and Development in Less-Developed Areas

The focal point of this study is a specification and evaluation of the various "friction points" which inhibit or facilitate growth in agricultural productivity and developmental processes in general. The "self-help" provisions of the Food for Peace Act of 1966 emphasize the complementary roles that recipient governments must play in stimulating domestic agricultural production. This study was designed to probe and evaluate the many alternative sets of self help conditions which could be specified and attempts to provide a broad background for approaching the development of specific sets of these conditions. The project report emphasizes a nontechnical, interpretative approach. This approach is chosen so as to make the report appropriate for an audience

of varying backgrounds.

The introductory chapter summarizes the study and is a general, self-contained discussion of the various friction points affecting producers' decisions on production, consumption, and investment. This chapter draws heavily upon subsequent chapters which deal with particular factors such as land tenure and rural credit systems together with their effect on developmental processes in the agricultural sector.

Chapter II is designed to put agricultural producers' problems into perspective, i.e., the importance of the agricultural sector in initiating and sustaining general economic expansion. Chapter III focuses on the importance of land tenure systems in affecting producers' capability to improve their economic and social well-being. Separate sections deal with the distribution of landholdings by size of firm, tenancy arrangements, and tenancy legislation for selected countries. In addition, concluding comments on the efficiency of existing tenure systems are made.

In Chapter IV, the various factors affecting choice of optimal production techniques are covered as well as the efficiency of resource allocation. Chapter V is devoted to examining the supply-demand conditions among rural credit institutions and the consequent nominal and real interest rates. A discussion of some of the factors generating imperfect competition in the credit market is included. Chapter VI covers the importance of market systems as one component of social overhead capital facilities. The various roles of marketing middlemen

affecting the economic activities of producer-consumers are described. Chapter VII incorporates a discussion of the impact of various non-economic factors such as religion and the extended family on producer-consumers' decision-making processes. Finally, Chapter VIII is oriented toward government programs and policies to stimulate and guide activities in the agricultural sector. Each chapter is accompanied by a summary section. For some chapters a section providing general guidelines for planning is appended.

#### PROJECTS UNDERWAY BUT INCOMPLETE

Two specific projects are now well underway but not yet completed. One project focuses on buffer stocks and weather fluctuations in India and the development of strategies to offset variations in food supplies. One phase of this particular project is nearing completion and a second phase on potentials of irrigation projects is well underway. These two projects are being jointly carried out at Delhi University's Institute of Economic Growth under the immediate direction of the distinguished Professor A.M. Khusro. Each project will result in a report to AID and an additional trained researcher attuned to India's problems.

A second project is of recent origin and represents an attempt to use input-output analysis to provide refinement of policy guidelines for administration of P.L. 480 programs. This project represents an innovative approach to public administration and if successful could provide new and valuable means for developing future directions of other public policy analysis.

An Input-Output Model to test Alternative  
Policy Guidelines for  
Administration of P.L. 480 Programs

Since receiving approval to proceed with this study we have made definite and steady progress. We anticipate, however, that this study will require all of the time remaining on this contract for the study's completion. This report follows the outline of the original proposal in discussing the progress to date, the work now in progress, and the expected next steps in the research.

The initial steps on this project have involved development of criterion functions, especially a criterion function for the United States. The giving of food aid constitutes a cost to the United States which can probably be shown to yield net benefits to recipients. If we continue to assume that policy makers in the United States attach a negative, non-zero weight to the costs the Nation bears, and a positive, non-zero weight to the benefits that appear in the recipient, further specification of the American criterion function will be unnecessary. In fact if the function is specified, in content and weights, the study will lose much of its practical value. This follows because any recommendations made on the basis of a specified function would reflect a ranking uniquely tied to the function involved. Clearly, any change in the weights of content of the function would invalidate the recommendations made on the basis of an original function.

We will henceforth present results in the belief that American decision makers themselves have an intuitive sense of the changing

trade-offs between the costs of P.L. 480 programs and the change in American well-being derived from changes in recipients' well-being.

The second part of our work on criterion functions has been to specify a criterion function for the food aid recipient. From our study to date we have derived a set of elements which will be included in a criterion function for the recipient of food aid. We have not as yet determined the relative importance that we should assume a recipient nation assigns to the respective elements.

