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NUTRITIONAL ANALYSIS OF PUBLIC LAW 480 TITLE II COMMODITIES

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Subcommittee on PL 480 Title II Analysis

Committee on International Nutrition Programs

Food and Nutrition Board

Assembly of Life Sciences

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This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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COMMITTEE ON INTERNATIONAL NUTRITION PROGRAMS

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Lincoln Chen

Frederick Dunn

Sandra Huffman

Maarten Immink

Robert Northrup

Noel Solomons

Frederick Trowbridge

Fernando Viteri

Carol Waslien

SUBCOMMITTEE ON PL 480 COMMODITY ANALYSIS

Abraham Horwitz, National Library of Medicine, National Institutes of Medicine, Bethesda, Maryland, (Chairman).

George Beaton, Department of Nutrition and Food Science, University of Toronto Faculty of Medicine, Toronto, Canada.

David Franklin, Sigma One Corporation, Raleigh, North Carolina.

George Graham, Division of Human Nutrition, Department of International Health, School of Hygiene & Public Health, Johns Hopkins University, Baltimore, Maryland.

William Hoover, American Institute of Baking, Manhattan, Kansas.

Shlomo Reutlinger, Development Economics Department, World Bank, Washington, D.C.

Alberto Valdes, International Food Policy Research Institute, Washington, D.C.

National Research Council Staff

Staff Officers: Judith Bale
Judit Katona-Apte
Staff Associate: Milton Fisher
Consultant: Michael Demousis

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SUMMARY AND RECOMMENDATIONS

The Subcommittee recommends a structuring of the criteria to be used for selecting commodities for PL 480 Title II programs. Underlying the Subcommittee's recommendations are some conclusions about the current nature of nutrition problems existing in developing countries, the limited budget available from governments and external aid sources for addressing these problems, and the pathways by which supplementary food distribution programs affect the nutritional status of the population.

The current list of available commodities includes many that by themselves or in combination with other foods can provide nutritionally adequate supplementation of existing diets. The Subcommittee recognizes that over the years the Office of Food for Peace has maintained the quality of foods supplied under the PL 480 Title II program. The central question addressed in this report, therefore, is which commodity or combination of commodities should be used in order to achieve the maximum nutritional impact from the PL 480 Title II budget.

Commodity selection must begin at the level of the recipient country and with a knowledge of the community in which the distribution program is to operate. The first criterion of commodity choice is the suitability of the commodity for the intended recipients. This assures the acceptability and usefulness of commodities. The second criterion is nutritional

cost-effectiveness. It is the major recommendation of the Subcommittee that nutritional cost-effectiveness be carefully considered by those selecting Title II commodities. It is on the basis of this consideration that the Subcommittee sees a significant opportunity for improving the overall benefit of PL 480 Title II programs. This requires knowledge of the requirements of the population, and whether specific nutrient deficiencies exist or general energy supplementation is needed. Because the immediate objective of food distribution programs is seen as improvement in energy and nutrient intake, the nutritional content of available commodities and a guideline to nutritional requirements are presented in this report.

The Subcommittee identified two pathways by which food supplements exert a nutritional effect: direct and indirect. In the direct pathway, foods distributed and consumed by recipients directly influence their nutrient and energy intake. Allowance is made for the displacement of foods that would have been eaten in the absence of this supplement. In the indirect pathway, commodities reaching the household exert their nutritional effect through an increase in real income by displacement of foods usually purchased. In on-site feeding programs, both the direct and indirect pathways of nutritional effect operate. In take-home distribution programs, the dominant pathway of nutritional effect is indirect. Selection of nutritionally cost-effective commodities requires that the program planner define both the program mode--on-site or take-home-- and the nutritional objective--increase in energy (and general nutrient) vs. increase in specific nutrient intake.

For direct effect, the energy and nutrient content of foods currently consumed should be estimated and the proportion of total energy intake to be supplied by the distributed foods predicted. On the basis of this

information, a target nutrient composition of the mixture of foods to be included in the meal supplied by an on-site feeding program can be estimated. Similar estimates can be made for commodity targeting within a take-home program. Once these determinations have been made, suitable commodities should be selected on the basis of least-cost formulation to meet an appropriate nutrient concentration. This approach will yield maximum cost-effectiveness.

The nutritional impact of commodities supplied is often through an indirect effect. Thus nutritional cost-effectiveness is greatest when the ratio of the local value of a commodity, or its substitute, to the cost to Food for Peace (acquisition plus shipping) is maximized. In this report, this ratio is designated as the α value. Therefore, in take-home programs, it becomes desirable to use commodities that have a high monetary value to the recipient relative to the cost of the commodity, since by increasing family income nutritional benefits will be maximized. When specific nutrient deficiencies are identified, a food fortified with the deficient nutrient is desirable. Although fortified foods are less cost-effective in supplying energy needs than non-fortified foods, they may be more cost-effective when specific nutrients are required. Therefore, fortified foods should be used only when the additional nutrients are considered more important than improvement of the total diet. In a take-home program where the commodity is shared by members of the household, a fortified food is unlikely to have a noticeable impact unless the amounts distributed are very high. The selection of particular commodities for a take-home program does not necessarily result in net changes in the amount and composition of foods consumed by the household, except to the extent that foods that convey more purchasing power

allow greater improvement in the quantity and nutritional quality of the foods purchased. This observation, supported by empirical evidence about the relationship between income and food consumption, leads to the recommendation that commodities be ranked on the basis of their value to recipients relative to their cost to Food for Peace.

Because approximately 75 percent of Title II commodities are distributed in take-home programs, the report summarizes the existing evidence about the relationship between household income and food consumption based on data obtained in household consumption and expenditure surveys in selected developing countries. This relationship is seen to be remarkably similar and robust over a range of countries for households with low per capita income and undoubtedly widely differing food supplies and prices. In those households that are representative of participants in PL 480 Title II-aided programs, a 10 percent difference in household income is associated with a 7-10 percent difference in expenditures for food, a 4-6 percent difference in food energy intake, and a 5-9 percent difference in protein intake. The evidence cited lends support to our conclusion that the use of the recommended α values facilitates the nutritional cost-effectiveness of commodities supplied in take-home food programs, i.e., a commodity that has a higher α value should convey more nutritional benefit than a commodity with a lower α value.

A cursory review of the α values calculated for commodities in selected countries at this time suggests that a judicious application of the α criterion would lead to substantial nutritional gains. Grain and grain-based processed foods deliver between \$0.30-\$1.00 of purchasing power for each dollar spent by Food for Peace, oil delivers between \$1.00-\$1.80 and non-fat dry milk delivers between \$3.00-\$9.00 for the same program dollar. The α

values of grains are low because in many countries grain retail prices are maintained at a low level as a matter of government policy, and because shipping costs to Food for Peace represent as much as 25 to 50 percent of the total delivered cost. The α value for oil is high because in many countries oil is a scarce and high priced commodity and the shipping cost represents only 15 percent of the total delivered cost. Non-fat dry milk has an extremely high α value because it is a surplus commodity available to Food for Peace at a fraction of its market value.

Major policy questions requiring attention are the currently legislated minimum tonnage requirement and the shipment of grain and grain based products for distribution in countries where grains are available at far below current delivery costs. The minimum tonnage requirement for Title II is considered by the voluntary agencies to be a safeguard against program erosion via budget cuts. However, the current discrepancy between the minimum tonnage and the allocated budget is an impediment to the potential nutritional cost-effectiveness of the program.

In conclusion, the Subcommittee is optimistic that implementation of the cost-effectiveness criteria could have a major impact on PL 480 Title II programs. This could be on the order of a 50 to a 100 percent increase in the nutritional benefits that the voluntary agencies and the World Food Programme could provide to participants.

Specific recommendations are listed at the end of Chapter V, pages 129-130.

CHAPTER I

INTRODUCTION

The Title II Food for Peace program was begun in 1954 as a means of providing food directly to those in need.* Acquisition and ocean transport costs are paid for by the program, while internal transport, storage, and distribution are the responsibility of private voluntary agencies such as CARE (Cooperative for American Relief Everywhere), CRS (Catholic Relief Services), and the World Food Programme. Specifically, the program's responsibilities are shared as follows: the U.S. Department of Agriculture (USDA) selects and acquires the commodities; the Agency for International Development (AID) administers the program; and the Office of Management and Budget (OMB) is responsible for selecting the program's level of funding. The voluntary agencies and the World Food Programme are often assisted by the recipient country's government, which might provide storage, transportation, or reimbursement for costs incurred.

An important distinction must be made between two basic modes of distributing the donated commodities: on-site and take-home feeding. In on-site feeding, the ration is prepared for consumption by the recipients at

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*Title II is one of several titles comprising PL 480; it differs from the others in this direct provision of commodities. The history of PL 480 in general and Title II in particular is presented in detail in Appendix B.

distribution centers. This usually includes school and other child feeding programs. In take-home feeding, the ration is given to the recipients to be taken home for preparation and consumption. This usually includes maternal and child health, as well as food for work programs.

The central question in Title II programs is which commodities to select. Until 1966, this was not an issue. The program was originally designed as a way to dispose of this country's surplus commodities, which were the only items eligible for use. In 1966, the emphasis of the program shifted: its goal now became the combatting of hunger and malnutrition; at the same time, the program was seen as an opportunity to promote U.S. foreign policies and to expand export markets. Non-surplus commodities became eligible for inclusion, and the essential criterion for selection became the perceived needs of malnourished populations. In this regard, the Commodity Credit Corporation (CCC) was authorized to pay for protein, vitamin, and mineral fortification of some of the donated items.

The "nutritional wisdom" of the mid-1960's and early 1970's stressed the need for more protein in the diet of malnourished populations; the only high-protein commodity used historically in the program--non-fat dry milk--was not consistently available. In response to these concerns, two changes were made: in 1966, blended foods were introduced, while in the early 1970's, soy-fortification was initiated. At present, the commodities available for use in the Food for Peace program include grains, which are available whole, as flours, or protein-fortified; blended foods; non-fat dry milk (NFDM); oil; and peas (see Table I-1).

The Food for Peace program is an essential part of U.S. foreign aid. It is the only program in which the aid is given in kind, not in services or promises, directly to the beneficiary; its recipients are not governments,

COMMODITIES ON THE CURRENT AVAILABILITY LIST

PROCESSED FOODS

Blended

Corn Soy Milk (CSM)
Instant Corn Soy Milk (ICSM)
Wheat Soy Blend (WSB)
Wheat Protein Concentrate Soy (WPC-Soy)

Protein-Fortified

Soy-fortified Bulgur
Soy-fortified Cornmeal
Soy-fortified Rolled Oats
Soy-fortified Sorghum Grits
Soy-fortified Wheat Flour

Flours

All-Purpose Wheat Flour
Cornmeal
Soy Flour (defatted)

Other

Bulgur
Non-Fat Dry Milk (NFDM)
Oil
Peas
Rice

NON-PROCESSED FOODS

Whole Grains

Corn
Sorghum
Wheat

Table I-1

health clinics, or communities, but individuals whose quality of life is improved substantially as a result of the program. Moreover, this concrete benefit is achieved at a relatively low cost to the U.S. taxpayer. Its budge constitutes only about 30 percent of total U.S. food aid. For as little as 3 dollars a year from each American, this program improves the diet of 55 million of the world's poorest people.

Purpose of This Study

The importance of the PL 480 Title II program underlines the question, first raised by the 1966 changes, of criteria for commodity selection. Since that time, two factors have made it increasingly important to address this question. First, since the 1960's, debate has arisen over the extensive use of blended and protein-fortified foods. Second, economic considerations have become more important with increases in transport costs and changes in the relative prices of the commodities.*

While these issues have been of concern to Food for Peace, no systematic evaluation has been made of the criteria for selecting Title II commodities. As a result, the Office of Food for Peace requested an analysis of the program's commodity selection procedures. The objective of this analysis is to determine which commodities best meet the goals of the program most cost-effectively, in short, to identify and systematize the criteria by which commodities are selected.

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*In 1974, in response to increased commodity and transportation costs, a minimum tonnage requirement was set for the Title II program. This was done in an attempt to protect the program from large fluctuations in costs.

In performing this analysis, the Subcommittee has kept in mind the many variables involved in applying such criteria: the program type (e.g., maternal and child health, school feeding), the program mode (on-site or take-home feeding), local conditions, and the fact that the commodities are used for general population feeding and not for rehabilitation. Therefore, this analysis is presented as guidelines for applying the criteria identified, and commodity selection is presented as a general process to be tailored to each situation. These guidelines will be incorporated in a revised version of the Commodities Reference Guide (Food for Peace, 1977), which gives responsible field staff information in such areas as commodity availability, usage, and characteristics; ration sizes; storage; and handling.

This report presents the Subcommittee's findings on the criteria for Title II commodity selection. It does not address the effectiveness of food distribution programs except as such data affect these criteria, nor does it address commodity selection for emergency and disaster-relief programs. In terms of cost-effectiveness, the analysis concentrates on costs to Food for Peace only. The report also does not elaborate on many related issues that surfaced during the Subcommittee's deliberations. These included nutrition-related questions such as breast feeding substitutes and nutritional assessment, as well as program-related issues such as developmental effect, program impact and outcome, and availability of markets for food purchase in recipient countries. These issues were not covered in this report either because there were insufficient data, or because they fall beyond the scope of the Subcommittee's work.

Structure of This Report

Chapter II of this report first examines how commodities have been chosen

for the program historically, and then describes two considerations involved in the development of any selection criteria--the suitability of the commodity and its mode of distribution. Chapters III and IV are a detailed discussion of the two primary considerations identified by the Subcommittee--nutritional and physiological concerns and nutritional cost-effectiveness--and represent an attempt to systematize the principles governing their application. Chapter V addresses the practical application of the principles discussed in Chapters III and IV; it also presents recommendations based on the findings of this report.

Finally, five appendices are included: Appendix A, a list of abbreviations; Appendix B, a detailed history of the Title II program; Appendix C, a series of tables relating to current Food for Peace operations; Appendix D, a discussion of supply considerations in the U.S.; and Appendix E, an explanation of the criteria to be applied in selection of the processing site.

CHAPTER II

DEVELOPMENT OF SELECTION CRITERIA

As indicated in Chapter I, the PL 480 Title II feeding program has been operating in its present format since 1966, yet its process of commodity selection has never been formally systematized. This chapter provides the background for such an effort. The information offered here is based on published books and articles, Food for Peace annual reports, government and private firm evaluations, interviews with personnel from voluntary and government agencies, and other published and unpublished data provided by Food for Peace and the U.S. Department of Agriculture.

This chapter is divided into two main sections. First, the Food for Peace program's current operations are described. Included are an explanation of the program's administrative and budgetary structures, and a description of various factors now influencing commodity selection. Second is a discussion of the Subcommittee's effort to systematize the process of commodity choice.

It should be noted here that because of insufficient data, the Subcommittee could not evaluate the effectiveness of commodities in particular programs. Therefore, criteria currently used by the voluntary agencies were systematized and analyzed. From this effort, guidelines were developed for making commodity selection more nutritionally cost-effective.

Current Operations

This section describes current operating procedures for commodity selection, including administrative and budgetary structures, and factors influencing the voluntary agencies and the World Food Programme in commodity choice.

Administrative and Budgetary Structures

As noted in Chapter I, the Agency for International Development (AID) has primary responsibility for administering the Food for Peace program. The U.S. Department of Agriculture (USDA) selects and acquires the commodities, and the Office of Management and Budget (OMB) is responsible for the program's level of funding.

However, within AID, the Bureau of Food for Peace and Voluntary Assistance is the focal point for administering the program: it coordinates the availability, procurement, allocation, and delivery of commodities with the USDA; it also coordinates the requirements and procedures of the program with the voluntary agencies and the World Food Programme.

Within the Bureau of Food for Peace and Voluntary Assistance, the Office of Food for Peace (FFP) prepares the budget two years in advance using USDA estimated prices. These price estimates change frequently, sometimes monthly, and with each change the program is rebudgeted. For example, in August 1981, the commodities had already been allocated for FY 1982 with an estimated budget; at the same time, the budget for FY 1983 was also being prepared. The USDA incorporates the commodity costs as part of its overall budget at three levels: 1) Operational--for the current year; 2) Budget--for the following year; and 3) "Out year"--for beyond the budget year.

Country programs are prioritized by AID, then submitted to OMB for a decision on funding level. As an example of the funding process, OMB received

the budget request level for 1983 in September 1981; OMB decided the funding level by December 1981; AID made the request for funding from Congress in January 1982; and the funding will be available for fiscal year 1983 on October 1, 1982.

Below is a brief description of the steps necessary between program planning and approval:

> (1) AID prepares in the field a five-year analysis to be used as a strategy framework, or macro-development plan, called a Country Development Strategy Statement (CDSS). This is updated every spring (January to April).
>
> (2) From the CDSS, the Annual Budget Submission (ABS) is prepared b each U.S. AID mission; this specifically lists proposed PL 480 programs, such as voluntary agency feeding programs, in terms of recipient levels and dollar budget. The ABS is prepared by the AID mission and is used to build overall Title II request levels.
>
> (3) Next, for Title II feeding programs, the voluntary agency submits the Annual Estimate of Requirement (AER). This is prepared by the voluntary agency in each recipient country; it is sent to the AID mission, then to voluntary agency headquarters in the U.S., and finally to Food for Peace (FFP) in Washington by April 15 for the following fiscal year. The AER is the result of a program plan whic is part of a multi-year document.

The World Food Programme (WFP) operates differently: the commitment or pledge is for a specified amount of U.S. dollars for a period of two calendar years to cover acquisition and ocean freight of PL 480 commodities. WFP carries out its own project development process independent of AID. When project proposals are ready, they are submitted to the Committee on Food Aid, of which the U.S. is only one member, and are reviewed. U.S. AID missions comment on proposals mainly to ensure that they make good developmental sense. When the project has been approved, WFP requests the commodities from Food for Peace. WFP projects differ from voluntary agency ones because proposals are not reviewed during the developmental stage, and because AID ha no operational responsibility for their design or delivery.

In addition to acquisition costs, a numbers of other costs are incurred

during the purchase, shipping, and distribution of commodities. First, the commodities are purchased by the USDA (packaged and at a U.S. port); then they are shipped to the recipient country's port of entry, where they are stored and transported to distribution sites. Specific costs are detailed below.

Acquisition and Ocean Freight. Under the Title II program, the U.S. government is responsible for all costs of commodity procurements,* including packaging and transportation to U.S. ports. In most cases, contracts for acquisition of Title II commodities call for supplies to be delivered "free on board vessels" in U.S. ports ready for ocean shipment. All costs of ocean transportation are covered by the Title II program.

Shipping for voluntary agency programs is arranged by each agency through its designated freight forwarder. For Title II programs, ocean transport is normally charged by conference rates,** with charges generally determined by volume and/or weight.*** Since the U.S. government is self-insured, there are no additional shipping insurance costs.

Transfer and Distribution. The voluntary agency or World Food Programme that administers each feeding program is responsible for these costs in the country of distribution. These may be paid by the recipient government, as in CARE programs; by the voluntary agency; or in part by the recipients (e.g., 10 percent of the local value of the food). It is not possible to calculate costs, especially differential costs, for each commodity. For example, the recipient government may provide storage space, a railway cart for transportation, or a distribution facility. Sometimes there are differential

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*Estimated prices for the twenty commodities currently on the list are shown in Appendix C, Table C-1.

**Conference rate means that charges are the same regardless of carrier.

***Examples of freight charges for selected commodities and destinations to selected ports are provided in Appendix C, Table C-2.

in-country insurance or other costs because some commodities are considered to be more valuable than others.

Losses. In a program of this magnitude carried out in over 60 of the world's poorest countries, it is expected that such losses as spoilage, broken bags, punctured oil cans, and theft will occur. Surprisingly, commodity loss between acquisition and discharge at the port of entry totals less than 0.5 percent (Miteff, 1982). When the loss occurs before the commodity reaches the distributor, AID provides replacement; losses occurring after the commodity reaches the port of entry are the responsibility of the distributing agency. Losses from spoilage appear to be higher for protein-fortified commodities, while losses due to pilferage are higher for the more valuable commodities such as oil and non-fat dry milk. Such losses are frequently dealt with by the recipient government. For example, port losses were reduced from 18 to 4 percent in Ghana when the government intervened (Development Associates, 1981).

Commodities Reference Guide. The Title II Commodities Reference Guide (Food for Peace, 1977) provides information on the use of Title II commodities; it complements Handbook 9 (Food for Peace, 1981b), which details operating procedures for the planning, management, and evaluation of PL 480 programs. The Commodities Reference Guide is written for use by Food For Peace officers, voluntary agency field staff, and other intergovernmental and recipient government personnel. It provides information on commodity availability, characteristics, usage, nutrients, ration sizes, storage, and handling to assist field personnel in selection and maintenance of the commodities.

Factors Influencing Commodity Selection

Several factors currently influence the choice of commodities for the Food

for Peace Program:

- The item must be included on the commodities availability list.
- A number of product considerations apply.
- The commodity is subject to certain program constraints.
- A variety of selection criteria are used by the voluntary agencies and the World Food Programme.

These factors are discussed in the subsections below.

Availability list. The official PL 480 docket is determined by the Secretary of Agriculture. However, this document provides only general commodity groups, such as "corn products" or "wheat products." The list of specific commodities is prepared jointly by the USDA and FFP. The following procedures are necessary for inclusion on the list:

(a) If the commodity is not a processed food (see Table I-1), it is required to be designated as available by the Secretary of Agriculture.

(b) If the commodity is a processed food, it must be assessed by the Processed Food Committee, which is comprised of members from several branches of the USDA and a representative from FFP.

The Processed Foods Committee prepares specifications and reviews new foods submitted for inclusion in the Title II program. This review focuses on the technical aspects of the commodity to determine whether its characteristics (nutrient content, stability, physical characteristics) are as specified. The committee may also examine issues of commodity supply and appropriateness. Requests for such review or for development of new foods come from voluntary agencies, the United Nations, the U.S. government, and industry and trade associations. The results of the review, with recommendations, are considered by the Commodity Credit Corporation, which is chaired by the Secretary of Agriculture.

Product Considerations. Items included on the commodities availability list are subject to the following considerations:

Acceptability testing: Informal testing is done by both AID and milling companies. A potential commodity is distributed to selected programs; its acceptability is then determined by personnel at the distribution site and according to requests for future shipments of that commodity. Since program administrators are not likely to request a commodity that is unacceptable to their recipients, this has been an effective test. For blended foods, acceptability trials have also been done by the milling companies that manufacture them: for example, corn soy milk (CSM) was tested in 21 countries, with "excellent" results (Tollefson, 1967); wheat soy blend (WSB) was tested in 59 countries, with similar results (Horan, 1973). For both blended and fortified foods, the factors considered include method of preparation, suitability as part of the local diet, and the temperature at which the commodity is to be served (for example, some beverages may be more acceptable when hot).

Attributes: It is assumed that commodities have inherent attributes that make them suitable for specific programs, although the positive or negative value of a commodity will also depend on the cultural setting. These attributes are as follows:

- Nutrient values--Each commodity has been analyzed for a number of nutrients (see Table C-3 in Appendix C).

- Appearance--Both color and texture are important. In fact, because the color of a commodity has a strong initial impact, a penalty is assessed against the supplier if color specifications are not met. Yellow corn or red sorghum, for example, may not be acceptable to people who traditionally use white corn or light sorghum. A fortified rice with yellow specks (protein) may be looked upon with suspicion by potential beneficiaries. Weaning foods are more acceptable if they resemble traditional preparations.

- Preparation and texture--These are also important for acceptability. For example, bulgur and soy-fortified sorghum grits are acceptable in rice-eating areas because of their texture, while wheat and sorghum as flours would not be acceptable since they could not be prepared in the same manner.

Transferability: The ease with which different commodities can be

packaged, shipped, stored, or treated against loss depends on the particular commodity. For example, NFDM must be protected from moisture which causes it to cake; whole grains can be shipped in bulk at a much lower cost than if bagged; and soy-fortified commodities are more susceptible to infestation than their unfortified analogues.

Packaging and storage: U.S. government regulations specify the packaging of commodities; these are described in handbooks prepared by the Agricultural Stabilization and Conservation Service (ASCS), USDA. Packaging is important because commodities are often stored for a number of months, and are expected to have a shelf life of at least six months. In storage, blended and fortified foods appear to be stable, although data on storage problems are difficult to obtain. In mixtures containing uncooked cereals, a low fat content is maintained to minimize the effects of lipase activity. Vitamins used for fortification are stabilized to ensure maximum shelf life; stability appears to be adequate even after the addition of minerals (Bookwalter, 1981). Blended foods are fortified with tricalcium phosphate to protect against insect infestation; on the other hand, the soy-fortified flours, although prone to infestation, are not so treated. There have been complaints about limited shelf life for CSM or NFDM: CSM may become infested and need to be repackaged, while NFDM in large bags frequently hardens and looses flavor.

Program Constraints. The voluntary agencies and the World Food Programme representatives in the field are bound by a number of constraints, besides budgetary ones, in selecting the most appropriate commodities to request for their programs. These are described below.

Place: The location of the program is a constraint on commodity selection--whether it is in Asia or Latin America, in the city or mountains, near or some distance from the port. As an example, for a program that is far from the port, NFDM is not suitable if covered transport during the wet season

is unavailable. When a program site is not easily accessible and commodities must be stored for longer than average periods, insect infestation may be a problem; thus soy-fortified flours, which are more prone to insects than blended foods and whole grains, should not be chosen.

Culture: This aspect is important in determining which commodities are likely to be familiar and acceptable due to their taste, texture, color, etc. In rice culture areas, for example, bulgur and sorghum grits are more acceptable than wheat or sorghum flours. For a program in Latin America, CSM may be more acceptable than wheat soy blend (WSB) since corn is a more popular staple than wheat. If milk is not part of the target population's diet and if protein needs to be provided, blended foods will be more appropriate than NFDM

Policy considerations: Historically, shipments of a given commodity have not been made under Title II programs to countries that export like commodities. For this reason, bulgur rather than wheat has been shipped to India in the 1970's.

Budget tonnage discrepancy: Title II has both a budget and a mandated minimum tonnage. Decrease in the budget coupled with increase in tonnage have led to dollar ceilings for voluntary agency programs; this forces the agencies to choose more lower-cost, high-tonnage commodities.

Program type: Commodity selection is also constrained by the program type, as described below.*

o Maternal and Child Health (MCH): These programs are generally operated in conjunction with health services for pregnant women and children; commodities are frequently used as incentives for the participation of mothers

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*Table C-4 in Appendix C provides information on present commodity uses for the different program types; Table C-5 provides information on commodity volume and value by program type.

and children in preventive and other health care. Traditionally, MCH programs use more "high-protein" foods, such as NFDM and the blended foods, than other programs. Moreover, because the food package is frequently an incentive to attract the target population to the health center, commodities having high local values, such as NFDM and oil, are used in larger proportions than in other program types.

o School Feeding (SF): These programs provide meals for school children; it has been suggested that as a result, attendance and attention span are increased and illness reduced. The commodities used in large quantities were bulgur and the soy-fortified grain products during 1976-1980, and wheat flour in 1981. This is the least expensive program type in terms of cost to Food for Peace per participant (see Table C-5). This is due not only to the use of less costly commodities, but also to the fact that school feeding provides only one meal a day while school is in session.

o Food for Work (FFW): In this program type, labor is repaid with food. This is also a household*-oriented program since rations are not aimed at individuals, but at households. In the last 5 years, only 4 percent of the commodities supplied to these programs were those usually having high local value, NFDM and oil, while 75 percent consisted of whole grains and bulgur.

o Other Child Feeding (OCF): This program type includes preschool and some institutional feeding of children. Blended foods make up a higher proportion of the commodity package in this program type than in any other; in 1981, blended foods, wheat flour, and bulgur represented the greatest volume. This appears to be the most expensive program type in terms of cost per participant (see Table C-5), probably due to the fact that many of these

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*The term "household" throughout this report is used to define a number of individuals who share the same food supply.

programs include total feeding of institutionalized children.

Program mode: As indicated in Chapter I, there are two basic program modes in the Food for Peace program--on-site feeding and take-home distribution.*

o On-site feeding: These programs include institutional feeding at schools, health centers, hospitals, and orphanages, thus ensuring that the intended recipient actually consumes the food. Commodities that do not have a high value on the local market and those that are being introduced to an area (as in an acceptability trial) may be useful for these programs even though they might not be suitable for take-home distribution. On-site feeding is more expensive than take-home distribution because a lower percentage of the volume is whole grains** and because of additional administrative and equipment costs.***

o Take-home feeding: This program is preferred by most agencies and recipients since it enables feeding within the household setting. Food for work and most maternal and child health programs are of this type, accounting for approximately 75 percent of both commodity volume and value.**** The commodities most frequently used in these programs are whole grains and bulgur.

Criteria Used for Commodity Choice. The voluntary agencies and the World Food Programme (WFP) select commodities for their programs according to different criteria. These appear to be related to the operating characteristics of the agencies, detailed below.

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*The strengths and limitations of each program mode are summarized in Table C-5; Table C-7 provides information on commodity volume and value by program mode.

**See Appendix C, Table C-4.

***See Appendix C, Table C-8.

****See Appendix C, Table C-7.

CARE (Cooperative for American Relief Everywhere) does not have a world-wide infrastructure and thus operates through agreements with host governments. Its principle concern is the school-age child who may be fed through institutions having facilities and government support. Almost half of CARE's Title II programs are school feeding (see Table C-9, Appendix C). Commodity selection is based on existing diet, nutritional need, program type, shelf life, ease of handling, and ease of preparation. The local government provides the cost of transfer between the port of entry and the distribution site and participates in the selection process, sometimes playing a dominant role. CARE programs serve more participants* per dollar value or commodity volume than either The Catholic Relief Service (CRS) or WFP.**

CRS has a world-wide infrastructure. This organization tends to operate with less local governmental involvement than CARE, and often provides in-country transfer and distribution costs. The CRS program costs more than three times per individual than the CARE program.*** This is mainly due to the emphasis of CRS on MCH**** programs, which use more of the expensive commodities such as oil, NFDM, and blended foods than school feeding programs (see Table C-11, Appendix C).

CRS food assistance programs in Sub-Sahara Africa operate on the following principle: to improve the diet of the child, one must increase the household income by an increment larger than would be needed to provide just the additional food for the child. Further, this increment must represent significant economic assistance to the recipient family. To receive this food

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*The term "participant" throughout this report refers to the number of persons reported to be receiving commodities, not to the actual number.

**See Appendix C, Tables C-9 and C-10.

***Table C-10 shows that over forty percent of CRS participants in 1979 were enrolled in maternal and child health programs.

****See Appendix C, Table C-9.

package, the recipient must demonstrate that the child maintains appropriate growth indicating his consumption of either the commodity or its equivalent in local foods (Capone, 1979).

Unlike the voluntary agencies such as CARE and CRS, the World Food Programme (WFP)* receives, from a number of donors, a wide variety of foods, including small amounts of fish, meats, and fruits. As a result, WFP's food basket fluctuates more than those of programs receiving mainly Title II foods. WFP staff are therefore especially attuned to regional and cultural differences in acceptability.

The criteria for commodity selection used by the agencies involved in Title II programs depend on several factors. Some of these, such as cost and volume, are important to the donor; some, such as suitability, are important to the voluntary agency; and some, such as logistics, are important to the recipient government (see Figure 1). The agencies apply those criteria for commodity selection which they consider most important. For example, CARE emphasizes the number of recipients, while CRS in Sub-Sahara Africa emphasizes the income transfer value (the additional purchasing power that accrues to the household as a result of program participation) of the food aid package. The following criteria for commodity selection are used by one or more of the agencies involved in distributing Title II commodities.

Nutritional content: The nutritional content of commodities is a vital criterion for their selection since the primary goal of the Food for Peace program is to improve the nutritional status of those receiving aid. Most commodities are selected for their protein and energy value; very few are chosen for their micronutrient value, such as the Vitamin A in NFDM. Both

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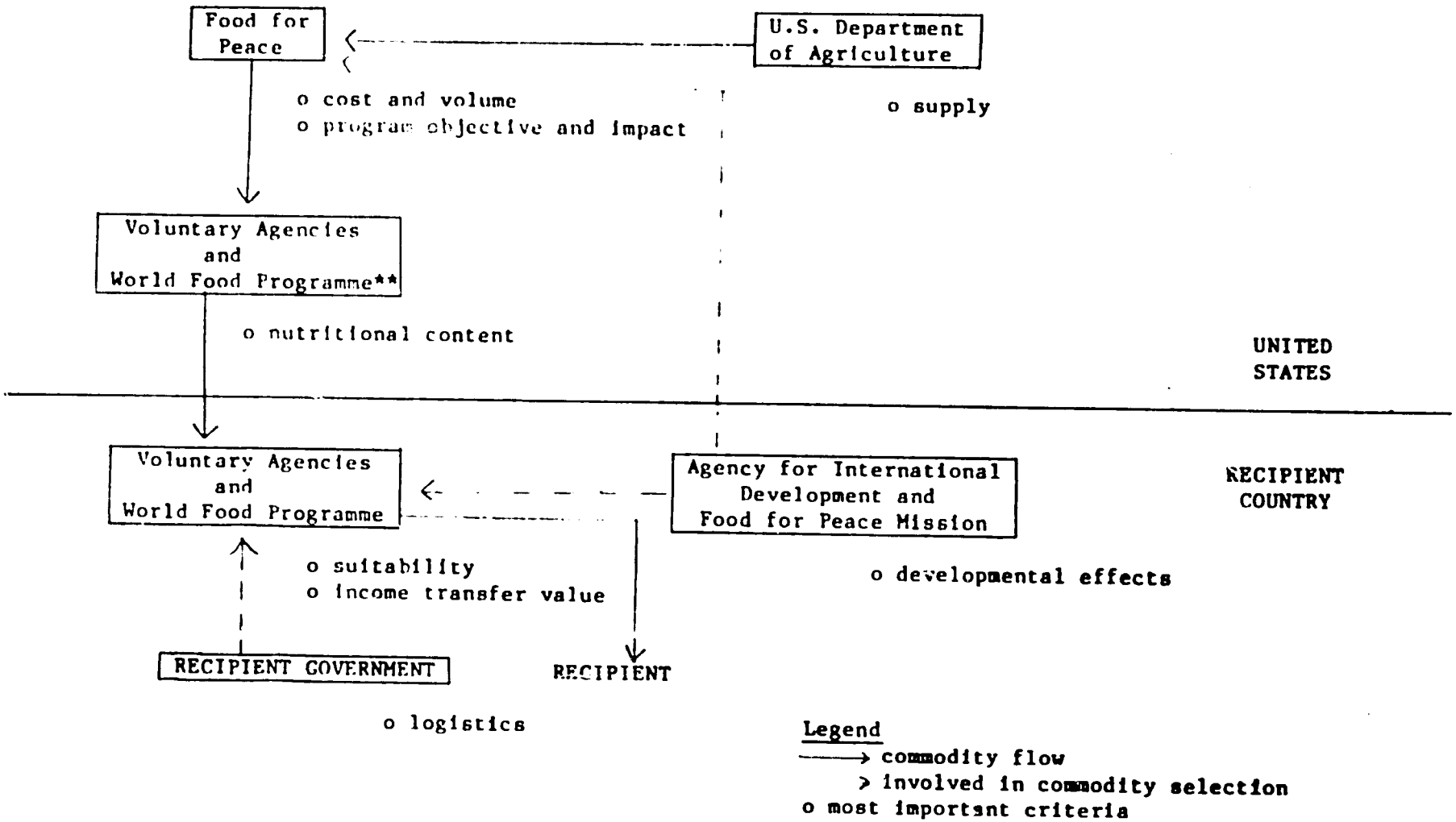
*Differences in commodity value and volume between the voluntary agencies and WFP can be observed from Table C-10.

CRITERIA* FOR COMMODITY SELECTION
MOST IMPORTANT TO EACH AGENCY



*The criteria listed under each agency are not the only ones that particular agency considers important.

** World Food Programme headquarters are in Rome.

Figure 1

the voluntary agencies and the World Food Programme try to consider the nutritional status of the potential recipients. However, because assessment of nutritional status is expensive, determination of need is often based on limited information, and commodity selection is usually based on perceived rather than actual nutritional need. Commodities that would meet this perceived need (e.g. soy-fortified grains and flours for a protein deficiency), are selected, while those that would exacerbate a perceived deficiency are eliminated. Sometimes a least-cost formulation is used for protein or energy content. In such cases, commodity costs per unit of protein and energy are considered (see Table C-1).*

Cost and volume**: As noted above, the Title II program has a specific budget and a minimum tonnage mandated by Congress. Depending on the varying costs of commodities and ocean freight, use of low-cost commodities such as whole grains, rather than the more high-cost blended foods and soy-fortified products, will help meet the minimum tonnage requirement.***

Sustained availability: The USDA prefers to program commodities that are available in CCC inventory; thus availability maybe linked to U.S. production. During the history of the program, commodities have disappeared (e.g., whey-soy drink mix), reappeared (e.g., NFDM) or appeared (e.g., WPC-soy). Sustained availability is an important criterion because commodities are programmed two to three years in advance, and because introducing and promoting new ones is expensive. Although U.S. supply

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*Commodities are ranked according to energy and protein costs in Table C-12.

**While the term "volume" is used throughout this report, it refers to quantity.

***In Fiscal Year (FY) 1981, the tonnage targeted for voluntary agency feeding programs and the World Food Programme totalled 1,266,352, while the dollar value budgeted was 480,021,000 (Food for Peace, 1981a)); this averages $379 per metric ton (MT) or an average of $8.21 per recipient per year.

considerations do not appear to affect Title II grain supplies (see Appendix D), they migh affect processed supplies. Note, for example, that soy-fortified rolled oats are in short supply because of a lack of processors. On the other hand, sustained availability is not a constraint, because if the price is low enough, any commodity will be used. For example, although peas are in short supply on the commodity list, they are highly desired by many programs.

Suitability: The criterion of suitability covers a variety of both socio-cultural and health-related factors. The former include familiarity; acceptability; taste, texture, and color of the commodities; time and energy needed for preparation; and market and social status values. The latter include appropriateness of the commodity to physiological status and notions of treatment for conditions such as diarrhea. Ease and sanitation of preparation also need to be considered in relation to the program mode. Problems in take-home distribution are different from those in on-site feeding. For example, potable water is likely to be used in on-site feeding but not necessarily in home feeding.

Logistics: In some countries, local transportation and warehousing are a problem. Transporting the commodities from the port of entry to the interior parts of a hilly country or transporting them during the rainy season requires that they be resistant to spoilage. If loading and unloading are a problem, commodities packed in smaller bags are chosen. It is difficult to estimate the possible differential costs of transferring various commodities; in many localities, because the recipient country provides transportation and warehousing, these costs are the same for all commodities. On the other hand, as noted above, losses from spoilage and theft do appear to be differential: the more valued commodities are more likely to be stolen, while blended or protein-fortified foods appear to spoil more quickly.

Income transfer value: Commodity packages convey income by displacing foods that would have been purchased in their place. Oil and NFDM are considered to have high income transfer value. However, this effect is mediated by the expenses incurred in receiving the package, such as lost labor, transportation costs to and from the distribution site, extra fuel needed to boil water for preparation of a blend, or additional ingredients such as spices and oil needed to make grains palatable. In households that receive commodities monthly but do not have adequate space and storage containers, individually packaged commodities are preferred.

Program objectives and impact--developmental effects: While the primary objective of Title II programs is to improve the nutritional status of recipients, certain programs relate this goal to other desired impacts. As an example, the commodities given to mothers are often used as an incentive for concommitant child health care. School feeding may increase attendance, and thus educational level. Food for work projects are seen as development programs, with specific objectives such as road building or irrigation. Commodities may also assist development in indirect ways, such as improving the status of women or the quality of life in general.

Systematizing the Criteria for Commodity Selection

As discussed above, Title II commodities are currently selected according to a wide variety of considerations, constraints, and criteria; moreover, these are applied differently by the various agencies involved in the programs. The Subcommittee's central task in this study is to analyze the relative importance of these factors, and systematize the basis for commodity selection. In this process, two considerations were identified as primary: nutritional and physiological concerns, and nutritional cost-effectiveness. These are examined in detail in Chapters III and IV of this report. A

criterion--suitability--and a constraint--program mode--were also identified as essential to the selection process. These are discussed in further detail below.

Suitability

Suitability refers to the "perceived value" of the commodity package, which may encourage or discourage participation in a particular program. Sociocultural factors which influence suitability include local food habits; local time allocation patterns, particularly women's work patterns and their effect on household diets; income levels and sources, and patterns of expenditure on food by households of targeted beneficiaries; and the social unit in relation to the population targeted.

Local Food Habits. These include (a) the local diet (staples and other foods), and (b) intra-household feeding practices. Such data provide the background for establishing whether or not the population is nutritionally at risk, and for determining the nature of the nutritional deficiency. The following questions need to be asked: What are the familiar foods? What are their expected qualities (color, taste, texture), and what commodities can best approximate these?

Familiarity is an important criterion because populations do not, under normal conditions, consume unfamiliar foods. When selecting a commodity, program planners need to look for one that is either identical to what is regularly consumed, or lends itself to preparation of an acceptable final product. In Somalia, for example, NFDM was unacceptable because of its taste; the addition of sugar and cardamom markedly improved acceptability (WFP, 1980).

In the process of commodity selection, those involved should consider whether certain items can be distributed in a more familiar textural form, so that they can be more readily prepared into acceptable local foods. For

example, most blends are distributed as flours. Consideration might be given to distribution in the form of grits, where grits are closer to the standard textural form in which grains are consumed. Certain commodities may be perceived as more or less digestible, healthful/growth-promoting, or otherwise appropriate for particular age or sex groups. For instance, the smooth porridge prepared from blended foods and milk powder is considered to be an infant food in many cultures, while oil may be considered appropriate for adults only. In one area of Ghana, soy-fortified sorghum grits are considered unacceptable to adult males and are consumed by females and children only (Development Associates, Ghana evaluation debriefing, 1981).

Commodity selection should also be based on the perceived cultural and economic values of particular foods in particular quantities (from the recipients' points of view). Factors to consider include which foods are least costly (in fuel) and least time-consuming to prepare. For example, a blend containing milk may be considered inappropriate if recipients cannot afford the fuel to cook more than once daily, while the use of commodities that can be reconstituted in cold water (e.g. instant corn soy milk and NFDM) may be restricted to areas where potable water is available. Basic ingredients which can be used to prepare food for the entire household may be perceived as more valuable than preblended foods for infants (Gopaldas et al., 1975).

Local Time Allocation Patterns. These include how much time is allotted by females in the households to food preparation and child feeding and child care. For example, when the relative merits of delivering whole grains or processed foods are evaluated, attention must be given to how much time and energy a household has to spend on processing grain or cooking soybeans. One can also consider time in relation to the relative ease of preparation of

certain commodities. If release time from food preparation can be otherwise productively used, there is both a nutritional and an "economic" argument for supplying processed foods over whole grains, or particular grains over others. Conversely, the relative time spent in preparation provides one basis on which to decide whether the additional cost of processed or blended foods is warranted.

Income Levels, Sources, and Patterns of Expenditure on Food. These must be known if the potential nutritional impact and income transfer value of particular commodities are to be understood. Commodities do not have equal home or market values; home values fluctuate further according to household income and variations in food and non-food expenditure patterns. Foods made available by other government programs at low cost or by subsidy may also affect the income transfer value of the commodities. As a further consideration, if women rather than men control the income transferred, that increased income may be more likely to be spent on food. The cultural value placed on high-prestige foods, such as soft drinks, could also affect the proportion of additional income spent on nutrients.

Social Units of Food Distribution. In take-home programs, household organization and food sharing arrangements determine who consumes the food. A related issue is the logistics of particular commodities: some may be easier to distribute (or pilfer) depending on particular social infrastructures.

Finally, commodity selection must also be senaitive to the perceptions of the donor and of the donor's auxiliaries, the voluntary agencies. These agencies are communicating a "good health" message; food distribution is only one component of a general health-nutrition education effort. Changes in commodity packages could appear to them to diminish the value of this nutrition education. This perceived value of commodities also includes "cultural factors" such as prestige, convenience, and cost.

Program Mode

It is now widely recognized that in food distribution programs like those supported by Title II, sharing and displacement patterns are important considerations. It cannot be assumed, as it has in the past, that food given to or for a particular individual will be consumed by that individual in addition to his usual intake--an implicit assumption that underlies commodity selection for many programs. A related issue is the essential distinction between the two modes of food distribution--supervised or on-site feeding and take-home distribution--each involving its own patterns of food usage and hence of nutritional benefit. On-site feeding ensures that the targeted individual consumes the distributed food (there is minimal opportunity for sharing, except for accompanying family members). At the same time, there is a strong displacement effect: the individual consumes less food at home. In take-home distribution programs, on the other hand, sharing of the food with other household members is the general rule.

In a review of on-site and take-home programs directed toward young children, Beaton and Ghassemi (1979) found that in general, the net increase in energy intake of the children involved was about 50 percent of the energy level of the distributed food; the other 50 percent was assumed to appear as a benefit to other members of the household in ways that were not measured. There did not appear to be any characteristic difference between the net energy intake in take-home and on-site distribution. Rather, the sharing and displacement effects appeared to balance each other.

In contrast, sharing and displacement do not balance in terms of their effect upon nutrient intake: if a food is shared, the nutrients in that food are also shared; if a food is consumed and other foods displaced, only the nutrients of the displaced foods can be shared with others. The target beneficiary will thus have a net increase in nutrient intake equivalent to the

difference in nutrient composition between the consumed and displaced foods.

The Beaton and Ghassemi study showed that in direct feeding programs, about 30 percent of the total final energy intake was derived from the distributed foods themselves; in take-home programs, this figure was reduced to about 10 percent. Mora et al. (1974) reported empirically similar findings from a study of supplements for pregnant women in a program that also provided supplemental food for other family members (a practice intended to discourage sharing and displacement). Women were supplied daily with food containing 856 kcal. The net increase in energy intake was only 16 percent of this amount, or 137 kcal; although the women actually consumed over half of the distributed food, displacement of usual food was very high. Nevertheless, as would be expected, the effect on nutrient intake was much greater than that on total energy intake since the displaced food had lower nutrient concentrations than the food distributed to, and consumed by, the women. Recently, Knudsen (1981) presented observations from India that are consistent with this general description.

Table II-1 illustrates the implications of the ingestion of distributed food, even with full displacement of an equivalent amount of home foods. Here it is assumed that two programs have similar effects on total energy intake, but with different effects on the actual consumption of the distributed commodities, a situation similar to that seen in the Beaton and Ghassemi study. These data suggest that in on-site programs, the nutritional quality of the distributed commodities is more important than in take-home programs, regardless of whether specific nutrient benefits (as opposed to a general energy increase) are sought. Moreover, there is a greater opportunity for detrimental effects when a significant proportion of the total food intake comes directly from the distributed foods. For example, if very low-nutrient-density foods (such as sugar or oil) are distributed, there must

EFFECT ON PROTEIN INTAKE OF
COMMODITIES WITH VARYING PROTEIN
CONCENTRATIONS IN TWO MODES OF
FEEDING PROGRAMS

Protein Concentration in Distributed Food	Expected Protein Concentration in Final Diet (Change)*			
	Usual Diet Providing 10% Energy as Protein		Usual Diet Providing 15% Energy as Protein	
	On-Site Feeding	Take-Home Distribution	On-Site Feeding	Take-Home Distribution
35%	17.5% (+7.5)	12.1% (+2.1)	12.0% (+6.0)	16.7% (+1.7)
30%	16.0% (+6.0)	11.7% (+1.7)	19.5% (+4.5)	16.3% (+1.3)
25%	14.5% (+4.5)	11.3% (+1.3)	18.0% (+3.0)	15.9% (+0.9)
20%	13.0% (+3.0)	10.9% (+0.9)	16.5% (+1.5)	15.4% (+0.4)
15%	11.5% (+1.5)	10.4% (+0.4)	15.0% (0)	15.0% (0)
10%	10.0% (0)	10.0% (0)	13.5% (-1.5)	14.6% (-0.4)

*These calculations assume that on-site feeding and take-home distribution have comparable effects upon total energy intake. They also assume that in on-site feeding, 30% of the final energy intake is derived from the distributed commodities, while in take-home programs, this figure is only 10%. These assumptions are consistent with the observations of Beaton and Ghassemi (1979) relating to young child feeding programs.

Table II-1

be reasonable assurance that they will not dilute the overall concentration of nutrients below critical levels. More specifically, the data suggest that the inclusion of oil in a take-home distribution program is unlikely to have a major negative impact on any individual since its use will be distributed throughout the family (or, as will be suggested later in this report, its value will be transferred to other food purchases). Conversely, in direct feeding programs, excessive amounts of oil will reduce the overall nutrient concentration in the supplemental food, and may therefore have a negative impact.

Any recommended approach to commodity selection must be based on consideration of these effects of food distribution modes. "Leakages" from a food distribution system, that is, failure of the distributed food to reach the intended beneficiary, must appear elsewhere as a "benefit." This practical lesson was a fundamental consideration when the Subcommittee developed commodity selection criteria for the present report.

CHAPTER III

NUTRITIONAL AND PHYSIOLOGICAL CONSIDERATIONS

Introduction

Ideally, food distribution programs should be based on a precise assessment of the nutritional status and existing nutrient intake patterns of the intended recipients. Commodity selection should then be designed to counter existing dietary inadequacies and to complement the usual diet. Such a supplementation program would meet perceived nutritional goals. However, in practice, such an approach is seldom feasible.

Precise information about nutritional status or dietary intake is frequently unavailable for the recipient population. Judgments about such populations must be made on the basis of obtainable information such as birth weights, infant and preschool mortality statistics, infant and child growth patterns, adult size, etc. As discussed in Chapter II, food distribution programs do not necessarily represent a simple addition of distributed foods to the existing diet. It is difficult to anticipate the precise changes in intake that will result from the distribution of additional foods, especially in take-home programs. Nutritional status, a parameter of health and function, is influenced not only by nutrient intake, but also by the environmental influences of household and community. The nutritional goals of food distribution programs should reflect more than a change in nutrient

intake; appropriate community development benefits which may not be measured as changes in food and nutrient intake should also be considered.

In spite of these complexities and limitations, there are certain nutritional and physiological principles and practical considerations that are relevant to commodity selection in food distribution programs. These are discussed briefly in this chapter.

Reference Guidelines on Nutritional Quality of Diets

A nutritionally adequate diet meets all of an individual's nutrient requirements while satiating his energy needs. That is, the concentration of nutrients in the diet, expressed per 1000 kilocalories (sometimes described as the "nutrient density"), is sufficiently high that when the individual has satiated his energy needs, he will also have met his needs for protein, essential fatty acids, and the various vitamins and minerals. This definition of a nutritionally adequate diet must also take into account such matters as the digestibility of protein and the bioavailability of vitamins and minerals in the particular mix of foods provided.

At present, there is no internationally accepted reference pattern of desirable nutrient concentrations, although many authors have published such figures for individual nutrients. Beaton (1977), Beaton and Swiss (1974), and Payne (1975) have addressed protein:energy ratios, yielding some general principles and an empirical approach. Such an approach can lead to an <u>interim guideline</u> that may assist in commodity selection; however, it must be emphasized that this is only a guideline, and that many factors can affect the precise numeric values appropriate to a particular situation. It must also be recognized that this guideline applies to the individual, and that the diet under discussion is consumed by the individual. That is, it does not address group averages or per capita diets. Finally, it must be recognized that

individuals vary in their requirements for energy and nutrients. It follows that in defining the necessary nutrient concentrations, the most critical situation will be represented by that individual with the lowest energy requirement (lowest food intake) and highest nutrient requirement.

This fact is illustrated in Table III-1, taken from Beaton (1977) and based upon 1971 Food and Agriculture Organization of the World Health Organization (FAO/WHO) protein and energy requirement estimates (FAO/WHO, 1973). From this table, the "safe" protein concentration would seem to be about 7.1 percent of energy as protein equivalent to that of egg or milk.

Beaton and Swiss (1974) used a probability approach to estimate the protein concentration that is adequate for all but 2.5 percent of the population (the same level of risk as implied in the recommended intake). The calculated value was about 5.4 percent of the energy as egg or milk protein, about 10 percent higher than that calculated as the simple ratio of the recommended intake of protein and the average requirement for energy in Table III-1. This then provides an empirical approach:

$$\text{Reference Concentration} = \frac{\text{Recommended Nutrient Intake X 1000 X 1.1}}{\text{Average Energy Requirement}}$$

To design nutrient requirements for populations receiving food aid, the assumption must be made that the FAO/WHO nutrient requirement estimates are applicable to those populations. However, two adjustments may be necessary. First, the nature of a particular mixture of foods may affect the biological quality of the protein or the bioavailability of the nutrients, necessitating an adjustment. Second, the lifestyle/activity profile of the population may differ from that assumed by the FAO/WHO committee, necessitating an adjustment of the average energy requirement estimates (presumably downward). Both of these issues will be addressed in some detail in the report of a 1981

SOME SIMPLE APPROACHES TO CALCULATION OF PROTEIN:ENERGY RATIOS FOR INDIVIDUALS

Protein Requirement	Energy Requirement	Derived Ratio egg protein as % energy
Average + 2 SD*	Average*	5.0
Average + 2 SD*	Average - 2 SD	7.1
Average	Average*	3.8
Average - 2 SD	Average + 2 SD	2.7

*Note: These are the requirement estimates usually published in Dietary Standards - "Recommended Intake" for nutrients and average requirement for energy.