The literature of the past few years shows that the use of G.N.P. as an indicator of national well-being is not adequate for a developing nation, and that measurements of the distribution of income, employment creation and surplanting effects of development, and the growing disparity between returns to labor as opposed to the returns to capital which may accompany growth should be given at least positive weighting in a criterion function. As a result, the function we propose to use contains elements which will measure the impacts of food aid on (a) the change in G.N.P., (b) the positive or negative employment creating impact of the growth, (c) the resultant changes in income distribution over regions and sectors, and (d) the change in the balance of payments resulting from aid-induced economic activity.

We are confident that the criterion function so defined will fully aggregate the multi-sectoral and regional impacts of the food aid inflow, so that a scaling of the effects of changes in donor policy can be monitored.

We are in the process of attempting to verify that the criterion function which we have assumed to be relevant is so in fact. In this regard, we are discussing the matter with colleagues in India (which, as explained below, has been selected for the testing of policy alternatives).

Given the development of work on criterion functions, we have also studied alternative economic models for this analysis. Having reviewed the P.L. 480 contracting process under all titles (but especially under Title I), and considering the spirit of the Food For Peace Act, we are satisfied that the Input-Output form of impact measuring model is sufficiently robust to provide a means of policy alternative testing. We have determined further the degree to which it will be possible to "endogenize" various demand sectors through a recursive formulation of the model.

On the basis of an inventory of existing input-output models available in the world today, we conclude that those for India offer i) a desirable frequency of publication, ii) a sufficiently broad scope and detail of coverage and iii) recent enough base years to be useful as a foundation upon which to build the simulation.

To date we have quantitative estimates of the interindustry flows for a (77x77) industrial matrix for 1964-65 magnitudes. Even failing our efforts to secure a larger and more detailed table (which we are seeking) this data should serve as an adequate base for simulation, given the refinements envisaged.

We are now in the process of refining the traditional Leontief Input-Output system to eliminate most of the economically undesirable characteristics of the model; namely, i) the static nature of the inter-industry flows with respect to time, ii) the exogenous nature of demands and iii) the concentration of industry activity, not firm activity. In addition we are expanding the definition of capital accumulation activities so that a recursive model can be defined, with the possibility of optimization preserved.

When the model is formulated so that it can produce a dynamic solution when subjected to changes in aid policy, it will be computerized and tested. This process will probably occupy the research team until mid Fall.

We anticipate receiving an interindustry flow matrix of the Indian economy for 1968 which is about (150x150). We also have considerable data on the Indian agricultural sector so that the I-O table can be given added detail in this regard.

This detail of information will be sufficient to construct an interregional table. Obviously, this task will require that many "convenient" assumptions be made, since the data were collected on a macro level of aggregation.

However, to increase the realism of the simulation in the model, we propose that appropriate researchers visit knowledgeable individuals in India in the late summer or early fall. On this trip they would be expected to verify the assumptions, or modify them, in addition to

determining (through interview) the respective weighting which would be appropriate for the elements in India's criterion function.

The testing of policy alternatives will proceed when the model is working and is fully quantified. As a prelude to this, we expect to request interviews with various administrative personnel in the Washington office of A I D in the early fall. These visits would be the basis of agreement on the scope of policy alternatives to be considered in the simulation.

#### Weather Fluctuations, Foodgrains Production and Buffer Stocks for India

This project is nearing completion. The study is divided into the following chapters:

- I. Introduction and Development of the Study
- II. Imbalances, Instability and Government Management of Food-grain Supplies
- III. Dimensions of India's Future Food Problem
- IV. Weather-Induced Fluctuations in Production: A Statistical Analysis
- V. Economics of Buffer Stocks Operations
- VI. Conclusions

Preliminary drafts of Chapters 2, 3 and 4 are completed and submitted to Iowa State University for review and comments. Work on Chapter 5 is now under progress and it is hoped to be completed by August. Chapters I and VI will be completed after other chapters are finished.

The study opens with a critical evaluation of the Post-Independence food policy of the Government of India. It is argued through

some explanatory models for fluctuations in prices and various other indicators that in the past the Government was more concerned about equitable distribution of whatever supply was available on a yearly basis; the need for stabilization over years through maintenance of adequate stocks did not receive much attention. This is concluded to be the basic mistake in the past food management operation of the Government.

To provide a long term solution, the study then focuses on the dimensions of India's future food problem. For this a fifteen year time horizon was taken ending in 1983-84. Statewise demand and supply projections made under the assumption that all-India production will equal the corresponding needs. Based on this exercise it argued that for future years the need will arise to maintain three types of stocks with the Government: (i) pipeline stock generally to meet the need for the poorer section of the people, (ii) buffer stocks proper to check the speculating activities of the traders, and (iii) reserve stocks to meet weather-induced fluctuations in production. Arguing further, stocks under (ii) and (iii) were added together to define buffer stocks.

To work out the economics of buffer stocks operations a detailed statistical analysis is then made about the effects of weather on production. Based on this analysis it is argued that past variations in production due to weather would suggest maintenance of a reserve of about 7 million tons of cereals to offset any individual year's production fluctuation with probability 0.95. To increase this

probability to higher level would require about 9 million tons of cereals. However, when sequences of good and bad years were considered it seemed desirable to maintain about 11 million tons of cereals reserve.

The above estimates are based on a statistical approach only and have no economic significance. Work is now under progress to determine the economic size of buffer stocks and the efficiencies of several operational rules by imposing various economic constraints.

#### SUMMARIZATION AND INTEGRATION OF COMPLETED STUDIES

The original project statement for this contract specified several aspects of P.L. 480 which were to be examined and economic analyses completed in order that programming and utilization of food aid in recipient countries be meshed with theoretical and pragmatic considerations. The aspects to be evaluated included the following: (1) the linkages between the agricultural sector and the economy in general; (2) the economic and technical nature of the agricultural sector; (3) the domestic plans and policies which the food aid both affects and must operate within; and (4) the terms and magnitudes of the food aid shipments.<sup>1/</sup>

Several major studies have been completed each of which has dealt with one or more of the above areas of concern. In addition, some studies have broadened the problem area to indicate the major means of utilizing food shipments in less developed countries without negative effects on domestic production. Further, we have looked at the alternative uses

---

<sup>1/</sup> Contract No. AID/csd-2163. Article I, Statement of Work. p. 2.

of local currency stocks generated under past food shipments and expect to develop further suggestions for and consequences of their use. Altogether, ten major studies are planned for completion under this contract with each providing extended analysis of a particular problem area relating to essential relationships between food aid, agricultural development and economic growth. A general description of the final report on this project follows.

**Procedures and Guidelines for Utilizing P.L. 480  
Commodities in Economic Growth and Development**

To draw together the mass of data, analytical techniques, economic models and published reports into a comprehensive statement on the utilization of P.L. 480 the project leaders plan to develop a manuscript during the final year of the contract which will include the basic research results of past studies with appropriate economic interpretation and extensions. This manuscript will provide a set of guidelines and procedures for the use of P.L. 480 with emphasis on the following:

- (a) The prospects for available supplies of food commodities from the U.S. during the period 1970-2000.
- (b) The prospects for commodity demand in recipient countries during the period 1970-2000.
- (c) Projections of food production potentials for one and two decades in comparison with projected food requirements by countries, with priority ranking of countries and conditions wherein food aid can be used to effectively promote agricultural development and economic growth.
- (d) The appropriate set of conditions and terms under which the U.S. could provide food aid to recipient countries.

- (e) The appropriate set of distribution methods and allocation procedures in recipient countries to attain economic growth and self sufficiency of food.
- (f) The appropriate sets of self help or developmental policies for the agricultural sectors of recipient countries relating especially to credit, irrigation and technology.
- (g) The appropriate set of contingency policies to assure recipient countries of adequate stocks of food grains during periods of depressed production.
- (h) The set of intersectoral relationships which exist within an economy and their importance to utilization of food aid.
- (i) The appropriate set of public policies to maximize the contribution of nonfarm sector inputs into the agricultural production processes.
- (j) The set of alternative strategies available to maximize the use of food aid for welfare, employment, and economic growth of recipient countries.
- (k) The development of PERT, CMP and/or other models which establish the links in programming food aid to attain particular goals and the development of operational applications for future food aid programming.

The objective of this particular analytical effort would be to provide a framework within which decision-making on all aspects of P.L. 480 can be evaluated and programmed. These decisions relate to the prospective amount of food aid which can be usefully employed in development the terms and conditions of sale, the use of foreign currency generated, the self help provisions and their implementation, and the long term outlook for needs and supplies of P.L. 480 commodities. All such questions would be anticipated and a framework for decision-making established. While the characteristics of particular countries and conditions would not be analyzed, yet given the general framework a large start could be made toward improving the application and allocation of food aid to problems of economic growth and development.