Source: Beaton (1977).

Table III-1

FAO/WHO/United Nations University (UNU) committee on energy and protein requirements; that report will also examine and probably adjust the estimates of protein requirements. It is recommended very strongly that following publication of that report, the question of reference guidelines for nutrient concentrations be reconsidered.

In the meantime, some additional guidance can be offered. Beaton (1977), following the lead of Payne (1975), has published estimates of the protein:energy ratio that would apply for average energy requirements characterizing "maintenance" or "light" activity, or observed intakes in the U.S. Such estimates are about 20 percent higher than those suggested above; that is, about 6.5 percent of energy should come from protein equivalent in quality to that of milk or egg. In generating an interim guideline, the calculated values have been increased to assume low energy intakes in the populations of interest.

For older children and adults, it appears likely that digestibility of dietary protein is the major factor affecting the biological quality of mixed diets. Amino acid composition remains important in infants and young children; however, for practical purposes and for the mixed diets consumed in most parts of the world, digestibility is probably the central factor to be considered. At present, data on the digestibility of protein from various sources is fragmentary. An FAO/WHO consultation assembled available information in 1975;* this was included in a recent UNU publication (Pellett and Young, 1980) and is reproduced as Table III-2. There is a need for more

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*Research on digestibility of grains since 1975 includes the following: wheat (Graham et al., 1981; MacLean et al., 1979); corn (Graham et al., 1980); rice (MacLean et al., 1978, Nicol and Phillips, 1978) sorghum (MacLean et al. 1981; Nicol and Phillips, 1978; Pushpamma et al.. 1979) wheat-soy-sorghum blend (MacLean et al., 1977).

SOME OBSERVED PROTEIN DIGESTIBILITIES

Protein source	True Protein Digestibility*		Approximate Digestibility Relative To Egg or Milk
	children	adults	
Egg	0.92, 0.97	0.97	1.00
Milk	0.93, 0.91, 0.90	0.97	1.00
Maize	0.82	0.76	0.82
Rice, polished	0.85	0.84	0.90
Wheat, whole	—	0.79	0.93
Wheat, refined	0.93	0.89	0.96
Soybeans	—	0.78	0.82
Soy protein, isolated	0.92, 0.95, 0.88	--	0.97
Mixed vegetables diets			
Corn + beans	0.78		0.82
Wheat + soy protein	0.83		0.87
Incaparina	0.77		0.81
Indian rice diet	0.77		0.81
Mixed vegetable/animal diets			
Corn, beans, milk	0.84		0.90
Corn, soya, milk	0.94		1.00
Corn-soya blend	0.87		0.92
Indian rice diet + milk	0.87		0.92
Fish flour, millet, and peanut flour	0.83		0.87

$$\text{*True protein digestibility} = \frac{\text{N in diet} - (\text{observed faecal N} - \text{endogenous N})}{\text{N in diet}}$$

$$= \frac{I - (F - F_k)}{I}$$

N = Nitrogen
I = Intake nitrogen
F = Faecal nitrogen
F_k = Metabolic nitrogen

Source: FAO/WHO, 1975.

Table III-2

up to date data on digestibility. Recent research on rice, for example, suggests that the digestibility of rice protein may be lower in young children than that indicated in Table III-2 (MacLean et. al., 1978). The digestibility of protein in a mixed diet may be lower than that of individual proteins. Other factors, such as very high dietary fiber contents, may also have an unfavorable effect on digestibility. The central point is that the protein:energy ratios discussed here refer to proteins having biological utilizability equivalent to that of egg or milk protein consumed without interfering materials; in examining community diets, some downward adjustment of the observed ratio will have to be made to account for digestibility and for amino acid composition for young children. In the same sense, in looking at the cost of commodities per unit of protein (Table C-1), it would be more appropriate to adjust the protein content downward to account for digestibility. It is inappropriate to adjust single proteins on the basis of amino acid composition since this consideration applies to the mixture of foods consumed. However, it should be recognized that at times only a single protein source is fed to an infant or young child. In such cases, amino acid composition is important.

With these reservations in mind, the guidelines presented in Table III-3 have been derived from various FAO and FAO/WHO expert committee reports on nutrient requirements. They have been calculated on the basis of the formula presented earlier, with a 20* percent upward adjustment to assume a lower average energy requirement in the populations of interest. In the case of thiamin, riboflavin, and niacin, the original FAO/WHO requirement estimates were expressed per 1000 kcal, and no adjustment is needed. This guideline

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*In the case of infants, the adjustment was only 10 percent.

AN INTERIM GUIDELINE TO NUTRITIONAL QUALITY STANDARDS*

Nutrient	Nutrient/1000 kcal							
	Age in Years				Adolescent	Young Adult	Preg. (later) half)	Lact. (first 6 months)
	<1.0	1-3	4-6	7-9				
Protein** (g)	20.6	15.5	14.4	13	20	17	20	22
Vitamin A (μg RE)	440	240	220	240	400	400	390	575
Vitamin C (mg)	30	20	15	12	17	18	25	25
Thiamin (mg)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Riboflavin (mg)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Niacin (mg NE)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Folacin (μg) (as free folate)	90	95	70	60	110	100	210	140
Vitamin B_{12} (μg)	0.5	0.9	1.1	0.9	1.1	1.1	1.5	1.2
Calcium (mg)	810	435	320	270	360	250	570	530
Iron** (mg)	15	9.5	7.2	6.0	***	***	****	****

*Calculated from FAO/WHO reports by technique described in text. The table includes nutrients for which information is available, rather than nutrients considered important. It is recommended that this guideline be reviewed and revised when the report of the 1981 FAO/WHO/UNU committee on energy and protein requirements becomes available. At that time additional nutrients can also be included.

**Values should be adjusted to consider biological value and bioavailability of nutrients in mix of foods selected in comparison to assumptions made. Protein is expressed as equivalent of egg or milk. Iron assumes bioavailability of a high cereal diet.

***Method of calculation suggested in text not applicable.

****For women whose iron status throughout life has not been adequate and is not satisfactory at the beginning of pregnancy, the requirement is increased; in the extreme case of women with no iron stores, the requirement can not be met without supplementation.

Table III-3

provides a crude approximation of the concentrations of nutrients that would be desirable in the final mixed diet if there were a very low risk of the individual's consuming insufficient food to satiate his or her energy needs. It should be noted that failure of a diet to achieve these nutrient levels cannot be taken as evidence that deficiency exists. However, if the nutrient concentrations in the existing diet are much below these guidelines, it would suggest that inadequacies may exist and that attention should be directed toward specific nutrients as well as toward total food intake.

These guidelines must be used with considerable caution and only as an approximation. How, then, could they be of use in commodity selection? First, they might be used in attempting to judge whether or not the existing diet is reasonably adequate in quality. That is, should the objective be merely to increase total food intake, or also to combat a specific nutrient inadequacy? The obvious example is in judging whether total food intake or protein intake is more limiting. After adjustment for expected digestibility, if individual diets do not approximate the protein:energy concentrations suggested in Table III-3, then protein may be a limiting factor, and attention should be directed to improving protein intake as well as total food intake. Such might be the conclusion, for example, in cases where the individual depends on rice, plantains, or cassava as a major staple.*

Another application for the guidelines in Table III-3 is in establishing nutritional standards for the composition of meals in supervised feeding programs. Although the quantity of food offered (total energy) will depend on other factors related to the particular program, the nutrients included should

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*Note again that this discussion refers to an individual's diet, not to averages or per capita food disappearance data. For discussion of differences, see Beaton and Swiss (1974) and Beaton (1977)).

meet, or reasonably approximate, these guidelines. If the home diet is believed inadequate in a particular nutrient, the concentration of that nutrient in the distributed meal should be increased above the guideline. The objective is to achieve or approximate the guidelines in the final total food intake of the individual (distributed meal + home food). The final concentrations can be estimated if the proportion of final energy intake to be provided by the distributed food can be reasonably assumed, and if the concentration of the nutrient per 1000 kilocalories (kcal) in the distributed food and in the home diet is known. Of course, these same calculations can be used to adjust the guideline for desirable concentrations of the nutrient in the distributed food.

As illustrated in Chapter II, it is difficult to apply the same approach to take-home distribution programs, in which the usage of commodities by individuals is harder to predict. One exception may be the case of fortified cereals if it can be assumed that these substitute for cereals consumed in the home. Here the nutrients added to the cereal are retained in the household, and the effect upon total household nutrient concentrations could be estimated.

Finally, as Table III-3 illustrates, the characteristics of intended beneficicaries have an important effect on the desirable nutritional attributes of foods distributed in supplementary feeding programs (on-site feeding in particular, but also targeted commodities included in take-home programs). Thus the age and sex of the beneficiaries, as well as the nature of existing nutritional problems, must be considered.

Potential Negative Attributes of Commodities

While nutrient concentration is the central measure of the nutritional quality of commodities, there are also potential negative effects associated

with some commodities. These may be inherent in the commodity or restricted to certain situations. Some of these effects are discussed in the subsections below.

Intolerance and Malabsorption

In some cases, there may be problems of physiological tolerance or absorption. An example is incomplete development and digestive capacity in the infant. In most developing country populations, low lactase activity is the rule after 2 years of age and evidence of milk intolerance has been reported. It is useful to distinguish between three terms now widely used in discussing this problem:

- Low lactase activity refers to a low level of the intestinal enzyme lactase, responsible for splitting lactose into component monosaccharides.
- Lactose malabsorption refers to the reduced absorption of lactose resulting from low lactase activity.
- Lactose intolerance is the condition in which clinical symptoms (abdominal pain, bloating, flatulence, diarrhea) follow the ingestion of lactose mixed with water in a standard dose such as 2g/kg body weight.

Low lactase activity is seen in many populations, particularly the non-white; many individuals in these populations develop symptoms of lactose intolerance when given large test doses of lactose. Lactose intolerance may therefore be relatively widespread in a number of the populations targeted by food distribution programs.

An important consensus that has emerged is that lactose intolerance and milk intolerance are not synonymous. That is, lactose intolerance depends upon the magnitude of the load of lactose that is presented to the intestine at any one time. Few individuals are intolerant to all levels of lactose, and many healthy individuals who are intolerant to standard doses are still tolerant to a glass of milk (Brown et al., 1980). The practical implication

for commodity selection and program design is that even in populations where a high prevalence of low lactase activity or lactose intolerance has been reported, milk in small quantities (e.g., 250 milliliters or 8 ounces at a time) is well tolerated without apparent effect on the digestibility of other foods. If milk or milk-containing commodities are considered a desirable inclusion in food distribution programs, they can be used at levels not exceeding existing consumption, and can probably be used without problem in levels that do not exceed the equivalent of one glass of milk in a single feeding. Beyond that, experience with the local population is the best guidance.*

In spite of this assurance, it would be prudent for program administrators to make a special effort to monitor the introduction of NFDM and milk-containing commodities in new populations since a small percent of children cannot tolerate even 8 ounces of reconstituted NFDM at a single feeding (Graham et al. 1971). Allowing a few days of gradual introduction for adaptation to milk drinking by children who have not been consuming milk, likely will prevent distressful symptoms. It would also be appropriate to keep on the commodity list some blended foods suitable for complementary infant feeding that do not contain milk powder.

Toxic Effects

Commodities now included on the Title II list are clear of any known toxic effects. The only potential concern for the future would be excessive levels of fortification with such substances as vitamins A and D and iron, intended

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*For further discussion of this important topic, reference is made to statements by the Protein Advisory Group of the United Nations System (1972), the Food and Nutrition Board (1972), and the Committee on Nutrition of the American Academy of Pediatrics (1974, 1978).

to meet nutrient deficiencies in particular populations. Since not all individuals require similar levels of nutrients or consume the same amount of a food, high fortification levels of potentially toxic nutrients may endanger individuals who consume unusually large amounts of the fortified food. Feeding programs are not intended to be treatment and rehabilitation programs; specific nutrient deficiencies are more appropriately treated by individual therapy. Food fortification guidelines and approaches are discussed in the report of a Pan American Health Organization (PAHO) Technical Group Meeting (1972).

Antinutrient Effects

Some grains have antinutrient effects due to components that interfere with the digestibility and absorption of nutrients either in the grain itself or in foods consumed with it. Whole-grain sorghum, for example, is associated with decreased absorption of protein, energy, and trace minerals (MacLean et al. 1981), and should be distributed only to people familiar with its traditional processing techniques since these remove the portion exerting antinutrient effects. Whole-grain sorghum processed into flour is unsuitable for any group since subsequent separation of the antinutrient portion is not possible; sorghum grits is an improved and appropriate form of the grain. Similarly, the calcium, iron, and zinc in whole-grain wheat are poorly absorbed, which may be a concern when wheat is used as the major source of energy.

Recent concern about the use of soy-fortified products is due to evidence that soy protein fractions may reduce the utilization of iron, and to animal studies which show that zinc, manganese, magnesium, and vitamin B_{12} utilization may also be reduced (Cook et al., 1981). Human studies show that the availability of iron in some infant food supplements may also be reduced (Morck et al., 1981; Ashworth and March, 1973.) As there is no

evidence from field studies that consumption of these food supplements results in mineral deficiencies, it would appear that further research is required if soy-fortified products are to be a major part of the diet.

Description of Available Commodities

The desirable nutritional attributes for foods distributed by supplementary feeding programs depend on several factors: the physiological states of the intended beneficiaries and their current or habitual dietary intakes; the nutritional goals of the programs; and a realistic estimation of the amounts of distributed commodities expected to reach recipients, as well as the relative contribution of these amounts to the overall intake. In the frequent cases in which the distributed food is shared by other family members, the potential benefits to those members should not be totally discounted: in the developing world, malnutrition does not involve only one individual or age group within a family; the family shares the additional food according to the perceived needs of individual members.

Much of the current thinking about the relative importance of energy or protein deficits in the diets of populations in developing countries is based on the 1973 FAO/WHO recommendations. The applicability of those recommendations to the much smaller children of developing countries is in question. Although British (Durnin et al., 1974) and American (NCHS, 1979) school children consume only 75 to 90 percent of those recommendations for energy, they grow at near maximal rates and are generally overweight for their height. The possible overestimate of energy requirement by the FAO/WHO committee is taken into account in Table III-3, where the relevant protein:energy ratios have been increased by twenty percent. That is, a lower energy intake than that suggested by the FAO/WHO committee has been assumed. Conversely, there is reason to believe that the protein recommendations may be

too low for infants and young children.* This applies particularly to the correction factors for vegetable proteins with inferior digestibilities and amino acid compositions. (FAO/WHO, 1975) Until adequate information is available, it would be wise to consider these doubts rather seriously in making recommendations about the nutritional value of foods to be used in programs designed to prevent malnutrition. As noted earlier, the quality standards should be reconsidered after release of the 1982 FAO/WHO/UNU report.

The difference in body size already alluded to is only one of many factors to be considered in judging the appropriateness of foods for different programs. It is obviously desirable to become familiar with each locale and its problems through surveys and other sources providing information about the health and nutritional status of the intended beneficiaries and their families. With these considerations in mind, commodities can be selected from the availability list for Title II programs. These available commodities, listed in Table I-1, are briefly described below.

Blended or Formulated Foods

These were originally designed as supplements to protein-poor diets of weaned preschool children. They consist of a grain processed with soy, as in wheat-soy blend (WSB), and sometimes also with non-fat dry milk (NFDM), as in corn soy milk (CSM); they are also fortified with vitamins and minerals. When rice, corn, millets (e.g., sorghum), cassava, sweet potato, or plantain are the major sources of energy for the weaned infant, relatively small amounts of these products will do much to improve the quality of the diet and the

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*In Bangladesh, Brown et al. (1980) achieved a significant additional weight gain and improved apparent nitrogen retention when a children's diet that met FAO/WHO recommendations for protein and energy was supplemented with milk.

efficiency of energy utilization since they have high protein and energy content per volume. One major advantage of the blended foods is that because their value to the recipient is usually low, they have little or no market value and thus are often successfully targeted. However, they are also expensive and not always readily accepted by recipients.

Currently, there are four blended foods on the commodity list--CSM, instant corn soy milk (ICSM), wheat protein concentrate soy (WPC-soy), and WSB. Of these, ICSM is the most digestible and the only one that is suitable for weaned infants under six months of age; WPC-soy, a very expensive commodity, is made from wheat fraction and is considered to be very poorly digestible by infants under one year of age.

Soy-Fortified Grain Products

These flours can have up to 15 percent defatted soy product added and are considered to be an economical way of increasing the protein content and quality of the diet where such an intervention appears desirable. Their cooking properties, appearance, and organoleptic characteristics are supposed to be similar to those of the non-fortified analog. It should be noted that defatted soy flour can only be used as a fortifier in other flours or as an ingredient in formulated or processed foods.

Whole Grains

These have an advantage over other grain products because they fit easily into most local diets; moreover, with the exception of rice, they are usually available at a lower cost than other commodities. The processed forms--bulgur, cornmeal, and wheat flour--are preferred by most of the voluntary agencies.

Non-Fat Dry Milk

This is the only commodity currently on the list that is available to the program below world market price. This commodity, routinely fortified with vitamins A and D, is highly cost-effective in delivering protein and micronutrients. However, because NFDM has no fat and an inadequate energy density, it is imperative to recognize that for child feeding, it must be "diluted" with fat and sugar.

Oil

This is the commodity most often used as an incentive for participation in Title II feeding programs. It is high in energy, essential fatty acids, and vitamin E and contributes to the palatability of other foods. Although it is the most expensive item on the availability list, it has high market value almost anywhere in the world; however, this can also be a disadvantage since it contributes to losses through theft and administrative misuse.

Peas

This is a well-accepted, high-protein commodity, although it is currently in short supply.

Commodity-Specific Needs of Recipient Groups

Physiological and other considerations pertaining to specific age groups should influence commodity choice. These are discussed in the subsections below.

Newborn

Newborn infants, including small-for-date infants and prematures, are not considered primary Title II recipients; however, they may be indirect recipients of the nutrients provided to their lactating mothers. On the other

hand, the Subcommittee notes that in unusual circumstances, Title II commodities are requested by institutions such as orphanages, where very young infants do not have access to breast milk. It is undesirable to use commodities now on the list, except with careful formulation, for the exclusive feeding of young infants (i.e., as breast milk substitutes). In the judgment of the Subcommittee, therefore, if such support is to continue, consideration should be given to very selective provision of formulated breast milk substitutes.*

Young Infant

Infants less than 6 months old are not to be considered primary Title II recipients; this is an age group in which the dominant mode of feeding would be breastfeeding. It is generally considered desirable to introduce complementary feeding sometime between the ages of 4 and 6 months. By this age, the digestive tract is more developed, although perhaps not to the stage of being able to readily utilize table foods. If an infant is thriving on breast milk alone, complementary feeding might well be postponed beyond 6 months; if growth is faltering before 4 months, as is common among undernourished populations, such feeding may become desirable as soon as this condition is detected.

Older Infants

After 6 months of age, digestive tract capabilities are generally well developed; it is less difficult to feed semi-solid foods, and it gradually becomes possible to use solid hand-held foods such as bread. The use of blended foods for this age group may be due to the logistics of a particular

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*For guidance in emergency situations, reference is made to an Administrative Coordinating Committee-Subcommittee on Nutrition (ACC-SCN) statement (1980).

program rather than the specific physiological needs of the recipient; or it may be due to the fact that in take-home distribution, blended foods may be targeted more successfully than other commodities. It does appear that the protein level in the blended foods is higher than is needed.

For infants completely weaned from the breast, or for those whose supply of breast milk is minimal, it is still important to provide at least 50 percent, preferably more, of total energy intake as a liquid, energy-dense, nutritionally complete food with an important fat content.

For supplementation of a more adequate amount of breast milk, the list of foods which can be used includes CSM, WSB, and soy-fortified cornmeal, all with added oil or sugar to reduce the unnecessarily high protein contents to approximately eight percent and to increase energy densities. The poor digestibility of wheat protein concentrate makes WPC-soy inappropriate. Oats are recommended. However, properly processed oats do not require fortification with soy; despite relatively inferior protein digestibility, protein content and quality are high enough to make oats a good source of protein when unfortified. Fat content is also uniquely high, although not as digestible as that of corn. The mixture of soy and oat proteins is almost certainly inferior to oat protein alone at isonitrogenous intakes. Wheat and corn could be used with small amounts of peas as a protein supplement. Sorghum, however, is not recommended because its protein quality is low, and the digestibility of both its protein and carbohydrates is questionable.

After older infants have been weaned and are relying heavily on a staple with a low protein content or on one with poor protein quality, supplementation with CSM, ICSM, WSB, NFDM, soy flour, or possibly peas can be considered. If at all possible, it would be highly desirable to add vegetable oil as well.

Preschool and School Children

In young children, the major continuing concern is the energy density of the diet (bulk to be consumed in meeting energy requirements). If energy density is too low, or bulk is too high, insufficient food may be consumed to meet energy or nutrient needs. With increasing age, this becomes progressively less of a problem.

When rice, corn, millets (e.g., sorghum), cassava, sweet potato, or plantain are the major sources of energy for this age group, relatively small amounts of protein-fortified commodities will do much to improve the quality of the diet and the efficiency of energy utilization, even if energy intakes are less than desirable. Energy supply can be increased with grains, oil, or sugar, the last two only if the protein value of the diet has first been raised to a safe level.

If wheat is the major source of energy in the diet and enough is available to satisfy most of the energy requirement, then relatively small amounts of soy flour, peas, or NFDM will suffice to correct its lysine deficiency and to ensure that protein needs are met (Graham et al., 1981). Small amounts of oil and almost any other source of energy can complete energy requirements. For sources of energy which are inferior sources of protein, in quality or amount, the blended foods or NFDM would be ideal supplements. Although digestive functions are presumably more mature in this age group, it must be remembered that both the energy and protein of some foods such as wheat concentrate are relatively poorly absorbed.

Adolescents

Above school age, there are unlikely to be any commodity-specific needs. The progressive changes in nutritional needs have been portrayed in Table III-3. The most notable change in this period is the usual increase in energy

requirements and food intake associated with adolescence and, in girls, the change in iron requirement associated with menarche. During puberty, the requirements of boys and girls are equally high and qualitatively similar. The female spurt, however, does tend to occur earlier than that of the male. Moreover, the female growth spurt, sexual maturation, and cessation of growth occur over a considerably shorter time span, and nutritional status at this critical time may affect later adult reproductive and lactational performance; thus it is important that energy and protein needs be adequately met. After sexual maturation and the cessation of growth, protein needs become less critical because increases in muscle mass do not continue. On the other hand, because males' adolescent growth, with functionally important increases in muscle mass, continues much longer than that of females, the satisfaction of higher energy and protein requirements must be prolonged.

Adults

In older adults, energy requirements may be expected to fall, with the rate of decline depending on the patterns of physical activity typical of the particular community, while nutrient requirements remain unchanged.

It should be noted that during pregnancy and lactation, requirements for energy, protein, and most other nutrients increase (see Table III-3). While this does not impose unique commodity requirements, it does imply a need for additional food. Iron requirements during pregnancy are a special consideration. For women whose iron intake has been inadequate or marginally adequate before pregnancy, and whose body iron stores are depleted, it seems probable that the requirement during pregnancy cannot be met by dietary means. In such circumstances, consideration should be given to concurrent distribution of iron supplements.

Targeting of Commodities Within Programs

Given the differing needs of the various age groups discussed above, targeting of specific groups becomes a concern for a Title II program in which infants and young children are involved. Food for work programs, for example, though aimed at the total household, should include the concept of direct targeting of some foods if infants under two years of age are involved. Such direct targeting becomes more difficult for children over two years of age: because these children consume "table foods" at home, commodities distributed are likely to be shared with other members of the household. On-site feeding at preschool child care centers provides commodity targeting, although in these settings, the child receives only a proportion of his daily/weekly food intake.* School-age children are specifically targeted in on-site feeding programs (180 meals per year in school compared to 1100 meals total), but not in take-home programs. Pregnant and lactating women are very difficult to target; they are usually reached through take-home distribution, in which it is unrealistic to presume that the food received does not intermix with the general household supply. Thus a differentiation must be made between targeting the consumption of a particular commodity and directing an increased share of an augmented family food supply toward a target individual. The former is the rule in direct feeding programs, but is very unlikely in take-home distribution for weaning foods; the latter might be accomplished by educational activities.

Summary

In summary, a primary criterion for Title II commodity selection is the

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*Institutional feeding programs such as those in orphanages and hospitals in which a child receives 100 percent of his food represent a perfectly targeted situation.

nutritional needs of recipients, including energy, and protein, and other nutrients. Some central conclusions of this chapter in this regard are as follows:

- o Unless a protein deficiency is clearly indicated by study of the staples of the recipients, total food supplementation is preferred.
- o Even in on-site feeding and with successfully targeted commodities, vitamin and mineral needs may still not be met. Use of blended foods for their vitamin and trace mineral content alone is not a cost-effective way of delivering these nutrients; pharmacological means of supplementation may be more appropriate. If blended foods are chosen for other reasons, their vitamin and mineral content is an advantage.

This chapter has also emphasized that the physiological characteristics of the recipient are a major determinant of the nutritional effectiveness of the food distribution program when infants and young children are involved. This factor must be considered in conjunction with the mode of commodity distribution--on-site or take-home.

CHAPTER IV

NUTRITIONAL COST-EFFECTIVENESS CONSIDERATIONS

Introduction

As noted in Chapter II, the objective of a food distribution program is usually stated to be a nutritional impact. When several commodities qualify to achieve a nutritional objective, the criterion for selection should be the meeting of that objective as cost-effectively as possible.

Nutritional cost-effectiveness is sensitive to a number of behavioral and economic parameters affecting program recipients. This chapter first discusses a number of considerations involved in predicting the cost-effectiveness of alternative commodities within particular program settings in terms of nutritional and other outcomes. It also compares the cost-effectiveness of commodities used in particular cases on the basis of hypothetical but realistic parameters, as well as data available from many Title II program settings.* The second part of the chapter is a general review of existing data related to these parameters; this review is based on a survey of operating programs, as well as of the general literature. Finally, the chapter concludes with some general recommendations applicable to a wide range of conditions encountered in actual Title II program settings.

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*Notations, parameters, and data used for illustrations throughout the text are summarized in Annexes A and B.

An Approach to Nutritional Cost-Effectiveness

There is a wide range of perceptions about what constitutes a better or worse food from a nutritional perspective. The appropriateness of these perceptions depends to a large degree on the particular setting involved. The following discussion reviews current perceptions, but focuses on those most appropriately applied to commodity selection, based on a realistic assessment of the constraints and circumstances involved. The simple ranking of foods on the basis of energy and nutrient content may be appropriate in a clinical setting where there are no budgetary constraints, and where the diet can be completely controlled; at the community level as in a Title II program setting, such simple considerations could only be applied for the exclusion of a food with a potential negative effect.

The cost-effectiveness approach advocated in this chapter must be qualified by two considerations. First, the approach recommended here is appropriate primarily for the ranking of commodities distributed in the same program mode, whether take-home or on-site. Ranking of program modes by nutritional cost-effectiveness criteria would require consideration of additional factors such as participation rates, program administrative costs, and specific nutritional and other program objectives. Second, as noted in Chapter III, Title II commodities are <u>intended</u> to modify or supplement the diet of recipients. Because the commodities selected do not constitute a complete diet, the cost-effectiveness analysis in the present chapter is concerned only with marginal changes in nutritional and non-nutritional objectives.*

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*Broader questions about what constitutes a nutritionally palatable and otherwise feasible diet need to be addressed when a program can exercise complete control over participants' diets. If dietary control can be exercised, as would be the case with a feeding program for hospitalized patients, the well-known least-cost-diet linear programming method would be appropriate.

With these considerations in mind, the central factors involved in selecting the most cost-effective commodities to meet nutritional needs can be identified. These factors fall into two broad categories:

- o the costs and budgetary constraints involved in the distribution of commodities
- o the value of the commodities to recipients, including changes in food intake and other items of consumption resulting from the supplied items.

Costs and Budgetary Constraints

The central question to be answered about commodity costs and budgetary constraints is whether these factors are to be considered only in relation to the U.S. Food for Peace program, or whether they are also to be considered in relation to the voluntary agencies, recipient governments, and recipients themselves. The answer to this question will always affect cost-effectiveness analysis when in-country costs vary with the commodity; however, in some cases, the analysis will be affected even if in-country transfer costs are the same for all commodities.

The answer to this question in general is that the cost-effectiveness analysis for Title II can ignore costs other than those incurred by Food for Peace whenever those costs do not alter the nutritional well-being of the population. With respect to costs incurred by the voluntary agencies and recipient governments, this condition will be met if (1) their budgets are not a binding constraint on the delivery of the commodities, irrespective of those selected; and (2) if the economic resources they use to deliver the commodities do not otherwise affect the impact of the program or the nutritional status of the population. Similarly, with respect to costs incurred by recipients, this condition will be met when those costs, particularly in terms of the time required for acquiring, home processing, and cooking the commodities do not otherwise reduce what those recipients are willing or able to do for their nutritional well-being.

These are strong assumptions, and will have to be qualified for each case. However, for practical purposes, the Subcommittee recommends that these assumptions be applied, and therefore that analysis of nutritional cost-effectiveness ignore all costs other than those incurred by the Food for Peace program. The reason for this recommendation is primarily pragmatic. Generally there will be few data available on these costs. Moreover, such costs will generally be very small in relation to the overall budgets of recipient governments and households. When local cost data are available, and when a negative impact of these costs on the nutritional status of the population can be quantified, cost-effectiveness analysis should be modified accordingly. Later in this chapter, some cases will be described in which such local costs may be a particularly sensitive issue.

Value

In determining the nutritional value of the commodities to recipients, the following central questions must be asked:

- o Is the food provided an addition to the existing diet, or does it result in reductions or increases in the same or other foods?
- o To what extent are the net change in diet and related benefits to the targeted individual shared with other household members?

The answers to these questions will be affected both by the program mode--on-site or take-home--and by the particular foods selected for the program. The cost-effectiveness analysis presented in this chapter will suggest ways to reflect these variables.

In addition to these two central questions, the nutritional value of commodities provided will also depend on the nutritional objectives of the particular program. This factor is complicated by the fact that in most Title II programs, the nutritional problems encountered are multiple in nature. For instance, commodities can be ranked in terms of their energy, protein, and

income effects relative to their costs. Whenever a commodity ranks high in one of these effects but low in another, final commodity selection must be based on an assessment of need and program objectives.

The discussion that follows approaches an appropriate cost-effectiveness formula by examining in detail the program and commodity characteristics of three extreme but illustrative scenarios:

- o the commodity with zero convertibility--The commodity supplied is consumed in addition to the existing diet

- o the commodity with full convertibility--The commodity supplied is part of the recipient's normal diet. Its provision thus releases the income usually required for the purchase of that food. The commodity therefore has the value of cash or of another food of equivalent cost

- o the substitute commodity--The commodity supplied is not part of the recipient's normal diet but replaces the consumption of a similar food in the diet. Both the commodity's intrinsic value and the monetary value of the food for which it is substituted determine the nutritional outcome.

These three extreme situations are discussed in detail in the subsections below, together with their implications for cost-effectivess analysis. It must be stressed, however, that seldom does a commodity have zero convertibility; the other situations are more usual. The implications of these extreme situations are expressed as a series of generalized formulae which can then be applied to intermediate cases. Following this discussion is a consideration of the issue of targeted individuals sharing program benefits with other household members, sometimes referred to as the "leakage" problem. Finally, nutritional cost-effectiveness analysis is discussed in relation to program mode--on-site or take-home.

The Commodity with Zero Convertibility

Provision of a commodity to be consumed by the recipient without any change in the existing diet is rarely achievable in a supplementary feeding program. A food supplied at zero cost to the recipient generally provides him

with ample opportunities to reduce or increase the consumption of other foods in the existing diet, as well as to increase his non-food expenditures through use of the income released by the donated item. When the amount of food supplied is large, whether in an on-site or take-home program, that food can certainly be expected to substitute for part of the existing diet.

On the other hand, if only small amounts of a food are provided, that food can in fact be consumed without causing changes in the recipient's normal diet. This will be especially true if an effective nutrition education campaign is instituted in conjunction with the provision of food aid. In some cases, provision of the food may even be made contingent on evidence that the food has been consumed in addition to the former diet, for example when infants are weighed periodically to confirm expected rates of weight gain.

When zero convertibility can be assumed, cost-effectiveness is simply established on the basis of the energy or nutrient content in relation to the cost per unit: the higher the ratio of content to cost, the more superior the commodity. The present analysis is based on a somewhat modified measure--the daily energy or nutrient change achieved for each dollar of commodity cost, assuming the food is provided for a full year. The cost-effectiveness for energy and protein in this situation are

$$E_{C_i} = \frac{C_i}{365\ K_i}$$

and

$$E_{N_i} = \frac{N_i}{365\ K_i}$$

where E_{C_i} and E_{N_i} are the daily change in energy and protein intake per dollar spent annually on commodity i, C_i is energy, N_i is protein, and K_i is the cost per unit of food. For illustration, Table IV-1 lists the approximate nutritional content and cost to Food for Peace (including

COST-EFFECTIVENESS INDICES OF COMMODITIES WITH ZERO CONVERTIBILITY*

Commodity	Cost/kg ($)	Energy/kg (calories)	Protein/kg (grams)	Change Per Dollar Per Year	
				Daily energy intake (calories)	Daily Protein intake (grams)
Rice	0.60	3600	67	16	0.31
Corn	0.30	3500	90	32	0.80
CSM	0.55	3800	200	19	1.00
NFDM	0.60	3600	370	16	1.69
Oil	1.00	9000	0	25	0

*Consumption of commodity represents an addition to the diet.

Source: Tables C-1 and C-3.

Table IV-1

transportation costs) of several commodities in the first three columns, and their cost-effectiveness in terms of energy and protein in columns 4 and 5.

As the table indicates, if the exclusive concern is to supply additional energy, corn is the preferred commodity: one dollar buys twice as much energy in the form of corn as milk powder. Similarly, if the primary objective is to deliver additional protein, milk will be the preferred commodity. Alternatively, the objective may be to maximize delivery of energy per dollar, subject to some minimum desired ratio of protein to calories. The protein (g) to energy (calories) ratio for the five commodities is:

Commodity	Protein:Energy Ratio (g/100 calories)
Rice	1.9
Corn	2.6
CSM	5.3
NFDM	10.3
Oil	0

If the existing diet has a sufficient protein:energy ratio, the supplementary food may be adequate if it contains in excess of 2.0 grams of protein per 100 calories. In this case, corn will remain the preferred commodity. However, if on nutritional grounds a higher ratio of protein to energy is desired, the best solution is to supply a mix of corn and NFDM, as follows

$$r_d = kr_1 + (1-k)r_2$$

where r_d is the desired protein:energy ratio r_1 and r_2 are the protein:energy ratios in the energy-intensive and protein-intensive commodities, respectively; and k is the proportion of the energy-intensive commodity in the mix. For illustration, if r_d is 5 grams of protein per 100 calories of energy, then k, the proportion of corn, the energy-intensive

commodity in the mix, is 0.69. A kg of the desired mix will contain approximately 700 g of corn and 300 g of NFDM, at a cost of $0.39; the daily energy provided per dollar spent on the corn-NFDM mix will be about 25 calories. At least on the surface, it appears that for the same cost, a mixture of the two commodities would provide about 30 percent more energy and 22 percent more protein than CSM. It must be noted, however, that so far no attention has been paid to taste and convenience factors. It may well be that the inconvenience and cost of local processing of whole grain would more than offset its apparent advantage. This requires detailed knowledge of local processing conditions and food habits. The example demonstrates how cost-effectiveness analysis can be used to increase the nutritional impact of food aid when the commodities supplied do not alter the existing diet.

The Commodity With Full Convertibility

The provision of supplementary food generally causes adjustments in the existing diet. Hence, nutritional impact cannot be estimated simply on the basis of the nutritional content and cost of the provided food. Full convertibility of a commodity provided at zero cost allows the recipient to make the same dietary changes as if he were given cash or another food having an equivalent monetary value. Convertibility does not mean that the recipient will or will not increase consumption of the provided food; it merely means that changes in the consumption of the food provided would be no different than if he were given another food of equivalent value. On this point food consumption economists would generally agree. This being the case, estimates of nutritional impact should be based on (a) the monetary value of the food to the recipient, and (b) the propensity of the recipient to change his diet as a result of additional income.

There is some controversy about whether observed increases in the

consumption of different foods as a result of additional income provide good estimates of similar changes resulting from the provision of food. Some studies suggest that changes resulting from provision of food are greater than those resulting from equivalent additional income. It has been hypothesized that these differences may occur because food aid is usually obtained and allocated by women in the household, while money is generally handled by men.

Fortunately, knowledge about the precise changes in food consumption as a consequence of changes in income is not required for this cost-effectiveness analysis since the question does not affect commodity ranking. As long as any additional income is used for positive changes in food consumption, the most desirable commodity in terms of nutritional impact will always be the one which delivers the highest value to the recipient relative to its cost to U.S. Food for Peace. Specifically, all that needs to be calculated for each commodity is

$$\alpha_i = \frac{V_i}{K_i}$$

where α_i is the dollar value derived by the recipient from a dollar of expenditure on commodity i, V_i is the value of commodity i to the recipient, and K_i is the cost of delivering commodity i (acquisition cost + transfer cost).

The value of the commodity to the recipient is generally the retail price at which it can be purchased by that person, whenever the commodity provided is consumed as part of his diet. In this case, the recipient can always reduce his purchases of the commodity by that value. In the case of a farmer, his opportunity is to increase his marketed surplus, and therefore the value of the commodity is the price at which it is sold. When the amount of the commodity provided is in excess of the amount of the same food in a recipient's existing diet, the value to him is also the price at which he can

sell the commodity. For instance, if the program provides non-fat dry milk and the recipient normally would not purchase this commodity, the value to him is the price he could obtain from selling a small quantity to the trade. It should be noted that the transaction costs for small quantities could be very high, particularly if there is no easily accessible market for the commodity, the price obtained could be substantially below the wholesale price.

The precise nutritional impact depends, of course, on what the household does with this added opportunity. The household could continue to purchase the same amount and kinds of food as it did without food aid; the household could reduce its purchases of foods provided and purchase other foods; or could use the money saved for other expenditures which might or might not impact on nutritional status. Since these decisions do not depend on which commodities with full convertibility are chosen, this information is irrelevant for Title II commodity selection. If it is known that the food gift will be used at least in part to enhance the nutritional status of the family, it can be concluded that the higher a commodity's value of α, the more will be its potential nutritional impact per program dollar.

To illustrate this further, if the transfer costs per ton of rice and wheat are identical and if the value of these foods to a household in India is equivalent to their price in the U.S., rice will be more cost-effective than wheat. For instance, if the transfer cost is $150/ton, the price of rice is $450/ton, and the price of wheat is $225/ton in the U.S., then

$$\alpha_{Rice} = \frac{450}{600} = .75$$

and

$$\alpha_{Wheat} = \frac{210}{350} = 0.60$$

This illustration addresses differences in α values arising from the relationship between the price of the commodity and transfer costs. Other

illustrations might consider commodities being sold at prices markedly different from world prices. For example, in some countries, such as Egypt and Brazil, wheat is sold to consumers at a price significantly lower than the world market price. As a result, if wheat is priced, say, at 50 percent of the world price, the α value of wheat is only 0.30. Thus a food aid cost of one dollar delivers to recipients only 30 cents.

An even more interesting case may be vegetable oil. Some governments have policies which cause the price of oil to be much higher than in the world market. Another example is beans; in Brazil rigid import licensing [illegible] have resulted in periodic sharply higher bean prices than those of neighboring countries. Both commodities are consumed by potentially or actually undernourished households--the participants in food aid programs. These foods could thus be excellent vehicles for augmenting the family's income and hence nutrition. The α value for oil may be greater than one. For example, if the price in the recipient's country is $1,350, and the cost of acquisition and transfer is $1,000, the α value is:

$$\alpha_{oil} = \frac{1350}{1000} = 1.35$$

This kind of analysis is appropriate only if the supply of commodities in the program does not impact on food prices in the community. The additions to the diet then depend only on the income conveyed by the program and the preferences of the household.

Estimation of the nutritional impact resulting from the monetary value of a donated commodity requires knowledge of how the family decides to spend additional income. The daily change in energy, E_{C_1}, and in protein, E_{N_1}, intake resulting from each food aid dollar per year spent on

commodity i depends on the income elasticities of energy and protein, u_C and u_N; the ratios of daily energy and protein intakes to annual per capita income, r_C and r_N; and the proportion of the food aid dollar reaching the household with commodity i. That is:*

$$E_{C_i} = \mu_C \cdot r_C \cdot \alpha_i$$

$$E_{N_i} = \mu_N \cdot r_N \cdot \alpha_i$$

The income available for nonfood expenditures from a dollar spent on the food aid commodity, E_{y_i}, can be calculated if we know the cost, K, and the energy content, C, per kg of the food purchased by the recipient, as follows

$$E_{y_i} = \alpha_i - 365 \cdot E_{C_i} \cdot K/C$$

where $_i$ is the additional purchasing power conveyed to the recipient per program dollar, $(365)E_{C_i}$ is the additional food energy purchased per program dollar, and K/C is the cost per unit of food energy in the additional foods purchased.

For example, consider low-income households with an energy elasticity of 0.5 and a protein elasticity of 0.8, which are consistent with expectations that larger relative increases in high-protein than in low-protein foods take place. Assuming a per capita income in the households of $100, a daily diet containing 1800 calories and 50 grams of protein, and that the additional

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*Let X be any nutrient; then $E_{xi} = \frac{\Delta X}{K_i}$, $\mu_X = \frac{\Delta X}{\Delta Y} \cdot \frac{Y}{X}$, $r_X = \frac{X}{Y}$, and $\alpha_i = \frac{V_i}{K_i} = \frac{\Delta Y}{K_i}$, where X is the daily intake of the nutrient and Y is the annual income.

food purchased as a consequence of additional available money costs $0.35 and contains 3500 kcal per kg. Then, given the α's shown, Table IV-2 illustrates the change in daily energy and protein intake and the additional income available for nonfood expenditures as a consequence of spending one dollar on selected commodities.

Comparing the nutritional cost-effectiveness of the commodities reported in Tables IV-1 and IV-2, note that convertibility implies generally far lower values. For example, rice would be expected to add about 7 calories per day for each annual dollar spent on supplementary food when it is supplied under conditions of full convertibility, whereas its "undiluted" cost-effectiveness is 16 calories of energy per day for each dollar spent.

More important are the implications of convertibility for the ranking of commodities. As expected, the decisive determinant is the value of α. NFDM is superior in the illustration not because of its own nutritional value, but because its value to the recipient relative to its delivered cost is higher than that of the other commodities. The most interesting thing to note is that oil, which has no protein content, can result in more protein cost-effectiveness than nutritionally better balanced commodities. Finally, commodities having the attribute of convertibility provide money to the household for nonfood expenditures as well; it is possible that such expenditures also contribute to the nutritional status and general health of the recipients.

The Substitute Commodity

The value to the recipient of a commodity which is not part of the accustomed diet, such as a fortified food or a blend, will be the price of the food for which it would be substituted in the diet or, alternatively, the price at which the commodity could be sold. In either case, the estimation

COST-EFFECTIVENESS INDICES OF FULLY CONVERTIBLE COMMODITIES*

Commodity	α_i	Change Per Dollar Per Year		
		Daily energy intake (calories)	Daily protein intake (grams)	Annual income for nonfood expenditures ($)
Wheat	0.60	5.4	0.24	0.40
Rice	0.75	6.7	0.30	0.51
Oil	1.35	12.2	0.54	0.90
NFDM	5.00	45.0	2.00	3.36

*Assumes the commodity represents an income transfer rather than an addition to the diet. Nutritional benefits are derived from use of additional income.

Table IV-2

formulae for the daily energy cost-effectiveness, E_{C_i}, and the income cost-effectiveness available for nonfood expenditures, E_{Y_i}, would be the same as for commodities with full convertibility, provided that the energy content is approximately the same. For daily protein cost-effectiveness, the estimation formula is the same only if the recipient has the opportunity and chooses to sell the commodity. If, as is more likely, he consumes the commodity, the daily protein cost-effectiveness can be estimated as follows

$$E_{N_i} = \frac{N_i - N_s}{365\ K_i} + \mu_N \cdot r_N \cdot \alpha_i$$

where N_s is the protein content per kg of the food which it is substituted in the diet, and the other variables are as defined earlier (see Annex A).

For illustration, let us consider two similar commodities, wheat flour and soy-fortified wheat flour. The various measures of cost-effectiveness of the two commodities are as reported in Table IV-3, assuming that the local value of both commodities is $220/MT; the cost of delivering flour is $400/MT; the cost of delivering the soy-fortified variety is $440/MT; and the protein content per kg is 105 gm for wheat flour and 160 gm for soy-fortified wheat flour (Table C-3). Clearly, if supplementing protein in the existing diet is a major objective, the fortified flour is far superior. On the other hand, this improvement is bought at the expense of decreased energy and purchasing power per dollar of food aid, although in the illustrated case, this cost happens to be small.

However, the most noteworthy observation with regard to the fortified flour is that it delivers no more protein than the oil delivered under the conditions described in the previous section. This is of course due to the fact that oil, while not delivering protein directly, gives the recipient

COMPARISON OF COST-EFFECTIVENESS INDICES OF SUBSTITUTE AND FULLY CONVERTIBLE COMMODITIES

Commodity	α_i	Change Per Dollar Per Year		
		Daily energy intake (calories)	Daily protein intake (grams)	Annual income for nonfood expenditures ($)
Wheat	.55	5.0	0.22	0.37
Fortified flour	.50	4.5	0.54	0.33

Table IV-3

more purchasing power than wheat. The net result is that in the illustration, the recipient can buy (locally) much more food and other essentials with purchasing power delivered by the oil, including an amount of protein equal to what he would consume when given a protein-fortified food.

Commodities With Mixed Attributes

If a commodity is supplied in excess of the amount usually consumed by the recipient at his present level of income (plus the additional purchasing power conveyed by the commodity), that excess is likely to be consumed, with one of two consequences: the beneficiary may simply add the commodity to his diet (zero convertibility), or he may substitute it for another food.

If the commodity is added to the diet, the appropriate cost-effectiveness formulae for energy and protein are

$$E_{C_i} = \frac{m \cdot C_i}{365 \cdot K_i} + (1-m)\ \mu_C \cdot r_C \cdot \alpha_i$$

and

$$E_{N_i} = \frac{m \cdot N_i}{365 \cdot K_i} + (1-m)\ \mu_N \cdot r_N \cdot \alpha_i$$

where m is the proportion of the delivered commodity in excess of the amount that would be purchased if money were provided. For illustration, consider the case in which a recipient would purchase 1 kg of non-fat dry milk, but the program delivers 2 kg. One half of the milk (a fully convertible commodity) delivers nutrition through the conveyance of purchasing power; the other half (a commodity of zero convertibility) is consumed and causes no reduction in the consumption of other foods. This would hold particularly if the milk has little or no value in case the recipient should want to sell it. The

cost-effectiveness per program dollar spent on milk under two contingencies of utilization is illustrated in Table IV-4.

It is noteworthy that as long as milk is a highly effective conveyor of purchasing power (i.e., its α value is high), convertibility is desirable on all accounts. However, if the cost of milk to Food for Peace is more like its market value, a ration of milk in excess of the amount used in the existing diet is nutritionally more cost-effective than a smaller ration.

Alternatively, if the commodity supplied in excess of what the recipient would purchase can be expected to be substituted for another commodity in his diet, and if the substitution is calorie for calorie, the appropriate cost-effectiveness formulae for protein and energy are

$$E_{C_i} = \mu_C \, r_C [m\alpha_{si} + (1-m)\alpha_i]$$

and

$$E_{N_i} = m \frac{N_i - N_s}{365 \cdot K_i} + (1-m) \, \mu_N \cdot r_N \cdot \alpha_i$$

where m is the proportion of the commodity provided in excess of what would be consumed if money were provided, α_{si} is the value of the food for which the commodity is substituted relative to the commodity's cost, and N_s is the protein content of the displaced food.

For illustration, let us assume that rice is supplied in twice the amount the recipient would purchase and is to that extent substituted for corn. The results for cost-effectiveness are illustrated in Table IV-5. Half of the rice may substitute for corn in the diet and have an α value of 0.27, or rice may substitute for rice and have an α value of 0.60.

COST-EFFECTIVENESS INDICES OF COMMODITIES WITH MIXED ATTRIBUTES

Commodity	Change Per Dollar Per Year		
	Daily energy intake (calories)	Daily protein intake (grams)	Annual income for nonfood expenditures ($)
		$\alpha = 5.0$	
NFDM (fully convertible)	45	2.0	3.35
NFDM (1/2 fully convertible, 1/2 zero convertible)	38	1.8	1.62
		$\alpha = 1.0$	
NFDM (fully convertible)	9	0.4	0.67
NFDM (1/2 fully convertible, 1/2 zero convertible)	13	1.0	0.34

Table IV-4

COST-EFFECTIVENESS INDICES OF COMMODITIES WITH MIXED ATTRIBUTES

Commodity	Change Per Dollar Per Year		
	Daily energy intake (calories)	Daily protein intake (grams)	Annual income for non-food expenditures ($)
Rice (fully convertible)	6.8	0.3	0.43
Rice (1/2 fully convertible, 1/2 substituted for corn)	4.6	0.05	0.21

Table IV-5

Cost-effectiveness for Target Populations

Frequently, the primary objective of a program is to improve the nutritional status of a particular target population, such as children in a specified age bracket or pregnant and lactating mothers. To the extent that sharing with other members of the household is the same for all commodities, commodity ranking in terms of cost-effectiveness is unaffected. It should be noted, however, that the actual cost-effectiveness generally will vary among members of the household. In the case of fully convertible commodities, variations in cost-effectiveness could be due to different elasticities and initial levels of consumption.

In general, knowledge about the allocation of foods within families is limited. Children may receive a smaller or a larger share than adults of any additional food purchased by the household; the daily energy and protein delivered will simply be proportional to their per capita consumption in the household. (Note that the cost-effectiveness formulae measure changes in consumption for each dollar spent per recipient.)

Similarly, in the absence of evidence to the contrary, it can reasonably be assumed that the cost-effectiveness of a commodity with zero convertibility for each person is proportional to the energy and nutrient intake relative to the per capita intake in the household. This means that, irrespective of the characteristics of the commodity, it is reasonable to assume that

$$E_{C_{ij}} = \frac{C_i}{\bar{C}} \cdot E_{C_i}$$

and

$$E_{N_{ij}} = \frac{C_i}{\bar{C}} \cdot E_{N_i}$$

where $E_{C_{ij}}$ and $E_{N_{ij}}$ are the changes in daily intake of energy and

protein by person j sharing in the food consumption of the household, and $C_j/\bar{C}$ is the ratio of energy intake of person j to the corresponding per capita intakes of the household.

It is conceivable, however, that some commodities convey a larger share of nutritional benefits to the targeted individuals than do others, particularly if the program includes promotion of specific use of the commodities. For instance, NFDM and CSM might be consumed entirely, or primarily, by the children in the family. In this case, these commodities should be ranked higher if a primary objective of the program is to reach children.

To the extent that the commodity is judged to be fully convertible, its ranking remains unaltered by such considerations. The NFDM provided by the program can simply be substituted for the milk previously purchased. The savings will accrue to the family, which in turn will share the nutritional benefits in the same proportions as if the additional purchasing power had been acquired otherwise.

In the case of a commodity with zero convertibility, the commodity will be more cost-effective in terms of nutritional impact on children if it is consumed only by the children. Specifically, the cost-effectiveness for a child will be the ratio of the number of people in the household, n, to the number of children in the household, t, the per capita cost-effectiveness. That is:

$$E_{C_{ij}} = \frac{n}{t} E_{C_i}$$

and

$$E_{N_{ij}} = \frac{n}{t} E_{N_i}$$

For illustration, let us compare the cost-effectiveness of NFDM for children in a household where milk is consumed by all members, and another

where only the children consume the milk. Let us further assume that milk is not included in the existing diet, and that the milk provided is consumed and does not affect the consumption of other foods, i.e., that milk is a commodity with zero convertibility. Let us also assume that in the first household the children have an energy intake of 1200 calories, and the adults 1800 calories. Then the cost-effectiveness of NFDM for a child in such household is

$$E_{C_i}(\text{child}) = \frac{1200}{1800} \cdot \frac{3600}{365 \cdot 0.60} = 10.8 \text{ calories of energy}$$

and

$$E_{N_i}(\text{child}) = \frac{1200}{1800} \cdot \frac{370}{365 \cdot 0.60} = 1.1 \text{ grams of protein.}$$

The household which provides all the milk to the children consists of 5 persons of which 2 are children. Then the cost-effectiveness of NFDM for a child in such household is

$$E_{C_i}(\text{child}) = \frac{5}{2} \cdot \frac{360}{365 \cdot 0.60} = 41 \text{ calories of energy}$$

and

$$E_{N_c}(\text{child}) = \frac{5}{2} \cdot \frac{370}{365 \cdot 0.60} = 4.2 \text{ grams of protein.}$$

When the excess supply is substituted for another food in the diet, the savings accrue to the whole family, irrespective of whether only the child's food or everybody's is replaced. To the extent that the commodity's energy content is the same as that of the food replaced, the cost-effectiveness formula for food energy, irrespective of who in the family consumes the commodity, is*

$$E_{C_{ij}} = \frac{C_j}{\bar{C}} [\mu_C \cdot r_C (m\alpha_i + (1-m)\alpha_{si})]$$

---

*C_j = 1200 calories of energy
$\bar{C}$ = 1800 calories of energy

However, if the commodity is consumed by everyone in the household, the cost-effectiveness formula for protein is

$$E_{N_{ij}} = \frac{C_j}{\bar{C}} \left[\frac{m \cdot (N_i - N_s)}{365 \cdot K_i} + (1-m)\ \mu_N \cdot r_N \cdot \alpha_i\right]$$

When only the children consume the commodity, the formula is

$$E_{N_{ij}} = m \cdot \frac{n}{t} \left(\frac{N_i - N_s}{365 \cdot K_i}\right) + (1-m) \frac{C_j}{\bar{C}} \cdot \mu_N \cdot r_N \cdot \alpha_i$$

For illustration, let us consider the cost-effectiveness of CSM, which is treated entirely as a substitute commodity for corn in the existing diet. Clearly, the differences in cost-effectiveness in terms of food energy are wholly due to the different α values--0.6 for corn and 0.4 for CSM. This case illustrates that it would be very costly to achieve, say, a 10 percent increase in food energy intake by the children (from 1200 to 1320 calories) in a take-home program which delivers so little purchasing power per dollar of food aid; with corn, it would take 33 dollars for each member of the household in which the child lives. On the other hand, if inadequate protein intake is the primary problem being addressed, CSM looks very promising, particularly if its substitution for corn can be limited to the children's diet (see Table IV-6).

Cost-effectiveness and Program Mode

A further consideration in cost-effectiveness analysis is the type of program—on-site feeding or take-home distribution.

On-site Feeding Programs. These programs usually involve substitution and partial convertibility; however, this convertibility is different from

COST-EFFECTIVENESS OF COMMODITIES INTENDED FOR A CHILD
IN A TAKE-HOME DISTRIBUTION PROGRAM

Commodity*	Change Per Dollar Per Year		
	Daily energy intake (calories)	Daily protein intake (grams)	Annual Income for non-food expenditures ($)
Corn	3.6	0.16	0.47
CSM consumed by family	2.4	0.47	0.31
CSM consumed only by children	2.4	1.48	0.31

*Assumes that CSM substitutes for corn in the diet.

Table IV-6

that discussed above. In terms of food energy, the formula is

$$E_{C_{ij}} = \frac{p \cdot C_i}{365 \cdot K_i} + \frac{(1-p)}{n} \mu_{C_j} \cdot r_{C_j} \cdot \alpha_s$$

where p is the proportion of the food fed on-site which is not withdrawn from the diet at home; μ_{C_j} and r_{C_j} are as defined earlier, except that they are the values appropriate to the target individual; n is the size of the household; and α_s is the value of the food withheld from that individual for a dollar spent on commodity i. Since the benefit arising from the convertibility of the commodity is unrelated to which commodity is used in this program mode, the cost-effectiveness ranking of commodities requires knowledge only of the energy content per dollar.

Similarly, the cost-effectiveness formula in terms of protein is

$$E_{N_{ij}} = \frac{N_i - (1-p)N_s}{365 \cdot K_i} + \frac{(1-p)}{n} \mu_N \cdot r_N \cdot \alpha_s$$

where N_i is the protein content of the commodity used in on-site feeding, and N_s is the protein content of the food withheld as a result from the target individual.

For illustration, let us consider a child who resides in a household with 5 persons, where the average cost of the food in the existing diet is \$0.25/kg, and the protein content is 100 grams per kg. Let us further assume that the child's energy and protein elasticities are 0.5 and 0.8, his daily energy and protein intake are 1200 calories and 40 grams, respectively, and the per capita annual income of the family is \$100. The cost-effectiveness in terms of food energy and protein of corn and milk under different substitution/convertibility assumptions are as shown in Table IV-7.

The case analyzed illustrates several points. Ranking of the commodities,

COST-EFFECTIVENESS OF COMMODITIES FOR A CHILD
IN AN ON-SITE FEEDING PROGRAM

Commodity	p*	Change Per Dollar Per Year		
		Daily food energy (calories)	Daily protein (grams)	Protein (grams) per 100 additional calories
Corn	1.0	32.0	0.82	2.6
	0.5	16.5	0.39	2.4
	0.2	7.2	0.14	1.9
NFDM	1.0	16.4	1.69	10.3
	0.5	8.7	1.49	17.1
	0.2	4.1	1.37	33.4

*p = proportion of food fed on-site that is not withdrawn from home diet.

Table IV-7

by energy or protein effectiveness, is unaffected by the extent to which food is withdrawn from the child and hence "saved" by the household. Moreover, in the case of corn, the protein effect is drastically reduced when food richer in protein (360 grams per kg) is replaced by corn (90 grams per kg). This change in the ratio of protein to energy under different displacement scenarios has consequences for the optimal mix of corn and NFDM if the protein-energy ratio in the additional food consumed is important. Finally, it should be noted that for a child in an on-site feeding program the cost-effectiveness declines almost, though not quite, in the same proportion as the commodity fed displaces food in the child's existing diet.

Take-home Foods vs. On-site Feeding. The cost-effectiveness formulae described so far in this chapter incorporate the most important considerations for ranking commodities used in a given program mode, whether take-home distribution or on-site feeding. In comparing the cost-effectiveness of a commodity in the two program modes, it should be noted that the recipients in on-site feeding are exclusively the targeted individuals, while the take-home recipients necessarily constitute all members of the household. Thus, if a dollar spent on a food used in both an on-site and a take-home program deliver 100 additional calories of energy per day to the participating child, the two programs are not equally cost-effective if the primary objective is to improve the nutrition of the targeted individuals. This is so because for a take-home program to deliver 100 calories of energy to an individual, it must provide one dollar to each member of the household, while meeting this same objective in on-site feeding requires only the delivery of one dollar's worth of food to the targeted individual.

Data Requirements and Availability

Application of the principles and formulae presented to Title II programs requires additional data. Some data are available in statistical compilations published in the countries with Title II programs, or from researchers who continuously review and study the food sectors in many countries. These types of data are known to be difficult to collect with high accuracy, but we assume that they are reasonably acceptable approximations.

Perhaps the most accessible data are those on the retail prices of customary foods, and the extent to which the income transfer value of donated commodities will be used by recipients to increase food energy and protein intakes. The subsections below summarize some of these data for purposes of illustration only. For one thing, local price data must be continuously updated to reflect changes in trade policies, supply and demand conditions, and world prices. For another, in many cases, Title II participants will be able to substantiate their requests for particular commodities with more specific data relating to the specific program setting.

Value of Selected Foods in Some Countries

As noted earlier, the nutritional cost-effectiveness of commodities which are part of the recipient's normal diet frequently depends on the price of these foods to the recipient relative to their cost to Food for Peace.

Table IV-8 provides some data for selected commodities on local retail average prices and respective average costs to Food for Peace (acquisition plus transfer to port of country). Prices and costs must be adjusted to the same time in order to abstract from inflation. Ideally, current figures would be used; however, since the price data available were for different years, it was decided to make appropriate adjustments to the average of the year 1981 rather than use Food for Peace cost data for an earlier year. When retail

RETAIL PRICES, ADJUSTED FORWARD TO 1981,
AND COST OF COMMODITIES TO FFP (ACQUISITION + TRANSFER)

Country and Commodity		Retail price in year t ($/MT)		Adjusted retail price to 1981 ($/MT)		FFP Cost* 1981 ($/MT)
Egypt (1975)**						
Wheat		90		94		361
Wheat flour		184		193		445
Corn		83		105		333
Rice		264		370		629
Oil (free market)		768		763		954
Oil (ration)		256		254		954
Milk	(Fluid)	410	Fluid	624	(NFD)	598
India (1980)***						
Wheat		188		187		388
Wheat flour		190		189		467
Corn		175		213		331
Rice		279		328		627
Sorghum		162		171		325
Oil		2260		1889		1025
Milk	(Fluid)	442	(Fluid)	403	(NFD)	590
Pakistan (1979)****						
Wheat		162		178		361
Wheat flour		168		185		446
Wheat flour (ration)		96		106		446
Rice		293		451		679
Mustard oil		939		873		954
Milk	(Fluid)	324	(Fluid)	332	(NFD)	590
Philippines (1978)*****						
Rice		266		369		627
Oil		684		693		1025
Milk	(Fluid)	1013	(Fluid)	1150	(NFD)	591

*Includes ocean freight.
**Cochrane (n.d.).
***Ministry of Agriculture, Government of India (1980).
****Pakistan Economic Survey (1978-79).
*****First Nationwide Nutrition Survey, Philippines (1978).

Table IV-8

price data for an earlier year were available, it was decided to approximate the 1981 retail price by assuming its adjustment porportionate to the change in the international price of the commodity. For example, if the international price of rice increased by 50 percent between the average for 1978 and 1981, and the retail price was $200/ton in 1978, a current retail price of $300/ton was assumed. The price estimates thus derived are not precise, of course, because of variations over time in the local/international price ratio due to domestic demand and supply conditions in the commodities, fluctuations in exchange rates, and government import policies. Nevertheless, we regard these estimates as reasonable approximation of the values of the commodities to recipients relative to current Food for Peace costs. They will serve for illustrative purposes.

Several observations about the data reported are noteworthy. First, the FFP cost for delivering grain and grain derivatives is high due to ocean freight rates of approximately $150 per ton for grain shipped in bags. Second, retail prices for grains in the cases surveyed are generally low because the countries are nearly or more than self-sufficient in some grains due to their trade policies. However, in some years when agricultural production conditions are unfavorable, grain prices may be much higher. Finally, in a few countries (Egypt is a notable example), retail prices for most foods are low due to large subsidies paid by the government and large imports obtained on favorable terms from U.S. food aid.

Table IV-9 summarizes the price data from Table IV-8 in terms of values. For milk, it was assumed that one kg of NFDM has 5 times the value of one kg of fluid milk.* The table shows clearly that oil and NFDM appear to be

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*1 kg NFDM reconstitutes into 10 kg of milk, however, it is presumed that NFDM will have a lower value to the recipient than fluid milk.

α VALUES (RATIO OF RETAIL PRICE TO FOOD FOR PEACE COST) FOR SELECTED COMMODITIES AND COUNTRIES

Commodity	Country				Commodity Average
	Egypt	India	Pakistan	Philippines	
Wheat	0.26	0.48	0.49		0.41
Wheat flour	0.43	0.40	0.42		0.42
Corn	0.32	0.64			0.48
Rice	0.59	0.5[illegible]	0.72	0.59	0.61
Sorghum		0.53			0.53
Oil	0.80	1.84	0.92	0.68	1.06
NFDM	5.98	3.42	2.81	9.73	5.48

Table IV-9

attractive commodities in these countries.

Propensity of Household to Increase Energy and Protein Intakes with Additional Purchasing Power

As discussed earlier, in many cases the nutritional impact of Title II commodities is largely due to the indirect consequences of the additional purchasing power they convey. Rarely will it be possible to trace precisely the changes in consumption of particular foods resulting from supplementary food programs. However, such consequences can be inferred approximately from observed cross-sectional survey data on the food expenditures, food consumption, and energy and nutrient intakes of households at different income levels. Such data are collected in a growing number of surveys around the world. There is some direct and indirect evidence, though very sketchy, which suggests that the observed changes in food consumption do not fully indicate the potential changes resulting from supplementing household purchasing power through free or subsidized food rations. If so, the evidence presented here understates the nutritional benefits resulting from the additional purchasing power conveyed through take-home commodities.

The following conclusions are suggested by a review of the literature from household food expenditure and consumption surveys in several countries:

- o Additional purchasing power translates into large increases in food expenditures.
- o The percentage increase in food energy intakes is much less than that in total food expenditures; that is, the cost per calorie of energy rises with income.
- o Some of this increased energy cost is the result of people seeking greater variety and tastier and more convenient foods when the quality of their diet improves.

Table IV-10 summarizes food expenditures based on cross-sectional survey data collected in several countries. The range of income groups considered coincides with groups having reported per capita energy intakes in the range

AVERAGE FOOD EXPENDITURES, ELASTICITIES, AND MARGINAL PROPENSITIES TO SPEND ON FOOD OF LOW-INCOME POPULATIONS IN SELECTED COUNTRIES

Country (Currency)	Monthly Income		Monthly Food Expenditure (and proportion of income)		Income Elasticity of Food Expenditure*	Propensity to Spend Additional Income on Food*
	Low	High	Low Income	High Income		
Bangladesh (Takas)	53.3	74.8	40.1 (.75)	56.4 (.75)	1.00	0.75
India (Rupees)	26.0	38.4	21.7 (.83)	31.4 (.82)	0.95	0.78
Indonesia (Rupiah)	2503	4458	2065 (.83)	3479 (.78)	0.91	0.73
Morocco (Dirhan)	348	504	262 (.75)	357 (.71)	0.84	0.61
Pakistan (Rupees)	26.4	46.4	18.4 (.70)	25.9 (.56)	0.62	0.38
Average					0.86	0.65

*The precise formulae used for calculating the income elasticity of food expenditure and the propensity to spend additional income on food, respectively, are:

$[(X_H - X_L) / (X_H + X_L)] / [(Y_H - Y_L) / (Y_H + Y_L)]$ and $(X_H - X_L) / (Y_H - Y_L)$

where X=expenditure on food and Y=income.

Source: Knudsen and Scandizzo (1979).

Table IV-10

of approximately 1500 to 2000 calories, with the lowest and higher income groups excluded. The analysis concentrates on the low but not the lowest income groups for which data are more reliable and on which supplementary feeding programs are likely to focus. This group comprises between 30 and 50 percent of the total population of the countries.

A noteworthy conclusion from these data is that food expenditures take up generally between 70 and 80 percent of total income, and that the percentage increase in food expenditures closely resembles that in purchasing power. The only notable exception appears to be Pakistan. The explanation could be that in that country, food is heavily subsidized through the ration shops and thus is generally available at relatively lower prices.

Table IV-11 presents data on food energy intakes and elasticities based on data for the same income groups used in Table IV-10. It should be noted that on the average, the energy elasticity is about 55 percent of the food expenditure elasticity. The remaining 45 percent of the food expenditure elasticity is explained by the elasticity of the cost per calorie of energy as income rises. Noteworthy are the observed lower energy elasticities in Indonesia and Pakistan. In Indonesia, a particularly large discrepancy is observed between the food expenditure and the food energy elasticity. Apparently, as income rises there is a high propensity to replace low-cost energy from tubers with high-cost energy from rice. In the case of Pakistan, the low food energy intake, like the low food expenditure elasticity, might be related to the extensive food subsidy schemes operated by the government.

The first column in Table IV-12 shows the cost per 1000 calories of energy in the existing diet of households consuming between 1500 and 2000 calories per capita. These costs are obtained by dividing total expenditures on food per day by the recorded daily food energy intake. As a point of reference, it might be noted that 1000 calories of food energy would cost about 7 cents when

INCOME ELASTICITIES OF FOOD ENERGY INTAKE
AND COST PER UNIT OF ENERGY

Country	Daily Energy Intake		Elasticity	
	Low income (calories)	High income (calories)	Food energy intake*	Cost per unit of energy**
Bangladesh	1543	1927	0.67	0.33
India	1528	1904	0.56	0.39
Indonesia	1712	2057	0.32	0.59
Morocco	1652	2033	0.55	0.29
Pakistan	1739	1993	0.24	0.38
Average			0.47	0.40

*The precise formulae is:

$[(Z_H - Z_L) / (Z_H + Z_L)] / [(Y_H - Y_L) / (Y_H + Y_L)]$

where Z=daily energy intake and Y=income.

**Income elasticity of food expenditure-income elasticity of food energy intake.

Source: Knudsen and Scandizzo (1979).

Table IV-11

COST OF FOOD ENERGY AND MARGINAL PROPENSITY TO INCREASE FOOD ENERGY INTAKES OF LOW INCOME GROUPS IN SELECTED COUNTRIES*

Country	Cost Per 1000 Calories In Existing Diet (US cents)	Additional Purchase Power Required To Augment Existing Diet With 1000 Calories (US cents)	Daily Increase In Food Energy As A Consequence Of One Dollar Additional Annual Income (calories)
Bangladesh	11.3	22.4	12.2
India	6.4	13.7	20.6
Indonesia	11.6	45.0	6.1
Morocco	10.1	27.9	11.0
Pakistan	3.8	23.9	11.6
Average	8.6	25.9	12.2

*The respective exchange rates used per U.S. dollar were as follows: Bangladesh (1973-74), 8.1 Takas; India (1974), 8.0 Rupees; Indonesia (1976), 415 Rupiah; Morocco (1971), 4.6 Dirhan; Pakistan (1971-72), 11.0 Rupees.

Source: Knudsen and Scandizzo (1979).

Table IV-12

obtained in the form of a food grain costing $0.25 per kg. The different costs among countries reflect differences in the composition of their diets and in food prices. To an extent, differences in prices could be related to ambiguities arising from the official exchange rates used in the analysis and from the fact that the surveys were conducted in different years. Overall, it is clear that the diets include little by way of expensive foods.

The second column of Table IV-12 provides an estimate of how much additional purchasing power (additional income) has been required to add 1000 calories of food energy to the existing diet. The relatively high marginal cost is, of course, a direct consequence of the fact that even poor households allocate a sizeable portion of additional purchasing power to non-food expenditures. To the extent that they spend more money on food, they also purchase foods that are more expensive than those in the existing diet. Clearly, if we want to calculate the cost of additional food energy deriveable from an indirect transfer of purchasing power through U.S. food aid commodities, the figures in the second column of Table IV-12 need to be multiplied by the α values described in the previous section. For a commodity which delivers only 50 cents of purchasing power per dollar of food aid cost, the marginal cost may well be on the order of 50 cents per 1000 calories of energy. In contrast, for a commodity which delivers 2 dollars of purchasing power per 1 dollar of food aid cost, the marginal cost may be only on the order of 12 cents per 1000 calories of energy.

The third column of Table IV-12 shows the marginal propensities to increase daily food energy intake out of an additional dollar of purchasing power; i.e., $E_C = \mu_C \cdot r_C$, where μ_C is the income elasticity of energy and r_C is the ratio of the average daily energy intake in the existing diet to the average annual income.

Finally, a limited amount of evidence can be reported here on the extent

to which U.S. food aid commodities are likely to result in an improvement of existing diets through their contribution to food purchasing power. As noted earlier, additional food purchasing power is generally used to buy higher-priced foods than those in existing diets. Some of these foods may be bought because they are preferred or more convenient, but they may contain no more, or even fewer, nutrients per unit of energy. There is ample evidence that the purchase of higher-cost foods results from the propensity both to consume tastier and/or more convenient foods, and to increase the quantity and quality of protein in the diet as higher incomes are earned. To be sure, most of the evidence is statistical in nature, with all the usual measurement and analytical problems. Moreover, it should be noted that practically all observations about the relationship between food consumption and income are based on data from families with different incomes; that is, an act of faith is required to validate the assumption that when a family's income is augmented, that family will adopt the consumption patterns observed among higher-income families in the surveys. Nevertheless, with all these reservations, from the few studies available (Table IV-13) it seems that the percentage increase in protein intake is at least equal to, but more likely higher than, the percentage increase in energy when purchasing power rises.

The results reported in Table IV-13 are based more or less on carefully controlled statistical analyses, adjusting for factors other than income, such as family size and age composition. Table IV-14 reports additional evidence about percentage changes in food energy and protein derived on the basis of reported data about average food consumption levels in low- and middle-income groups. It is particularly noteworthy that there is generally to be an improvement not only in the protein:energy ratio, but also in the quality and variety of the protein sources.

Finally, some evidence about changes in the composition of diets, which is

INCOME ELASTICITIES OF FOOD ENERGY AND PROTEIN

Survey		Elasticity		
		Energy	Protein	
Brazil* (Ceara)	Rural (1973)	0.53	0.74	
	Rural (1975)	0.52	0.68	
	Urban (1975)	0.33	0.51	
Colombia**	Urban	0.69	0.90	
India***	Rural	0.52	0.47	
		0.52	0.55	
			Vegetable protein	Animal protein
Pakistan****	Rural	0.24	0.15	0.63
	Rural low income	0.41	0.24	2.41

*Ward and Sanders (mimeo).
**Pinstrup-Andersen and Caicedo (1978).
***Calculated for data reported in India National Sample Survey: 26th Round (1971-72).
****McCarthy (1976).

Table IV-13

PERCENT INCREASE OF FOOD ENERGY, TOTAL PROTEIN, AND ANIMAL PROTEIN BETWEEN LOW- AND MIDDLE-INCOME GROUPS' DIETS

Survey		Percent Increase Between Low- and Middle-Income Groups' Diets		
		Energy (calories)	Total protein (grams)	Protein from milk meat, fish, eggs (grams)
India*	Kerala	19	45	39
	Andhra	15	16	79
	Karnataka	9	14	54
	Tamil Nadu	5	12	28
Brazil**	Rural	21	19	31
	Urban	35	39	59

*Data reported in Food Habits Survey:Gujarat and Maharashra (1969).
**Data reported in Food Consumption in Brazil: Family Budget Surveys in the Early 1960s (1970).

Table IV-14

apparently related to purchasing power, is directly observable from changes in the proportions of food energy derived from different foods (Table IV-15). Except for an increase in rice consumption in rural Java, we observe no dramatic differences in the composition of diets in India or Brazil.

Summary

Clearly, one cannot provide a single formula for nutritional cost-effectiveness appropriate to all commodities and programs. This chapter has therefore provided many formulae, each appropriate under a different scenario. The concepts forming the basis for this analysis were presented with mathematical notations to facilitate uniformity of analysis.

This presentation has explicitly recognized three major distinct effects on the nutritional well-being of program recipients: the food energy intake effect, the protein intake effect, and the transmittal of purchasing power which is available for nonfood expenditures. It has been shown that under some circumstances, the ranking of commodities is the same on all three effects, while under other circumstances, it is not. If this is so, the selection of one commodity over another requires a trade-off of the different effects, and the specific nutritional objectives of a particular program may suggest alternative commodity choices.

It has also been pointed out that if targeting nutritional benefits for a particular group, say, infants, is important, there are two possible ways of achieving this objective: (a) delivering new foods--those outside the existing diet; and (b) distributing foods in excess of quantities normally consumed. Either method could enhance the nutritional cost-effectiveness of those commodities more likely to be consumed by the intended target than by others in the recipient households.*

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*See Annex C for an extended example.

PROPORTION OF FOOD ENERGY DERIVED FROM DIFFERENT FOOD GROUPS

Food Groups	Proportion of Food Energy Derived from Food Groups	
	low-income	middle-income
	Rural Java*	
Rice	0.37	0.55
Corn	0.36	0.23
Cassava	0.14	0.12
Other	0.12	0.11
	Urban Java*	
Rice	0.74	0.74
Corn	0.06	0.02
Cassava	0.07	0.03
Other	0.13	0.21
	India (Rural)**	
Cereals, potatoes, sugar	0.88	0.85
Pulses, nuts and seeds	0.05	0.06
Milk, meat, egg, fish	0.02	0.03
Oils	0.02	0.03
Fruits, vegetables, prepared foods	0.03	0.03
	India (Urban)**	
Cereals, potatoes, sugar	0.85	0.81
Pulses, nuts and seeds	0.04	0.05
Milk, meat, egg, fish	0.03	0.04
Oils	0.04	0.05
Fruits, vegetables, prepared foods	0.04	0.05

Table IV-15

PROPORTION OF FOOD ENERGY DERIVED FROM DIFFERENT FOOD GROUPS

Food Groups	Proportion of Food Energy Derived from Food Groups	
	low-income	middle-income
	Brazil (Rural)***	
Cereals	0.46	0.43
Roots and tubers	0.23	0.20
Meat, poultry, fish, eggs	0.07	0.07
Milk	0.03	0.04
Fats	0.09	0.11
Sugar	0.12	0.10
Fruits	0.04	0.04
	Brazil (Urban)***	
Cereals	0.50	0.49
Roots and tubers	0.09	0.07
Meat, poultry, fish, eggs	0.05	0.07
Milk	0.02	0.02
Fats	0.16	0.16
Sugar	0.15	0.15
Fruits	0.03	0.04

Sources:
*P. Timmer (1980).
**India National Sample Survey: 26th Round (1971-72).
***Food Consumption in Brazil: Family Budget Surveys in the Early 1960s (1970).

Table IV-15 (concluded)

This analysis has also recognized the different ways recipients use commodities supplied to them, depending on the program mode--on-site feeding or take-home distribution--and on the nature and quantity of the supplied commodity.

For on-site feeding programs, commodities are easily ranked in food energy or protein cost-effectiveness by calculating the cost of the commodities to Food for Peace per unit of food energy and per unit of protein. If the precise cost-effectiveness must be known, or if the net change in the protein:energy ratio in the diet of the target population is a factor, further information is needed about the foods displaced by the donated commodities and about changes in family food consumption resulting from food budget savings (see Table IV-7).

For take-home distribution, there are several cases to consider. First is the prevalent one of commodities supplied which are part of the existing diet and which are supplied in quantities below those already in that diet. In this case, the commodities can be ranked according to any and all nutritional cost-effectiveness criteria simply by determining the monetary value of the commodity to the recipient relative to its cost to Food for Peace, including acquisition and delivery. The precise nutritional cost-effectiveness depends on how the recipient allocates his additional purchasing power to different foods and to nonfood expenditures. However, the amount and quality of any additional food consumed is unrelated to the size and type of commodity package supplied by the program. Second, when a commodity is distributed in excess of the quantity included in the existing diet and the recipient is not likely to exercise the option of resale or substitution for another food, the cost per unit of food energy and nutrients in the different commodities determine their relative cost-effectiveness. Finally, when unaccustomed foods are delivered, such as fortified or blended foods, they are likely to be

consumed in lieu of similar accustomed foods. Since these new foods are usually more costly, they provide less purchasing power to the recipients than similar accustomed foods and hence usually less additional food energy per program dollar; however, they do provide more protein and other nutrients per program dollar. In view of current perceptions about the relative importance of augmenting energy and protein in existing diets, a careful reassessment should be made of whether this loss of food energy and purchasing power per dollar is justified.

Annex A

SYMBOLS USED IN EQUATIONS OF TEXT

E_{C_i}	Change in daily energy intake per program dollar per year spent on commodity i
E_{N_i}	Change in daily protein intake per program dollar per year spent on commodity i
E_{Y_i}	Change in annual income available for nonfood expenditures per program dollar per year spent on commodity i
$E_{C_{ij}}$	E_{C_i} for targeted person j
$E_{N_{ij}}$	E_{N_i} for targeted person j
C_i	Food energy in calories per kg of food i
N_i	Protein in grams per kg of food i
K/C	Cost per unit of food energy in additional foods purchased by recipient
K_i	U.S. Food for Peace cost to deliver commodity i
k	Proportion of budget to be spent on energy-efficient commodity
r_1	Protein:energy ratio in energy-efficient food
r_2	Protein:energy ratio in protein-efficient food
r_d	Desired protein:energy ratio
α_i	Dollar value derived by recipient from a dollar spent by Food for Peace on commodity i
α_s	Dollar value derived by household from providing less food to target individual for each dollar spent on commodity i
α_{si}	Dollar value derived by recipient substituting commodity i for a commodity in his diet from a dollar spent on commodity i
V_i	Dollar value of commodity i to recipient
μ_C	Income elasticity of food energy intake
μ_N	Income elasticity of protein intake
r_C	Ratio of daily energy intake to annual income, C/Y
r_N	Ratio of daily protein intake to annual income, N/Y

m	Proportion of commodity delivered in excess what of recipient would consume if provided with equivalent amount of money
p	Proportion of food fed in on-site program which is not withdrawn from the accustomed diet
n	Number of people in the household
t	Number of children in the household

Annex B

DATA USED FOR ILLUSTRATIONS

Prices

Commodity	Domestic price (per kg)	FFP Cost (per kg)	α
Corn	0.18	0.30	0.60
Wheat	0.21	0.35	0.60
Rice	0.45	0.60	0.75
NFDM	3.00	0.60	5.00
Oil	1.35	1.00	1.35
Wheat flour	0.22	0.40	0.55
Sf wheat flour	0.22	0.44	0.50
CSM	0.22(substi-tute)	0.55	0.40

Other Parameters

For Household

$\mu_C = 0.5$

$\mu_C = 0.8$

$r_C = 18$

$r_N = 0.5$

For Target Group (child)

$\mu_C = 0.5$

$\mu_N = 0.8$

$r_C = 12$

$r_N = 0.4$

$C_j = 1200$

$\bar{C} = 1800$

Annex C

Example: Comparison of CSM and oil in a take-home program when the child is targeted to receive a greater share of household food.

In this comparison, even if all the CSM is in fact fed to the child, while the oil is consumed by all members of the household, nutritional cost-effectiveness depends on the magnitude of the donated food and on the relative deficiencies of energy and protein. The appropriate cost-effectiveness formulae are as follows:

<u>for energy:</u>

$$E_{C_{ij}} = \frac{p \cdot C_i}{365 \cdot k_i} + \frac{(1-p)}{n} \frac{C_i}{\bar{C}} (\alpha_i \cdot \mu_C \cdot r_C)$$

<u>for protein:</u>

$$E_{N_i} = \frac{N_i - (1-p)N_s}{365 \cdot k_i} + \frac{(1-p)}{n} \cdot \frac{N_i}{\bar{N}} (\alpha_i \cdot \mu_N \cdot r_N)$$

Note that in the case of CSM, α_i is the local value of the food currently fed to the child relative to the cost of CSM, while the value of p depends on the amount of CSM delivered by the program. For instance, assuming the program delivers 400 grams of CSM per day and the amount of food currently consumed by the child and being fully substituted is 320 grams, and further assuming that the energy per unit of CSM and the food in the child's existing diet are the same, the value of p is 0.2. If an amount of CSM less than 320 grams is delivered, the value of p is o (n is the size of the household and is assumed to be 5, $C_j = 1200$, $\bar{C} = 1800$, N = 30, N = 50, and oil = 1.5).

Approximate results are reported in Table IV-16. The major conclusion is that CSM will deliver more energy than oil to the child only, provided that the program is large enough to ensure that a substantial net increase of energy by the child can be obtained; the mere fact that all the CSM is consumed exclusively by the child is not a sufficient condition. However, CSM will always deliver more protein to the child than oil when it is consumed only by the child (Table IV-16). Another conclusion is that the cost per net additional unit of energy to a targeted individual is very high in a take-home food program (see Table V-17). For comparison, the cost per 1000 calories in CSM is 14 cents, while in oil it is 11 cents; the cost per 100 grams of protein in CSM is 27 cents.

COMPARISON OF EFFECTS FOR OIL AND CSM

Annual Size of Program	Changes in Daily Intake			
	Child		Others in Household	
	energy (calories)	protein (grams)	energy (calories)	protein (grams)
$80/year				
CSM (145 kg)	348	53	172	10
Oil (80 kg)	95	6	624	42
$40/year				
CSM (73 kg)	13	24	88	6
Oil (40 kg)	48	3	312	21

Table IV-16

COMPARISON OF COSTS FOR CSM AND OIL

Annual Size of Program	Cost Per Unit of Energy ($/1,000 calories)	Cost Per Unit of Protein ($/100 grams)
$80/year		
CSM	0.63	0.41
Oil	2.28	3.65
$40/year		
CSM	8.43	0.46
Oil	2.28	3.65

Table IV-17

CHAPTER V

APPLICATION OF THE PRINCIPLES OF COMMODITY SELECTION

Introduction

One of the potentially most important and beneficial US foreign aid programs in terms of direct combat of world hunger and poverty is Public Law 480, Title II. Yet, PL 480, Title II costs very little. At the current level of the program--approximately 750 million dollars per annum (1981)--its budget constitutes approximately 30 percent of total food aid and less than 10 percent of total foreign aid. For as little as 3 dollars per year per person in the U.S., this program now provides 55 million people, among the poorest in the world, an improvement in the nutritional content of their diet.

The Subcommittee's charge was to conduct a nutritional evaluation of the commodities provided under PL 480. After careful consideration of alternative approaches, the Subcommittee elected to focus on the nutritional cost-effectiveness criteria presented in Chapter IV and to ask the question, "Is the selection of particular commodities likely to affect the relative nutritional cost-effectiveness of a food distribution program?" The answer was strongly affirmative. However, in the course of the Subcommittee's analyses, it became apparent that the relative nutritional cost-effectiveness of individual commodities can be expected to be affected by both the mode of distribution and the cultural setting. The system for commodity selection developed by the Subcommittee takes these variations into account.

Achieving maximum nutritional benefit will require a change in our understanding of the way food distribution programs function. As indicated in

Chapter IV, it is necessary to distinguish between those situations in which nutritional benefits are a direct consequence of the amount and nutritional quality of the foods provided, and those in which nutritional benefits are indirect, mediated by changes in family income and hence in food use. This principle can be applied to the judicious selection of commodities.

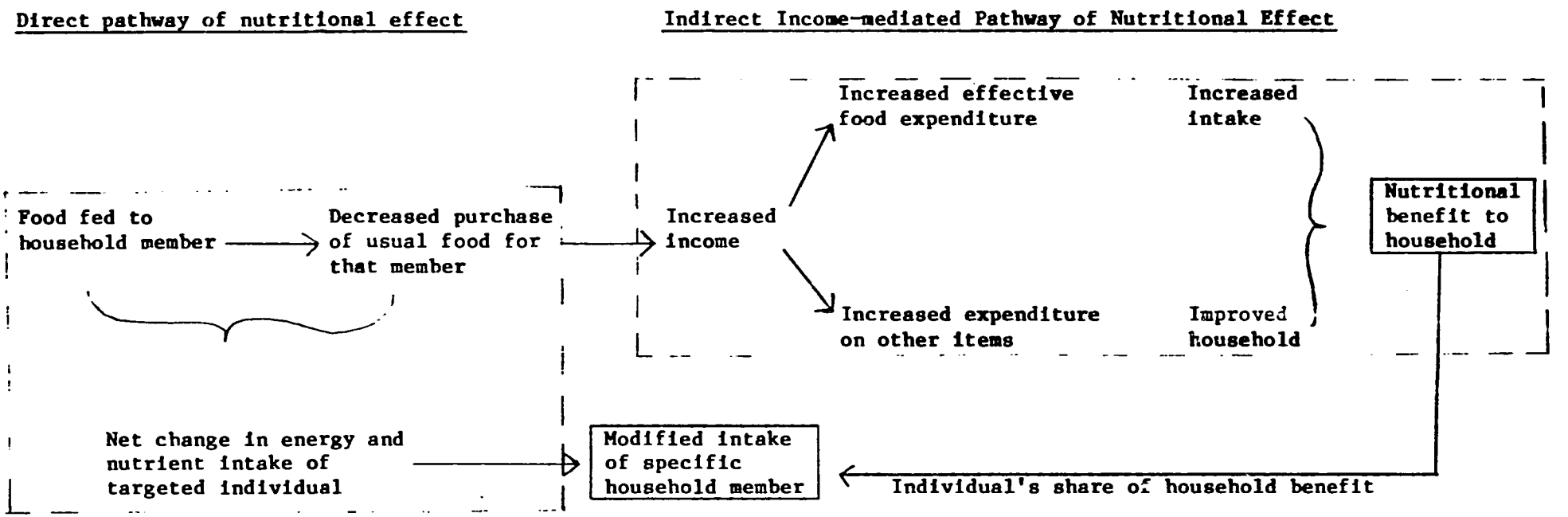
Applying this principle will require reconsidering and perhaps redefining the operational objectives of field programs, without changing their ultimate goal--the improvement of nutritional health and the fostering of community development. It will also require collecting additional information about the community served and changing the operational classification of program modes. Because this approach is innovative and only partially tested, it would be prudent to proceed in these new directions slowly, with appropriate examination of the results. It is noted that some of the directions advocated are currently being tested. As experience accumulates and the directions are refined, the pace of implementation can be accelerated.

Pathways of Nutritional Effects

The early concept of food distribution programs was that the food distributed directly augmented the diet of the recipient and thereby added both energy and nutrients. The displacement of foods consumed in the absence of the program, or the sharing of foods provided within the household, were seen as undesirable losses from the intended beneficiary. There is ample evidence that "sharing" does occur in every situation except that involving total feeding, as in residential care. The earlier concept also focused upon benefits reaching a "target individual" and tended to overlook benefits to the "target household." In the judgment of the Subcommittee, a broader perspective on the pathways of nutritional benefit is needed if sound decisions on commodity selection are to be made. In Figures 2A and 2B, an

PATHWAYS OF NUTRITIONAL EFFECTS IN FOOD DISTRIBUTION SYSTEMS

ON-SITE FEEDING PROGRAMS AND SPECIFICALLY TARGETED COMMODITIES IN TAKE-HOME DISTRIBUTION*

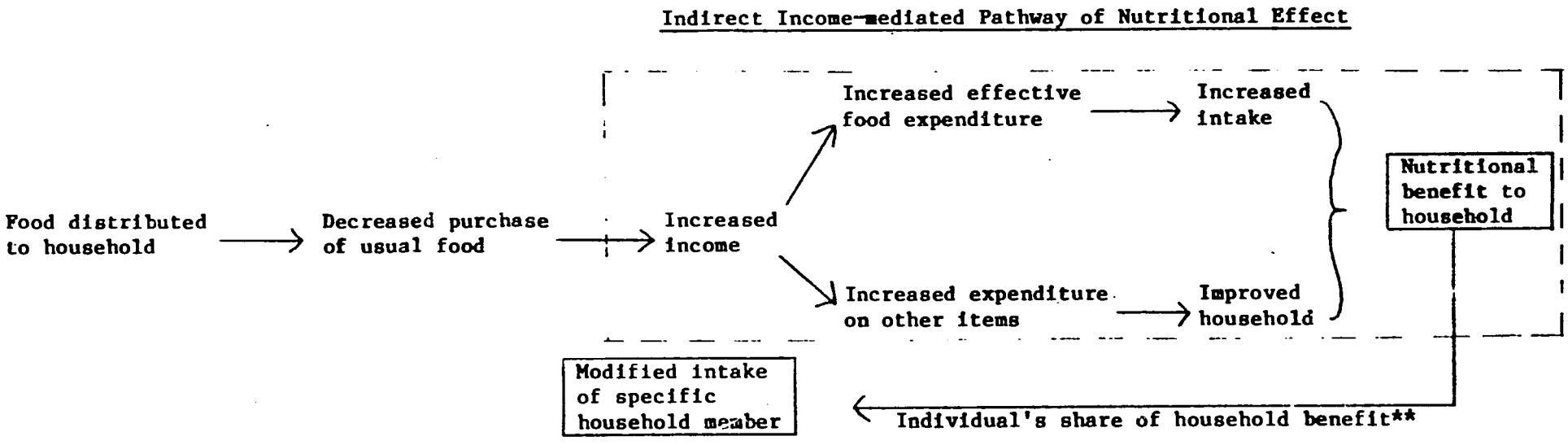


*In programs in which the commodity is ingested directly by the individual (target individual) some of the food he would usually consume is displaced. The direct nutritional effect is the net difference between food ingested and food displaced. As noted in Chapter II the magnitude of this effect is likely to be quite different for energy and for nutrients. The displaced food gives rise to an indirect income-mediated effect (See Fig. 2B)

Figure 2A

PATHWAYS OF NUTRITIONAL EFFECTS IN FOOD DISTRIBUTION SYSTEMS

TAKE-HOME DISTRIBUTION PROGRAMS WITHOUT SPECIFICALLY TARGETED COMMODITIES*



*In programs distributing food to a household, the distributed food replaces food that would have been purchased thereby increasing income. A large part of this additional income is used to purchase additional food (with consequent increase in both quantity and quality of food). Particular programs may succeed in directing an increased share of the general household benefit to a specific individual (this model still applies). To the extent that a program succeeds in directing a distributed commodity to an individual, the model portrayed in Fig. 2A applies to that commodity. Fortified foods present a different situation and are discussed in the text.

**Benefit to individual depends upon pattern of intrahousehold distribution and may be increased by educational components of the program.

Figure 2B

attempt is made to portray these multiple pathways, providing a background for this perspective.

Foods distributed and consumed by recipients will directly influence their nutrient intake to the extent that ingestion of these foods exceeds displacement of those usually consumed. This is portrayed as the direct pathway of nutritional effect in Figure 2A. As discussed in Chapter II, the magnitude of the effect is likely to be greater for nutrients than for energy as long as the distributed foods have a higher nutrient density (nutrients/1000 kcal) than the displaced foods.

Foods reaching the household either by the displacement effect mentioned above or by general distribution of commodities to the household seem to exert their nutritional effect by a different, indirect and income-mediated pathway. The distributed food represents an increase in real income (derived from a decreased need to purchase those or equivalent foods). In turn, this increased income permits the household to acquire additional food; empirically, this is reflected as an increase in both the quantity and quality of food consumed, a benefit shared among the individuals within the household. In addition, some of the increased income will generate nonfood household expenditures and potential improvements in the overall household environment. This indirect pathway of nutritional benefits is portrayed in Figure 2B and, as a derivative of the displacement phenomenon, in Figure 2A. In populations similar to those receiving food aid, the propensity to use additional income for increased food expenditure is very high; thus an increase in both quantity (energy) and quality (nutrients/1000 kcal) is to be expected. Empirical evidence supporting this assertion is presented in Chapter IV.

These perspectives may be applied to the classical modes of food distribution. In on-site feeding programs, both the direct and indirect

pathways of nutritional effect operate (see Figure 2A). When energy intake is considered, empirical evidence (Chapter II) suggests that the indirect pathway will dominate; that is, displacement of usual food will nearly balance consumption. Conversely, when nutrients are considered, even in the presence of full energy displacement, the individual will benefit to the extent that the nutrient content of the ingested food exceeds that of the displaced food (Chapter II). This direct benefit may be the dominant pathway for change in the individual's nutrient intake.

In take-home distribution programs, the dominant pathway of nutritional effect for both energy and nutrients is indirect (Figure 2B). Within this framework, the share of household benefits directed toward particular individuals (intra-household distribution) may be influenced by program educational activities; however, this does not alter the pathway of effects. Some programs may succeed in targeting the consumption of specific commodities by particular individuals (targeted commodity within a take-home distribution program). To the extent that this succeeds, the pathway portrayed in Figure 2A rather than that in Figure 2B would apply to that commodity. However, this is probably possible only for weaning foods. A special situation arises with fortified foods that replace non-fortified foods within the household. In this case, there is a direct pathway of nutritional benefit accruing to the household to the extent that the nutrient content of the fortified food exceeds that of the usually consumed food. This is not portrayed in Figure 2A or 2B but is discussed later in the present chapter.

There are important implications of these perspectives of the manner in which programs operate. As indicated in Chapter IV, nutritional cost-effectiveness depends upon the pathway of effect that is operating and upon the specific objective that is sought--the relative priority assigned to increase in energy (and general nutrient) intake vs. increase in specific

nutrient intake. It therefore follows that the definition of these objectives should influence the selection of program mode.* Thus to apply nutritional cost-effectiveness to commodity selection, the program planner must define for the particular program two important dimensions:

- o Program Mode
  - -- direct feeding and specifically targeted commodity in take-home distribution
  - -- non-targeted commodity in take-home distribution
- o Nutritional Objective
  - -- increase in energy and general nutrient intake
  - -- increase in specific nutrient intake

Once these dimensions have been defined, the principles of nutritional cost-effectiveness developed in Chapter IV can be applied in ranking commodities for particular programs.

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*While it is not the purpose of this report to evaluate program effectiveness or comment upon program design, two features are to be noted. Chapter IV provides an approach to evaluating the nutritional cost-effectiveness of all types of food distribution programs. It repeatedly emphasizes the need for defining program objectives (priorities for increases in energy intake, nutrient intake, and overall buying power) in choosing commodities and, more importantly, program modes. From these considerations, and those in Chapter III, it should be apparent that if nutrient supplementation of a target individual is a high priority, take-home distribution should seldom be the preferred program mode. Direct feeding (targeted nonconvertible commodities) will be more effective in achieving this specific priority (usually at the expense of one or the other of the remaining objectives). If the program priority relates to an increase in energy intake of a target individual, there is limited clear preference for either direct feeding or take-home distribution; however, there is justification, with either program mode, for activities which would increase the target individual's share of household benefits. When the program objective focuses upon target households rather than target individuals, the preferred mode will almost always be take-home distribution. Thus, it will usually be very cost-ineffective to attempt to achieve a particular goal through the wrong type of program, e.g., nutrient supplementation through the indirect type of food distribution. It is therefore evident that program goals must be clearly defined before program type, mode, and commodities are selected.

Recommended Approach to Commodity Selection

General Considerations and Nutritional Objective Definition

Commodity selection must begin at the level of the recipient country and with a knowledge of the community in which the distribution program is to operate. Selection must take into account explicitly defined program goals; existing food practices and the general nutritional situation; the list of commodities available through PL 480 Title II and their costs; program mode (on-site feeding and take-home distribution with specific targeting of one or more commodities, or take-home distribution without specific targeting of commodities); and finally, which commodities can be made available from other sources for inclusion in the food distribution program.

Since the immediate objective of food distribution programs may be seen as improvement in energy and nutrient intake, it is appropriate to consider the definition of goals in terms of these parameters. In Chapter III, a tentative guideline for desirable quality (nutrients per 1000 kcal) of diets was presented (Table III-3). If a definitive diagnosis of the particular community situation is not available, this guideline may be used cautiously as a tool in assessing existing food intakes. Consideration of the pattern of food intake against this guideline should assist in the selection of program goals and hence in the choice of commodities for the program.*

The first criterion of commodity choice must be suitability of the

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*When it appears that there are serious shortages of nutrients other than protein, it may be more cost-effective to consider direct nutrient supplementation as a companion program rather than to address the specific nutrient deficiency through commodity selection. In the case of protein, however, direct supplementation is not feasible, because of the volume of supplement required. Obviously, if a decision is made to use a protein-fortified commodity or a blended food, inclusion of a reasonable spectrum of other nutrient supplements is appropriate and probably cost-effective, recognizing that it will not be practical to adjust commodity nutrient levels for individual programs.

commodity for the intended recipients. The factors affecting suitability such as familiarity and desirability, were discussed in Chapter II. It is not clear that all these factors have been considered in sufficient depth in past selection practices, or that their significance has been adequately tested in operational research. A specific example may be the possible influence on commodity choice of the relationship between a commodity's perceived value and the time or fuel required in its preparation. If the intended beneficiaries are infants, consideration should be given to the physiological and nutritional suitability of specific commodities for that age group, as discussed in Chapter III. If lactose intolerance is a problem in the recipient population, there may be a limit to the amount of milk that should be distributed for consumption in a single meal. Clearly, suitability as a factor in commodity selection must be considered by those familiar with the community in which the distribution program is to operate. It is axiomatic that foods already in use in the community will be acceptable; it is the introduction of new foods or the distribution of increased quantities of existing foods that must be considered with care. Conversely, commodities that are deemed unsuitable for a particular community should be excluded from further consideration.

The second factor in the initial ranking of commodities should be their nutritional cost-effectiveness. This does not appear to have been a major conscious consideration in the past. It is the recommendation of the Subcommittee that nutritional cost-effectiveness be carefully considered by those selecting Title II commodities. It is on the basis of this consideration that we see a major opportunity for improving the cost-effectiveness and hence overall benefit of PL 480 Title II programs.

It is to be emphasized that these considerations are program- and country-specific. Commodity selection must begin at the level of the community.

Nutritional cost-effectiveness relates to FFP costs; however, these may not be given much weight by the voluntary agencies unless they have been offered commodities on the basis of those costs. That is, only if the voluntary agencies participate in the budget process, will it be in their best interest to use nutritional cost-effectiveness as one of their selection criteria, thereby maximizing program benefits.

The above considerations apply to all program modes. Below are discussed considerations that operate differently depending on program mode.

Program-specific Considerations

Nutritional Cost-effectiveness Ranking for On-Site Feeding and for Targeted Commodities in Take-Home Distribution Programs. On-site feeding programs provide a meal or snack as a general complement to food consumed at home. For this purpose, they should have nutrient concentrations per 1000 kcal that reasonably approximate the reference pattern suggested in this report (Table III-3). In situations where it is believed that the meals at home have inadequate concentrations of one or more nutrients, the distributed meal or snack should contain proportionately increased concentrations of the nutrient(s). Thus, as a first step in commodity selection, the nutritional quality of the foods consumed at home should be estimated and the proportion of total energy intake to be supplied by the distributed foods predicted. On the basis of this information, a target nutrient composition of the mixture of foods to be included in the meal can be designed. An analogous approach applies to a targeted commodity within a take-home distribution program.

Once these determinations have been made, commodities should be selected on the basis of least-cost formulation to meet the defined nutrient concentration criteria for the composite meal. This approach will yield maximum cost-effectiveness.

When only one nutritional parameter is considered, the approach is relatively simple. The data on current costs per unit content presented in Table C-1 may be converted to the one-dimension ranking portrayed in Table C-12. In this simple approach, the initial selection is made from among suitable commodities (see previous section) to give the least cost per 1000 kcal or per 100 g protein. The selection is then tested by calculation of other nutrient variables, to ensure that it meets or approximates the nutritional standards described in Table III-3. If there are short-falls, the selection can be modified on a trial-and-error basis.

A better approach examines all the nutritional variables of interest, also taking into account commodities that might be provided from local sources or from other foreign aid programs. Thus, a school lunch program might include commodities from several sources and be expected to meet appropriate nutritional standards with least cost. Commodity selection for maximum cost-effectiveness becomes a complex process in this situation. It is suggested that FFP work closely with country programmers to derive suitable, least-cost commodities.

In direct feeding programs, it is essential that not only energy and protein be considered, but also the total nutrient content of the distributed foods. The commodities selected should, when added to the home diet, be adequate in all nutrients. As noted above, if specific nutrient inadequacies cannot be met by available foods, concurrent direct nutrient supplementation should be considered. The total energy content of the supplied foods will usually be determined by program goals. For example, in school feeding, it may be appropriate to provide 25-30 percent of the estimated daily energy requirement; in the distribution of complementary foods for infant feeding, the amount distributed may progressively increase with the age of the infant

and the expected stages of weaning.

Nutritional Cost-Effectiveness Ranking for Non-Targeted Commodities in Take-Home Food Distribution. As is apparent from Figure 2, with non-targeted commodities added to the general household food supply, nutritional benefits may be expected to flow via the income-mediated pathway. The nutritional cost-effectiveness considerations pertaining to this pathway have been discussed in detail in Chapter IV and are only summarized here.

As long as the commodities distributed are already being consumed, and are supplied below existing consumption levels, their nutritional benefits (increase in energy and nutrient intake, and provision of nonfood household expenditure) will be maximized when the total value of the commodity package to the recipient family is maximized. It follows that nutritional cost-effectiveness will be maximized when the ratio of local value to FFP cost (acquisition plus shipping) is maximized. In this report, this ratio has been designated as the α value.

To rank commodities according to their α value, the following information is needed:

- o local market value of the food, or a similar food for which it will substitute
- o cost (acquisition plus shipping) to FFP
- o existing level of monetary expenditures for the food by targeted households

The first two items provide data required to calculate α values, while the third sets the limit on the amount to be distributed. In a commodity package, these calculations would be made for each commodity provided.*

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*Conceptually analagous α values exist at the level of the voluntary agency and at the level of the beneficiary. The former is considered in the discussion of logistics, the latter in the discussion of suitability in the household's decision to participate (see Chapter II).

As long as the distributed commodity is already in use and is supplied at levels below existing usage, the α value ranking is a robust predictor of relative nutritional cost-effectiveness. This is the situation described as full covertibility in Chapter IV. It is a situation in which no sale or barter is involved; the distributed food provides income by replacement of normal purchase. Nutritional benefit may be greater than that predicted by the analysis in Chapter IV since this additional income is likely to be managed by the person who normally purchases food; that is, the proportion allocated to the purchase of additional food may be even greater than that suggested in Chapter IV.

When the conditions stipulated above are not observed--that is, when a "new" food is distributed or when the food is distributed in greater amounts than those usually consumed--the α values are less reliable as predictors of relative nutritional cost-effectiveness. In this case, additional experience specific to the community in question will be needed before the pathway of nutritional effects can be predicted with confidence. Empirically, however, it seems likely that general nutritional cost-effectiveness will fall when unfamiliar foods or excessive amounts of familiar foods are distributed.

An important principle is omitted from the above discussion. By carefully selecting "unfamiliar" foods, it may be possible to trade off general nutritional benefits for specific nutritional benefits. The use of protein- (and other nutrient-) fortified cereals is a classic example. When a fortified cereal is distributed and replaces the unfortified cereal used in the household, it provides a specific increase in household intake of the added nutrients. Because the fortified cereals cost more to FFP, the α value is reduced. In effect, some of the general nutritional benefit (in this case, increased energy intake and increased nonfood expenditures) is traded off to gain a greater increase in a specific benefit (more intake of protein and

other added nutrients). In this example, the cost differentials are small and the trade-offs marginal; in other cases, such as the use of blended foods, the cost differentials and trade-off loss of benefits may be very large.

As noted earlier, such decisions must be based upon a clear understanding of specific community conditions and program objectives. However, it is the general recommendation of the Subcommittee that in take-home food distribution programs, suitable commodities be ranked for selection in accord with their calculated α values. Only when there is clear indication of the need for a specific nutritional benefit should there be a departure from the α value approach to commodity ranking. As discussed earlier, when programs are designed to target the consumption of particular commodities by selected individuals, those commodities might better be selected by a least-cost formulation approach.

It is suggested that FFP might assist in implementating this approach by collecting on-going information about local values of commodities on the PL 480 Title II list, and by undertaking calculations to demonstrate how the values and hence nutritional cost-effectiveness of existing commodity packages might be increased (see Annex A).

Other Considerations in Commodity Selection

Program Complementarity. In many take-home programs, an important consideration is providing mothers with a complete array of foods necessary to implement recommended child feeding practices. In this case, there is an implicit trade-off between providing a maximally cost-effective package and a "complementary" package. The Subcommittee recognizes the appropriateness of such trade-offs and would urge program planners to ensure that the program goals are appropriate, realistic, and achievable before sacrificing nutritional cost-effectiveness.

Educational Goals. Part of the community development aspect of many programs is providing technical assistance in education. In many programs, both take-home and on-site feeding, nutrition education includes demonstrating the usefulness and nutritional value of specific commodities, with emphasis often placed on foods of low monetary value in the local market. In such cases, the voluntary agency may be willing to sacrifice a significant part of the potential nutritional cost-effectiveness of the program for longer-term benefits to the community. This should be done only with full appreciation of the significance and magnitude of the trade-off involved.

Logistical Considerations. Conceivably, there are situations in which the voluntary agency does not wish to distribute a particular commodity because of logistical problems related to its handling or local preparation. When such constraints are real, they should be considered as factors affecting suitability rather than the ranking of commodities. That is, commodities that cannot be handled by the voluntary agency, just like commodities that are unacceptable to the recipient households, should be eliminated in compiling the list of commodities considered suitable for the ranking process.

Clearly, in the approach to direct feeding programs discussed above, the least-cost formulation must be tempered by both preparation and palatability of the final meals. Even though individual commodities may be deemed "suitable", the acceptability of the proposed combination as a meal must be considered.

Determinants of Amounts and Types of Commodities (ration package)

In on-site feeding, the commodity ration package, described in terms of the food energy equivalent, is likely to be determined in terms of physiologic considerations. For example, a school lunch program might be designed to provide 25-30 percent of the estimated energy needed; an infant weaning food

might be distributed according to estimates of the needed level of complementary feeding.

Another dimension is important--the incentive value of the ration package. In on-site feeding programs, this is likely to be measured mostly in terms of palatability and desirability of the meals offered. In take-home distribution programs, and to a lesser degree in on-site programs, incentive value is likely to relate to locally perceived economic value. That is, the distributed ration package must be worth the lost income opportunity and the effort to collect or use the food. No firm guidance on incentive value can be offered at this time. The relationship between local value of a commodity ration package, local opportunity costs, home preparation costs, and participation rates might be investigated in existing programs. Until better information is available, it might be suggested that the local value of a distributed commodity ration package at least exceed an average day's wage in the community.

Opportunities for Improving Nutritional Cost-effectiveness of PL 480 Title II Programs

In this report, two basic approaches to improving nutritional cost-effectiveness of PL 480 Title II activities are proposed. In direct feeding programs, least-cost formulation of the mixtures of foods is recommended. This might result, for example, in the use of NFDM and cereal rather than a blended food for infant weaning, given the present low cost of NFDM to FFP. For non-targeted commodities in take-home distribution, the recommended approach involves maximizing the α value of the commodity package. At present, and for many settings, this might result in an increased use of NFDM and vegetable oil and decreased use of cereals, as will be discussed below.

When the present mix of programs supported by PL 480 Title II commodities is considered, it is apparent that the take-home distribution mode is dominant

(Table C-7). Thus, FFP might well direct considerable attention to the arguments concerning α value ranking. For this reason also, the Subcommittee sees the α value approach as offering the greatest potential for improvements in the nutritional cost-effectiveness of Title II programs.

In applying these principles within program settings, it is important to remember that α values will be community- and country-specific since local prices are influenced by a number of factors, including government policies. α values will also vary with the U.S. economy and world trade insofar as these affect acquisition and shipping costs. Clearly, it is necessary that local prices be monitored on an ongoing and country-specific basis; there can be no rigid or universal ranking of commodities. Optimizing α values for a specific program by making frequent changes in the commodity package will have to be weighed against the desirability of maintaining continuity. In all likelihood, changes will have to be made gradually, and less than maximal α values accepted.

The tentative data assembled suggest a wide range of α values for commodities currently in use. Grain and grain-based processed foods deliver between $0.30 and $1.00 in purchasing power for a dollar spent by FFP; in selected countries, oil delivers between $1.00 and $1.80 and NFDM between $3.00 and $9.00 for the same program dollar. The α values of grains are low because supplies of grains are generally abundant, and retail prices are held at a low level in many countries as a matter of government policy. The α values of grains and grain-based commodities are also low because high shipping costs represent as much as 25 to 50 percent of the total delivered cost of these items. On the other hand, the α value for oil is high because oil is a scarce commodity with a high price in many countries, and because shipping represents only 15 percent of the total delivered cost. NFDM has an extremely high α value because it is the only commodity currently in

surplus and therefore costs the program a fraction of its market value.

Annex D provides calculation of α values for existing commodity packages for a few countries. Compared with the theoretical maximal α values, these figures show that these programs are operating at well below maximum cost-effectiveness. Undoubtedly, a part of this inefficiency is the result of intentional trade-offs for other program goals (e.g., health and nutrition education). However, part of the inefficiency may be attributed to a failure to apply nutritional cost-effectiveness criteria in selecting commodities for existing programs. In the judgment of the Subcommittee, the data in Annex D are reasonably representative of many existing programs, and serve to document the potential for improvement of nutritional cost-effectiveness of PL 480 Title II programs.

Within a fixed budget, increased acquisitions of oil and NFDM would result in decreased purchase and shipment of other commodities. Grains (fortified and unfortified) would probably be decreased since these generally have low α values. Such a shift in commodity selection could result in a substantial increase in the nutritional cost-effectiveness of the whole Title II program. However, there are constraints to the maximization of α values, as detailed below.

An Overriding Constraint To Implementation: The Budget-Tonnage Imbalance

At present, the minimum tonnage requirement, already mentioned in Chapter II, has a great impact on commodity choice; as shown below, this impact is likely to be even greater in the immediate future. The voluntary agencies consider the minimum tonnage to be a safeguard against budget cuts (an assurance of the continuity of their programs). An effect of the current high minimum tonnage requirement, coupled with the present Title II budget, is to

place a strong disincentive on the distribution of high-cost commodities, regardless of their cost-effectiveness. At present, the voluntary agencies seem prepared to sacrifice not only this overall value, but also a substantial amount of potential savings in transfer costs due to the lower volume of food handled when higher-priced commodities are selected.

It is with a strong sense of concern that members of the Subcommittee observed the contradictions involved in the increase in the minimum tonnage limitations along with the announced PL 480 Title II budget reduction for 1982. What was already a serious hindrance to improving the effectiveness of the FFP program would now appear much more serious. It would seem, in fact, that the nutritional cost-effectiveness of the program can only diminish, and that opportunities to apply the principles identified in this report will be minimal.

The situation for the immediate future is shown dramatically by the data presented in Table V-1. The 1982 budget is $724.2 million, while the revised tonnage increased to 1.77 million tons. The budget available per metric ton thus becomes $409. Only some commodities on the present list have an FFP cost (acquisition + ocean freight) below this level. If this situation remains unchanged, or the budget is reduced (for FY'83 the administration's budget request is $650 million and the legislated minimum tonnage is 1.7 million) it is clear that shipments of the less expensive commodities will have to increase dramatically, while shipments of all other commodities will have to fall. In most recipient countries, the less expensive commodities have predictably low α values. The nutritional impact of Title II programs may be expected to decrease in a proportion even greater than that of the budget cut. While partial implementation of the principles in the present report might offset this somewhat, there is too little room to achieve any major impact.

SOME COST CONSIDERATIONS, 1982

Budget allocation, revised	$724.2 million
Tonnage allocation, revised	1.77 million
Budget available per tonnage equivalent	$409

ANTICIPATED COMMODITY COSTS, 1982
(including $150/T shipping cost)

Commodity	Cost $/MTGE*
Whole grains excluding rice	315
Rice	600
Bulgur	380
Sf Bulgur	445
CSM	526
Cornmeal	305
Sf Cornmeal	347
Sf Sorghum Grits	311
WSB	899
NFDM	570
Oil	986

*Metric Ton Grain Equivalent (MTGE) refers to the amount of grain needed to produce a unit of processed food; e.g., 130 kg wheat produces 100 kg wheat flour.

Source: Food for Peace (1982).

Table V-1

The Subcommittee therefore concludes that there is an urgent need to reconsider the Title II budget and minimum tonnage requirement to allow for implementation of the principles presented in this report. This would establish an improved cost-effectiveness picture, while at the same time providing foods that meet the needs of the beneficiaries of this important people-to-people program. In considering the budget allocated to this program, the government should recognize not only the program's significance as an instrument for promoting community development in the Third World and for building a favorable U.S. image overseas, but also the fact that the program's cost to U.S. taxpayers is much less than the budget might seem to imply. There are considerable economic benefits to the United States in association with this program. Consideration of employment generation and taxation returns from the production, handling, and processing of the distributed commodities considerably reduces the net cost to the U.S. taxpayer.*

Reconsideration of the Title II budget and tonnage requirements will call for collaborative discussion among voluntary agency representatives, FFP staff, and government planners, with the objective of generating and maintaining a consistent policy. It is recommended that a cost-effectiveness analysis be considered for commodities submitted for inclusion on the commodity list. The present cursory analysis suggests that nutritional cost-effectiveness can be significantly improved, perhaps even doubled, if other factors such as logistics, program complementarity, and educational goals are not major constraints and if minimum tonnage requirements do not

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*A recent staff report of the U.S. Department of Agriculture entitled "Expanding the Products Share of the U.S. Agricultural Exports" (Schluter and Clayton, 1981) explored the multiplier effect of the value-added concept in the processing of agricultural commodities in the U.S. prior to export.

override nutritional cost-effectiveness considerations.

Recommendations

The following recommendations were drafted by the Subcommittee to assist the Office of Food for Peace in implementing a sound, nutritionally cost-effective program. It must be emphasized that the mandate for the Subcommittee included only voluntary agency and World Food Programme feeding programs. Although, the same commodity list is also used for disaster relief and emergency feeding, these programs were not considered for the present report.

- o The nutritional cost-effectiveness of all on-going food distribution programs should be monitored.
- o It is recommended that a modified program classification scheme be developed and implemented. This modification should permit differentiation between programs in which the distributed commodity is expected to be consumed by a target individual and those in which an increased share of family food is expected. This differentiation is necessary to applying the nutritional cost-effectiveness principles of the present report.
- o A system should be implemented to provide for on-going re-evaluation of commodities on the availability list, as well as of commodities proposed for the list, according to the guidelines established in this report.
- o Some specific recommendations for re-evaluation of commodities on the availability list or possible additions to the list follow:
  - -- Availability of a milk-free blended food is desirable for areas where lactose intolerance problems may be encountered.
  - -- Soy fortification of rolled oats is unnecessary; consideration should be given to adding unfortified rolled oats to the list.
  - -- For the formulation of weaning mixtures, consideration should be given to adding nutritive sweeteners (e.g., sugar or corn syrup) to the commodity list.
  - -- WPC-soy should not be used for children under one year of age; given its high cost in comparison to similar products, it is not a cost-effective commodity.

-- Consideration should be given to including vitamin/mineral premixes, and vitamin/mineral supplements.

-- Whole grain sorghum should only be given to populations that have traditionally used it; sorghum in the form of grits can be used where it is acceptable.

o In keeping with existing policies, it is recommended that voluntary agencies in recipient countries be given greater authority to select commodities according to the guidelines proposed in this report; this would include responsibility for making selections conform to current budget and tonnage requirements.

o Conceptually, the minimum tonnage protects the program against inflationary reductions. In 1983, with a proposed budget of 650 million and the legislated minimum tonnage of 1.7 million, it is not possible to operate a cost-effective program. The budget and the tonnage must be aligned so that nutritionally cost-effective programs can be operated.

o Field studies are needed to evaluate the appropriateness of particular commodities and minimum commodity package sizes in meeting nutritional and participation goals, particularly in take-home programs. More specifically, data are needed on the following:

-- What happens to the food from the time it is received by the recipient until it is consumed; i.e., what proportions are consumed, shared, sold, or bartered? What is the intra-household distribution of food in general, and specific commodities in particular? How does this affect the way commodities reach targeted individuals?

-- What income is freed, and how is it spent? What proportion is spent on food vs. nonfood items? What is the nutritional content of the foods purchased with the displaced income? What are some minimal criteria of package size and composition to encourage program participation?

-- What is the significance of the change in intake? What extra energy, protein, or other nutrients are consumed as a result of the donated foods which displace or replace other foods for targeted individuals or households? What criteria besides anthropometric measures (e.g. morbidity, activity levels) can be designed to measure nutritional impact?

-- What are the socio-cultural aspects of local food systems which affect the nutritional impact of particular commodity packages? What are acceptable or preferred foods and their forms of preparation? How are expenditures allocated to more or less preferred foods? Are certain foods considered to be more or less appropriate for specific age, sex, or physiological states? Do particular commodities require differential time, energy, or money for acquisition, preparation, or consumption?

Annex D

Observed α Values in Existing Programs

The text of this present report suggests that many existing programs have selected commodities with less than maximal cost-effectiveness. The following data are drawn from on-going country programs and give support to the above assertions.

Tables V-2 and V-3 illustrate the calculation of α values in existing take-home programs. In both the Sudan and Panama, if the α value were maximized, only NFDM would be used. In the Sudan example, inclusion of bulgur and oil in the commodity package reduces the potential economic value by 44 percent ($7.68 as compared with $13.72). In the Panama example, the voluntary agency appears to forego 32 percent of the potential economic value ($11.35 as compared with $19.53) using the present mix of commodities.

Data available indicate that in Panama, local costs are 11 percent of total FFP costs. Of these, approximately 4 percent might be different across commodities for packaging and handling. Given the high α value of NFDM in Panama, logistical costs do not seem to be the determinants of commodity mix. The same appears to be the case for Sudan (Table V-2) where even doubling the logistical costs would not change the ranking of the commodity with high α value. Logistical considerations may, however, have an effect on the choice of commodities having similar α values.

Finally, as suggested in this report, other factors, such as program complementarity, educational goals, and the minimum tonnage requirement, may be very important determinants in the selection of commodities in these programs.

ILLUSTRATION OF α VALUES IN SUDAN TAKE-HOME PROGRAM

Commodity	Cost		Ration	K	V**	
	acquisition	freight*	kg	total cost	local value	
NFDM	0.42	0.18	2	1.19	5.28	4.44
Bulgur	0.25	0.18	2	0.87	1.00	1.15
Oil	8.04	0.19	1	1.03	1.40	1.36
Total			5	3.09	7.68	2.49***

*To Aquaba, only port in Africa in Table C-2.
**Local prices at parallel, not official exchange rates: α values would be 40% lower otherwise
***Weighted average

Source: Tables C-1 and C-2; and D. Franklin's data.

Table V-2

ILLUSTRATION OF α VALUES IN PANAMA TAKE-HOME PROGRAM

Commodity	Cost		Ration	K	V	
	acquisition	freight*	kg	total cost	local value	
NFDM	0.41	0.19	2.2	1.33	9.24	6.95
CSM	0.40	0.14	0.91	0.49	0.60	1.22
SfRO	0.40	0.14	0.91	0.49	0.71	1.43
Oil	0.86	0.14	0.5	0.50	0.80	1.60
Total			4.52	2.81	11.35	4.04**

*To Callao, only port in Latin America in Table C-2.
**Weighted average

Source: Tables C-1 and C-2; and D. Franklin's data.

Table V-3

APPENDIX A

ABBREVIATIONS USED IN THE REPORT

ABS	-	Annual Budget Submission
ACC-SCN	-	Administrative Coordinating Committee--Subcommittee on Nutrition
ADM	-	A milling company
AER	-	Annual Estimate of Requirement
AID	-	Agency for International Development
AID/W	-	Office of AID, located in Washington, D.C.
ASCS	-	Agricultural Stabilization and Conservation Service (USDA)
CARE	-	Cooperative for American Relief Everywhere
CCC	-	Commodity Credit Corporation (USDA)
CDSS	-	Country Development Strategy Statement
CLUSA	-	Cooperative League of the U.S.A.
CRS	-	Catholic Relief Service
CSB	-	Corn Soy Blend
CSM	-	Corn Soy Milk
EEC	-	European Economic Community
FAO	-	Food and Agriculture Organization (UN)
FAS	-	Foreign Agricultural Service (USDA)
FFP	-	Food for Peace
FFW	-	Food for Work programs

FNS	-	Food and Nutrition Service (USDA)
g	-	Gram
GAO	-	General Accounting Office
ICSM	-	Instant Corn Soy Milk
ISC	-	Interagency Staff Committee (renamed Food Aid Subcommittee of the Development Coordination Committee)
kcal	-	Kilocalorie
kg	-	Kilogram
lact	-	Lactating
MCH	-	Maternal Child Health programs
mg	-	Milligram
MT	-	Metric Ton
MTGE	-	Metric Ton Grain Equivalent
NE	-	Niacin Equivalent
NFD	-	Non-Fat Dry
NFDM	-	Non-Fat Dry Milk
OCF	-	Other Child Feeding programs
OMB	-	Office of Management and Budget
OTD	-	Ocean Transport Division (USDA)
PL	-	Public Law
preg	-	Pregnant
PVO	-	Private Voluntary Organization
RE	-	Retinol Equivalent
SAWS	-	Seventh-Day Adventist World Service
SD	-	Standard Deviation
SF	-	School Feeding programs
Sf	-	Soy-fortified

SfRO - Soy-fortified Rolled Oats

SfSG - Soy-fortified Sorghum Grits

UN - United Nations

UNU - United National University

US - United States

USDA - United States Department of Agriculture

volag - Voluntary agency

WFP - World Food Programme

WHO - World Health Organization (UN)

WPC-Soy - Wheat Protein Concentrate - Soy

WSB - Wheat-Soy Blend

µg - Microgram

APPENDIX B

PROGRAM HISTORY

Legislative History and Objectives

Food as foreign aid began in 1812 as disaster relief when the U.S. Congress appropriated food assistance for the earthquake victims of Venezuela (McGovern, 1964). This type of food aid continued until World War II, when the first food aid program, the Marshall Plan (also known as the European Recovery Program of 1948), was established. Although the Marshall Plan could be considered as a precursor to PL 480 (Wallerstein, 1980), the Congress did not establish a formal U.S. food aid program until 1954. At that time, the American Farm Bureau Federation urged the government to sell agricultural surpluses for foreign currencies (McClellan, 1964); this resulted in passage of the Agricultural Trade Development and Assistance Act, also known as Public Law 480 (PL 480), by the 83rd Congress. This Act had two primary purposes:

- o to dispose of domestic agricultural surpluses
- o to make food available to deficient nations on concessional or credit terms.

Other goals of the Act included expansion of international trade; development and expansion of export markets for U.S. agricultural commodities; combatting of hunger and malnutrition and encouragment of economic development; and promotion of U.S. foreign policy.

PL 480 contained three titles: Title I, which authorized the sale of U.S. agricultural commodities for foreign currencies; Title II, which authorized donations of surplus commodities for famine relief and emergency food aid

abroad; and Title III, which authorized the barter of agricultural commodities for strategic materials and also allowed the Commodity Credit Corporation (CCC) to make commodities available to private voluntary organizations (PVO's) for distribution. PL 480 began operating with 3.4 million metric tons valued at $384,000; two years later, the tonnage was over 14 million valued at $1.5 billion (Baker, 1979). Because Congressional authorization for PL 480 was limited to one or two years at a time, the program was not envisioned as permanent and was, therefore, administered primarily as surplus disposal. In 1959, Title IV, which provided for long-term credit sales for dollars, was added. This new title required repayment of dollars over 20 years, with a two-year grace period preceding the initial payment.

Hubert Humphrey, along with other government officials, had been trying to have agricultural surpluses considered valuable American resources to be used for foreign aid. In 1960, in response to these efforts, the Office of Food for Peace was created by the Eisenhower administration. However, this legislative effort did not change any aspect of the existing PL 480 programs. In January, 1961, President Kennedy moved the Office of Food for Peace within the Executive Office of the President and named George McGovern as its first director.

The Food for Peace Act of 1966 represented a major restructuring of P.L. 480. This Act eliminated the requirement that a food commodity must be designated as surplus to be eligible for the program. The voluntary agency programs which had operated under Title III were incorporated under Title II, and all donation programs were henceforth administered under this title.

During the Nixon administration when commodity and fuel prices increased, the budget was reduced drastically; in 1973, 2.3 million tons was used by the voluntary agencies and the World Food Programme; in 1974, this figure was only 1.5 million (Wallerstein, 1980). This budget reduction generated a review of

the Food for Peace program, leading in turn to passage of the International Development and Food Assistance Act of 1975. This Act included a recommendation that the U.S. make a significant contribution to the World Food Conference annual food-aid target of 10 million tons.

This Act also included a provision to set the minimum quantity of commodities for Title II donations at 1.3 million tons. In 1977, Congress amended the Title II donations program by increasing the minimum tonnage from 1.3 million to 1.6 million metric tons per year through 1980, with a requirement for an additional 50,000 metric tons in 1981; the tonnage for 1982 was set at 1.7 million. A subminimum of at least 1.3 million metric tons was to be distributed through voluntary agencies and the World Food Programme through 1980; this was to be increased to 1.4 million in 1982. In meeting these minimum tonnage requirements, the program faces increasing cost constraints. In 1981, the program spent $768.3 million and shipped 1.80 million tons; the 1982 budget is $724.2 million and for 1983, $650 million have been requested.

The Food and Agriculture Act of 1977 extended the Food for Peace program for four years, and authorized the provision of commodities for PL 480 in times of urgent humanitarian need even if U.S. supplies were limited. In 1979, the Act was amended to include country evaluations.

> Country assessments shall be carried out whenever necessary in order to determine the types and quantities of agricultural commodities needed, the conditions under which commodities should be provided and distributed, the relationship between United States food assistance and other development resources, the development plans of the country, the most suitable timing for commodity deliveries, the rate at which food assistance levels can be effectively used to meet nutritional and developmental needs, and the country's potential as a new or expanded market for both United States agricultural commodities and recipient country foodstuffs. (Food and Agriculture Act, PL 96-53, 93, Section 404(b))

The 1977 Act was also amended in 1979 to emphasize the more effective use of Title II commodities and increased community participation. The most recent commodity-related legislative act is the Kasten amendment passed by the 97th Congress. This gives the

> Secretary of Agriculture the discretionary authority to set the value of a commodity acquired under a domestic price support program at less than the export market price currently mandated by law when used in the Public Law 480 program. (Congressional Record, Senate, September 17, 1981)

PL 480 legislative history related to commodities is summarized in Table B-1.

Specific Objectives of Title II

In recent years, the focus of Title II activities has been redirected from simply feeding people with surplus U.S. foods to using food aid for humanitarian and developmental objectives. Within budgetary constraints, the President is authorized to furnish agricultural commodities for Title II programs

> to meet famine or other urgent or extraordinary relief requirements; to combat malnutrition, especially in children; to promote economic and community development in friendly developing areas; and for needy persons and nonprofit school lunch and preschool feeding programs outside the United States. (Food and Agriculture Act, 1977)

This Act was amended in the 1979 Food and Agriculture Act (PL 96-53) to state that programs of assistance, as well as the types and quantities of commodities, should be directed toward the expansion of agricultural markets in the U.S. and recipient countries.

In 1961, the World Food Programme (WFP) was approved as a three-year experimental, multilateral food-aid program, administered by the U.N. and the Food and Agriculture Organization (FAO), and having the following priorities:

PL 480 LEGISLATIVE HISTORY RELATED TO COMMODITIES

Year	Legislation
1954	83rd Congress passes PL 480 legislation to allow the use of surplus commodities for assistance of needy persons. The Act contained three titles. (Agricultural Trade Development and Assistance Act, PL 83-480)
1959	Fourth title added to PL 480 (PL 86-341).
1960	Office of Food for Peace created.
	Title II coverage of transportation costs to include overland transport to landlocked countries added. (Mutual Security Act, PL 86-472)
1963	World Food Programme organized.
1966	Food for Peace Act passed by 89th Congress (PL 89-808). A new Title II created to combine famine relief and donations; commodity prices set at world market value.
1975	Minimum tonnage for donations program set at 1.3 million tons; voluntary agencies and the World Food Programme guaranteed 1.0 million of 1.3. (International Development and Food Assistance Act, PL 94-161)
1977	Minimum tonnage for donations program under Title II amended to increase to 1.6 million metric tons each year through 1980. For 1982 and thereafter, the minimum tonnage set at 1.7 million metric tons, with a 1.4 million subminimum to voluntary agencies and the World Food Programme. (International Development and Food Assistance Act, PL 95-88)

Table B-

PL 480 LEGISLATIVE HISTORY
RELATED TO COMMODITIES

Year	Legislation
1979	Country evaluations mandated to assess commodity needs. (Food and Agriculture Act, PL 96-53)
1981	Congress authorized PL 480 programs for 4 more years. Minimum tonnage remained at 1.7 million metric tons for Title II, with a 1.2 million subminimum for voluntary agency and the World Food Programme non-emergency programs. An amendment was added authorizing the Secretary of Agriculture to set the price of surplus commodities in CCC inventory at below world market price (Food and Agriculture Act, PL 97-98).

Table B-1 (concluded)

emergency needs, preschool and school-age institutional feeding; and development projects (often FFW programs). The U.S. commitment to WFP is for 2-year periods for commodities and ocean freight. For example, for 1981-82, the U.S. pledge is $220 million; this includes $165 million for commodities, $50 million for ocean transport, and $5 million in cash.

The percent of commodities as grains, blended or processed foods, oils, and NFDM used by the voluntary agencies and the WFP for Title II programs is shown in Table B-2.

History of Title II Program Operations

Legislation and Procedures

The PL 480, Title II legislation specifies not only program objectives, but also program operations. Specifically, it authorizes the designation of friendly governments, U.S. voluntary agencies, and other inter-governmental organizations such as the World Food Programme as potential sponsors. It also specifies that in addressing program objectives, assistance is to be focused on self-help activities that aim to alleviate conditions leading to the need for Title II aid. The sponsoring agencies are encouraged to direct assistance toward the community, as well as to use indigenous institutions and workers to distribute donated commodities. Sponsors are to assess the nutritional and other needs of beneficiaries and help in designing and implementing programs. They are also urged to recommend appropriate food assistance programs for each community, supervise commodity distribution, and evaluate program effectiveness.

Regional Emphasis

The percent of total PL 480 annual volume is shown for AID regions from 1955-1970 in Table B-3; this percent is shown for the present four AID regions

PERCENT OF VOLUME AND VALUE OF PL 480
COMMODITY GROUPS USED BY VOLUNTARY
AGENCIES AND THE WORLD FOOD PROGRAMME

Commodity	Volume %		Value %	
	Volag	WFP	Volag	WFP
Grain	22.6	59.2	15.9	44.1
Blended and processed food	66.5	28.3	60.6	27.7
Oil	6.2	6.4	18.2	20.5
NFDM	4.7	4.2	5.3	5.2
Peas		1.9		2.5
Total	100	100	100	100

Source: USDA (1980d).

Table B-2

PERCENT* OF ANNUAL PL 480 DONATIONS, COMMODITY VOLUME BY REGION, VOLUNTARY AGENCY PROGRAMS, 1955 - 1970

Region	Year**										
	1955-1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Europe	40.0	25.3	25.0	15.7	12.6	11.9	11.4	7.3	5.6	3.4	1.9
Africa	2.3	8.4	9.5	13.9	19.4	20.4	16.8	25.8	18.6	21.2	22.1
Near East and South Asia	21.5	31.4	30.4	25.4	22.6	24.2	31.7	36.7	41.9	44.5	41.0
Far East and Pacific	26.5	22.5	17.9	19.7	17.7	18.1	19.7	8.7	11.0	8.9	9.3
Latin America	8.8	12.4	17.5	23.0***	27.6	25.1	20.1	20.3	22.9	22.0	25.5
Total Volume (000 MT)		1,070	1,227	1,317	1,379	1,235	1,214	933	849	777	950

*Percentages do not add up to 100 due to rounding.
**1961-1966--Reported under Title III, voluntary agency foreign donations.
1967-1970--Reported under Title II, voluntary agency foreign donations.
***Includes 34,107,000 pounds to American National Red Cross in connection with Cuban prisoner exchange.

Source: Food For Peace Annual Reports on PL 480 (1961-1970).

Table B-3

from 1971-1979 in Table B-4. It is clear from these tables that there have been radical shifts in regional emphases for this program: the percentage of African and Latin American operations has more than doubled, while European programs have disappeared. Table B-4 also shows that from 1971-1979, Asia accounts for half or more of commodity volume for voluntary agency programs. It should be noted, however, that comparison by regions over time may be difficult due to changes in AID's regional country lists. For example, Bangladesh, Nepal, Sri Lanka, Pakistan, and India were moved from "Near East and South Asia" (see Table B-3) to "Asia," while Algeria, Morocco and Tunisia were moved from "Africa" (see Table B-3) to Near East (see Table B-4).

Evolution of Programs

Voluntary Agency Programs: Legislation mandates that Title II programs be carried out by cooperating sponsors, to consist of U.S. nonprofit voluntary agencies approved by AID and the World Food Programme. In 1966, the program served approximately the same number of participants as it did in 1981 (see Tables B-5 and C-9). The programs sponsored by the voluntary agencies in 1966 are listed in Table B-5, along with the number of recipients served.

Currently, the basic Title II program types are as follows:

- o Maternal Child Health Projects
- o Other Child Feeding
  - --Preschool Child Feeding (Day Care)
  - --General Child Feeding
    Institutionalized (hospitals, orphanages)
    Non-Institutionalized (daily organized feeding facilities)
- o Food For Work
- o School Feeding

Table B-6 depicts for the voluntary agency Title II programs the percent of total annual budget allocated to each program type from FY 1969 to FY 1979.

PERCENT* OF ANNUAL PL 480 DONATIONS, COMMODITY VOLUME BY REGION, VOLUNTARY AGENCY PROGRAMS, 1971 - 1979

Region	Year								
	1971	1972	1973	1974	1975	1976	1977	1978	1979
Asia	45.0	71.8***	54.4	46.8	55.9	58.4	65.5	63.8	61.4
Africa	6.1	2.5	5.2	7.9	8.4	8.7	6.9	9.3	11.6
Near East	27.5**	15.1**	25.0**	29.7**	16.1	10.1	12.5	15.2	12.6
Latin America	21.2	10.6	15.4	15.5	19.5	22.7	15.1	11.7	14.4
Total Volume (000 MT)	927	1,509	946	616	634	760****	934	909	995

*Percentages do not add up to 100 due to rounding.
**Includes Palestinian refugee programs.
***Includes initial Bangledesh voluntary agency programs after creation in Dec. 1971.
****Includes transitional quarter.

Source: Food For Peace Annual Reports on PL 480 (1971-1979).

Table B-4

PL 480, FOREIGN DONATIONS: NUMBER OF RECIPIENTS UNDER VOLUNTARY AGENCY FOREIGN DONATIONS PROGRAMS, 1966

Programs	Voluntary Agency						Total
	CARE	Catholic Relief Service	Church World Service	UNICEF	Lutheran World Relief	All other agencies	
Schools	21,754,250	5,980,309	1,324,807	295,210	223,848	119,407	29,697,831
Institutions	628,047	1,332,306	320,674		75,849	68,324	2,425,200
Family individuals	2,045,434	4,558,033	585,058		157,430	143,812	7,489,767
Self-help	215,552	1,162,604	425,650		44,500	58,726	1,907,032
Refugees	1,600	173,233	37,300		27,734	262,100	501,967
Summer Camps	1,173,427	190,634	132,817		19,521	7,250	1,523,649
Maternal/child care	3,400,050	2,416,835	327,647	1,360,723	30,023	42,615	7,577,893
Health cases	66,692	1,112,357	93,256	1,520	14,959	153,861	1,442,645
Feeding centers	121,038	342,888	216,739		55,526	92,445	828,636
Total recipients	29,406,090	17,269,199	3,463,948	1,657,453	649,390	948,540	53,394,620

Source: Food for Peace Annual Report on PL 480 (1966).

Table B-5

VOLUNTARY AGENCY PROGRAM TYPES AS A PERCENT
OF FFP, TITLE II ANNUAL BUDGET, 1969-1979

Program Type	Fiscal Year										
	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Maternal/Child Health	14.9	13.9	18.1	17.2	23.3	24.5	28.9	50.2	54.1	47.1	39.3
School Feeding	57.6	55.1	55.2	50.1	44.5	38.5	29.2	19.5	14.9	22.5	21.3
Other Child Feeding	4.0	4.0	2.4	4.0	3.4	3.4	8.3	3.4	3.4	3.7	4.5*
Food For Work	10.9	10.8	9.4	18.1	16.9	17.9	13.7	17.1	20.5	21.9	21.1
Total	87.4	83.3	85.1	89.4	88.1	84.3	80.1	90.2	92.9	95.[illegible]	86.2
Emergency Assistance	12.6	16.7	14.9	10.6	11.9	15.7	19.9	9.8	7.1	4.8	6.1
Total	100	100	100	100	100	100	100	100	100	100	100**

*Includes 1.5 percent preschool feeding.
**Includes 7.6 percent for the CLUSA program in India.

Source: Food For Peace Annual Reports on PL 480 (1969-1979).

Table B-6

This table shows shifts in the levels of different program types: MCH and FFW programs have increased, while SF programs have declined.

There are two typical modes of food distribution for these programs: on-site or take-home. In on-site feeding, the ration is prepared at the distribution site and consumed there by the recipients; in take-home feeding, the rations are given to recipients (usually monthly) to be taken home for preparation and consumption.

In choosing and planning programs, the cooperating sponsor is required to submit for approval a program plan identifying the project area, conditions, and scope of operations. Included in this program plan are the following:

- o the objectives of the program and the indicators to be used in assessing progress toward those objectives
- o important assumptions made in the program plan
- o the size and scope of the program and the usual method of food distribution
- o descriptions of in-country storage, transportation, and port facilities and practices
- o descriptions of any processing or repackaging anticipated
- o a comment on the acceptability of each available food and a justification, when necessary, for the use of whole grains rather than processed foods
- o a description of the particular problems to be addressed by the program, as well as its proposed responses
- o in the case of MCH projects, a description of the food and nutrition problems of the at-risk groups.

World Food Programme (WFP): WFP was approved by the Food and Agricultural Organization (FAO) of the United Nations (UN) in 1961. WFP operations are different from those of the voluntary agencies: the food is turned over to the recipient governments, which manage and finance the in-country operations. In 1979, the WFP distributed 20 percent of the total commodities used in Title II programs and served 22 percent of the total

QUANTITIES OF COMMODITIES SHIPPED
UNDER TITLE III, FOREIGN DONATIONS,*
JULY 1, 1954-DEC. 31, 1966

Commodity	Quantity (MT)
Wheat	701,379
Wheat Flour	4,640,880
Bulgur	621,113
Rolled wheat	128,671
Corn	228,649
Grain sorghum	67,512
Cornmeal	1,597,141
Rice	333,983
Oil	434,350
NFDM	2,492,328
Cheese	279,740
Butter	103,150
Butter oil, ghee	140,479
Dry beans	120,009
Blended foods	1,694

*Title II after 1966.

Source: Food For Peace Annual Report on PL 480 (1966).

Table B-7

number of recipients. WFP resources are obtained from UN and FAO members through contributions of commodities, cash, and services (primarily ocean transport).

The primary responsibility for WFP project execution lies with the recipient government. The U.S. is not a controller of project activities, nor do U.S. AID missions have any responsibility for the control, management, or fiscal accounting of these projects. Furthermore, the U.S. may not withhold agreement to supply commodities because of technical objections to the project, unless it conflicts with U.S. policy objectives. Thus, the U.S. has limited input into WFP program selection and execution.

Kinds and Quantities of Commodities

The new Title II, as amended by the 1966 Act, included the foreign donations made through voluntary agencies which previously appeared under Title III. Table B-7 shows the total quantity of commodities shipped from 1954-1966 under the foreign donations portion of PL 480. Until 1966, commodities available for donation were only those foods designated by the Secretary of Agriculture as being in surplus. The 1966 amendment removed this requirement. This change opened the commodity availability list to new foods developed by U.S. industry in response to a belief that more protein was needed in developing nations. A further stimulus for the development of blended and soy-fortified foods was the shortage of NFDM which began in the mid 60's. The USDA, in cooperation with AID, developed guidelines defining the nutrient composition of blended foods and specified requirements for each component: cereal, soy flour, and NFDM. In 1967, close to 124 million kg of corn soy milk (CSM), the first major blended food, was distributed through the Title II program.

By the early 1970's, the availability of NFDM had declined drastically; in

1974, none was available for Title II. This led to changes in the foods supplied to the program. From 1972 to 1976, the amount of blended foods used by the voluntary agencies dropped from a high of 252,000 metric tons to a little over 138,000 metric tons. Further, the NFDM component of CSM was reduced during this period from 15 to 5 percent; and in some cases, the milk component was deleted entirely, leaving the commodity as corn soy blend (CSB). Also, during this time, in 1972, soy-fortified grain products such as bulgur, cornmeal, rolled oats, and sorghum grits were introduced. By 1979, these products had become important commodities in the program and, in the case of cornmeal, had displaced the unfortified flour. In 1980, soy-fortified commodities represented 40 percent of voluntary agency commodity costs.

The past decade has seen the development of new technology for processing and blending of cereals and oilseeds. Recently, the USDA and AID have been trying to develop the capacity for in-country processing and blending of soy-fortified commodities. This could extend donated foods by blending them with indigenous products. Title II commodities are presently supplied for a number of in-country processing projects; however, as the country moves toward self-sufficiency, Title II donations are planned to be gradually phased out.

The single most expensive commodity used in Title II programs is oil, which accounts for approximately 20 percent of the total commodity costs. Table B-8 shows the percentage of value for each commodity used by the voluntary agencies and the World Food Programme for FY 1980.

Evaluations: Their Impact on the Program

Various evaluations have been made of the Title II program--its budgetary and planning policies, its processes, and its impact. The results of these evaluations are summarized below.

COMMODITY AS PERCENT OF VALUE FOR VOLUNTARY AGENCIES AND WFP IN 1980

Commodity	VOLAG	WFP
Corn Soy Milk	12.9	5.1
Instant Corn Soy Milk	3.2	2.3
Wheat Soy Blend	4.5	0.4
Soy-fortified Bulgur	8.9	4.1
Soy-fortified Cornmeal	2.7	4.2
Soy-fortified Rolled Oats	0.6	-
Soy-fortified Sorghum Grits	2.2	0.2
Soy-fortified Wheat Flour	5.2	1.3
All-Purpose Wheat Flour	4.9	8.2
Bulgur	16.4	2.6
Cornmeal	-	0.6
Corn	1.8	4.5
Rice	6.6	17.1
Sorghum	-	2.6
Wheat	6.4	17.4
Oil	17.9	21.0
NFDM	5.8	5.9
Peas	-	2.5
Total	100	100

Source: Food for Peace (1980).

Table B-8

Food-Aid Policy Assessments

In 1965, the Sub-group on Nutrition of the Interagency Task Force on Food and Agricultural Assistance to Less-Developed Countries recommended that the focus of the Title II program be on alleviating problems of malnutrition, particularly in children; that NFDM be fortified with vitamins A and D; and that "complete" foods for children be developed and incorporated into the program. The Sub-group also recommended multi-year commitments of nutritional inputs, particularly NFDM and oil seed protein products.

A major issue for the voluntary agencies has been the continued availability of commodities to support their programs. As noted above, the law mandated a minimum of 1.7 million metric tons for 1981, of which 1.3 million was a sub-minimum for the voluntary agencies and WFP. However, in recent years, emergency and disaster relief operations have required that the PVO's and WFP use part of this sub-minimum for emergency needs. Both CARE and CRS have recommended that Title II be amended to mandate a minimum tonnage for voluntary agency and WFP programs, with disaster and emergency relief financed separately. This was legislated in December, 1981.

Program Evaluations

A 1972 evaluation of the Title II program noted that the mix of commodities is often inappropriate to the program because a commodity is chosen only after it has been made available by USDA (Checci Report, 1972). This constitutes planning from the wrong perspective:

> A resource is provided and AID then attempts to find a use for it . . . exactly the opposite of most AID programming, which works on the principle that a problem should be defined and then a search initiated for the best combination of resources and skills to treat it.

The evaluators concluded that

> the nutritional impact of Title II will be directly related to the degree that commodity supply considerations continue to dominate programming policies. (p. 143)

The evaluators recommended a wider selection of commodities, including high-protein foods for MCH programs. Although the increased use of blended foods was recommended, the inclusion of some kind of dried beans was cited as a crucial step toward increasing nutritional impact. It was noted that it is questionable whether the same commodity list would exist or evolve if the Title II program were being newly created today. Although a broad array of foods was suggested, it was felt that the "luxury" foods (e.g., milk) should not be included in great supply. The evaluators made two additional recommendations: 1) through the use of Title II commodities, AID should encourage the production of locally blended foods; and 2) MCH programs should be emphasized and school feeding programs deemphasized. Since 1972, there has been a decline in voluntary agency school feeding programs and an increase in MCH programs (See Table B-6).

A 1975 General Accounting Office (GAO) report, "The Overseas Food Donation Program--Its Constraints and Problems", ran counter to the Checchi report on the question of the number and kind of commodities. A recommendation was made that the list be reviewed each year to determine which commodities should be deleted. The rationale given was that some commodities are used in small quantities and have few suppliers. Consequently, competition is limited, and the cost of the particular commodity increases.

A Task Force report to the Secretary of Agriculture (1978) states that the administrative procedures for Title II programs appear "unnecessarily cumbersome," and that

> voluntary agencies should be brought into the decision making process at key stages of program planning, administration, and operations. Moreover, the Task Force recommends that commodities be made available in new and/or expanded ways to U.S. voluntary agencies for use in developing countries. (p. 11)

The 1979 GAO report to Congress, "Changes Needed in the Administration of

the Overseas Food Donation Program," dealt primarily with questions of planning, programming, and implementing Title II programs. This report also covered program operations in six countries, emphasizing commodity storage, transport, and distribution. One conclusion of the report was that commodity availability (surplus) continues to have a strong influence on commodity programming. For example, it was noted that in 1978, AID agreed to use rice and increased quantities of NFDM after it sought and received a guarantee from the USDA that these products would be available for five years. The reaction of voluntary agency officials to these commodities was mixed. Balanced against the nutritional value of milk and the utility of rice were problems which had been experienced in the past. These problems included a greater danger of diversion of these high-value commodities from intended recipients, and the fact that NFDM is inappropriate for the diet of infants.

Country Evaluations

Prior to the late 1970's, country program evaluations had, in general, focused more on the management and logistics of the particular programs and less on their commodity selection process. In the late 1970's, a number of country evaluations of Title II programs were undertaken by AID. Such evaluations are now part of the ongoing activities of AID's Bureau of Food for Peace and Voluntary Assistance.

One generally acknowledged success in terms of acceptability of a new blended food was cited in the 1978 Sri Lanka evaluation. The evaluation group found that Thriposha, corn-soy blend with 20 percent pearled sorghum, had changed tastes and consumption patterns in the recipient population (Robert R. Nathan Associates, 1978).

In 1979, the country program in Morocco was evaluated (Robert R. Nathan Associates). This evaluation raised several questions about the particular

commodities in use, the ration sizes, and the difficulty of assessing nutritional impact due to the whole family sharing the ration. Other findings indicated a growing acceptance of a non-traditional food, soy-fortified rolled oats, as well as a general view that WSB was not acceptable to present tastes.

This lack of acceptance of WSB was also found in a case study of Egypt by Allen and Koval (n.d.). This study indicated that even with nutrition education, WSB had serious acceptability problems. The study's major recommendation, however, was related to the logistics of distribution. It was suggested that the blended foods be repacked into more conveniently sized packages (possibly 2 kg) for ease of distribution.

A recent Upper Volta evaluation (International Science and Technology Institute, 1981) provided information on potential changes in both the size and composition of the rations. Prior to January 1981, soy-fortified cornmeal had been used in the program; presently, 2 kg of regular cornmeal, 2 kg of NFDM, and 1 liter of oil is the ration given to each child. The evaluation team concluded that the substitution of regular cornmeal reduces the energy and protein value of the ration only slightly, from 392 to 364 kcal and from 13 to 8 grams of protein per 100 grams of commodity. The difference in cost between soy-fortified ($294.89/MT) and regular cornmeal (273.51/MT), however, could yield a potential savings of $216,866/year. On the other hand, the economic gain might be negated by the protein loss if protein deficiency is a problem.

The Upper Volta evaluation team also found that the program was having little effect on the nutritional status of the participating children and suggested that the children were consuming only a small amount of the ration due to sharing among the family. One recommendation was that the preschool ration be changed to 2 kg of cornmeal, 1 kg of NFDM, and 1/2 liter of oil. This would reduce the cost approximately $6.50 per participant annually, for a

total potential savings of $1,105,000/year. The evaluators felt that the ration would still provide an economic incentive and a significant nutritional supplement. Another recommendation was that AID and CRS study the problem of oil losses for the purpose of improving packaging and handling practices.

The Upper Volta team also noted that the school feeding ration includes 2 kg of NFDM per student. They found that in over 25 percent of the schools visited, either the children did not like the milk or it gave them diarrhea. The team suggested that these problems could be due to lactose malabsorption or improper preparation of the milk. Based on this conclusion and on "an abundance of protein in the school ration," the team suggested the elimination of NFDM from the ration. This may, however, be an extreme recommendation; reducing the amount of milk given to children per feeding might be more advantageous. The team further recommended that a least-cost commodity be substituted for rice, and that since school feeding makes a positive contribution to the nutritional status of large numbers of malnourished children, this program should be expanded to include all qualified schools.

The recent evaluation of the Title II program in Ghana (Development Associates, 1981) was very broad in scope. It included not only Title II inputs, but also donations of food and nutritional supplements by EEC countries and the WFP, the provision of medical supplies and vaccines, and an examination of regional differences in dietary patterns and agricultural production. The evaluation addressed three issues relating to the specific commodities in use. First was the loss of commodities during shipping and handling at ports of entry; second was the unreliability of supplies. The evaluators attributed these problems to the practice of calculating the quantities to be distributed based on ship manifests without considering losses. They also noted that calculating the number of rations per sack of

grain often yielded less than the amount specified in the authorization letter. Third, the evaluators cited problems related to the use of milk products*, which appeared to cause diarrhea. They found that when the milk was prepared in hospital kitchens under nurses' supervision, no diarrhea resulted. The conclusion of physicians and nurses was that the milk products were necessary and, if properly prepared, would cause no intestinal problems.

The Food For Peace evaluation in Kenya (Practical Concepts, Inc., 1980) identified under-nutrition as that country's principal nutrition problem. This is addressed primarily through MCH and FFW programs by CRS, which handles all Title II programs in Kenya. However, the amount of food available at many MCH distribution centers was inadequate to provide the 105,000 recipients with the authorized ration: 2 kg of NFDM, 2 kg of soy-fortified bulgur, and 1 kg of oil. The evaluation indicated that the ration for Kenya's MCH programs is large in order to provide an economic incentive for participation; for this reason, CSM was replaced by NFDM, which is viewed by the recipients as having a high economic value. The team did not recommend changing the MCH ration, but noted the large quantity of protein and oil in it. The evaluation also concluded that the ration size for a household is satisfactory to meet the children's nutritional needs, although it was suggested that a less expensive ration could still motivate potential beneficiaries to participate in the program.

Conclusion

The principal issue relating to the Title II program is the basis for commodity selection. Before 1966, when only surplus commodities could be

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*NFDM was not supplied by Title II but was contributed by EEC countries.

used, selection was a less complex issue. Now, however, a wider variety of foods is available, making the development of systematic selection criteria increasingly vital. The development of such criteria should address the question, for example, of whether the use of blended and fortified foods, based on the "nutritional wisdom" of the 1960's and early 1970's, should be reconsidered. Also addressed should be the relative importance of the many other factors involved in commodity selection: acceptability, sustained availability, nutritional status of recipients, program objectives and mode, suitability, and economic considerations. These factors are discussed in the body of this report. The central conclusion is that nutritional impact can be maximized through application of the criterion of nutritional cost-effectiveness. This criterion is discussed in detail in Chapter IV; some conclusions about its practical application are presented in Chapter V.

The history of the Title II program shows an ongoing effort to improve and enhance its value to recipients. The present report is part of that continuing effort.

APPENDIX C

TABLES RELATING TO CURRENT FOOD FOR PEACE OPERATIONS

COMMODITY ACQUISITION COSTS

Commodities	Costs		
	$ per MT*	¢ per 1,000 cal.**	¢ per 10 g prot**
Blended foods			
Corn Soy Milk	398	10.46	1.99
Instant Corn Soy Milk	442	11.59	2.20
Wheat Soy Blend	402	11.13	2.01
WPC-Soy (Wheat Protein Concentrate Soy)	617	13.14	2.71
Protein-fortified processed foods			
Soy-fortified Bulgur	278	7.89	1.57
Soy-fortified Cornmeal	295	7.49	2.23
Soy-fortified Rolled Oats	397	10.53	1.86
Soy-fortified Sorgham Grits	288	7.94	1.77
Soy-fortified Wheat Flour	316	8.82	1.95
Flours			
All-Purpose Wheat Flour	266	7.26	2.51
Bulgur	253	7.13	2.25
Cornmeal	274	7.48	3.43
Soy Flour (defatted)	500	15.30	1.05
Whole grains			
Corn	159	4.56	1.78
Rice	455	12.38	6.76
Sorghum	153	4.60	1.37
Wheat	187	5.68	1.51
Other			
Oil	836***	9.43	--
NFDM (Non-Fat Dry Milk)	419	11.49	1.12
Peas	318	9.12	1.30

*Packaged alongside ship, finished dry commodity; May 26, 1981 estimated prices for FY 82 program annd FY 83 budget.

**Calculations based on nutrient data from current Commodities Reference Guide (Food for Peace, 1977) and from USDA (1963). Protein costs would be more appropriately expressed as digestible protein.

***Average price of 19- and 209-liter containers.

Table C-1

CURRENT OCEAN FREIGHT CHARGES FOR SOME COMMODITIES TO SELECTED PORTS ($/MT)

Commodity	Port*			
	Dakar	Callao/Matarani	Aqaba	Manila
Wheat	140	121	no rate	172
NFDM	154	195	186	172
Bulgur	154	130	180	172
CSM	154	136	180	153
Cornmeal	154	120	187	201
Oil	202	146	192	189/m^3

*Because many ports cannot accept large vessels, cheaper bulk rates cannot be used; also, many shipments are too small to qualify for bulk rate.

Source: USDA, Foreign Agricultural Service, Ocean Transport Division, 1981. (personal communication)

Table C-2

NUTRITIVE VALUES*
(per 100 g. finished dry commodity)

Commodity	Food Energy Calories	Protein g	Crude Fat g	Crude Fiber g	Ash g	Carbohydrates g
Corn Soy Milk	380	20	6	1.2	4	60
Instant Corn Soy Milk	380	20	6	1.2	4	60
Wheat Soy Blend	360	20	6	2.4	4.8	60
WPC-Soy	468	22.5	20.5	3.0	5.5	48.5
Soy-Fortified Bulgur	350	17.3	2	2.1	2.4	70
Soy-Fortified Cornmeal	392	13	1.5	1.7	1.7	86
Soy-Fortified Rolled Oats	375	21	6	--	--	60
Soy-Fortified Sorghum Grits	360	16	1	1	--	68
Soy-Fortified Wheat Flour	357	16	1.3	0.6	1.8	72
All-Purpose Wheat Flour	364	10.5	1	0.3	0.43	76
Bulgur	354	11.2	1.5	1.7	1.6	76
Cornmeal**	364	7.9	1.2	0.6	0.5	78.4
Soy Flour (Defatted)**	326	47.0	0.9	2.3	6.0	38.1
Corn	348	8.9	3.9	2	1.2	72
Rice	363	6.7	0.4	0.3	0.5	80
Sorghum	332	11	3.3	1.7	1.7	73
Wheat	330	12.3	1.8	2.3	1.7	72
Oil	884	--	100	--	--	--
NFDM(Non-Fat Dry Milk)	363	35.9	0.8	--	8.0	52
Peas**	340	24.1	1.3	4.9	2.6	60.3

*Source: Commodities Reference Guide (Food for Peace, 1977) except **.
**Source: USDA (1963).

Table C-3

NUTRITIVE VALUES* (VITAMINS)
(per 100 g. finished dry commodity)

Commodity	Vit A IU	Thiamin mg	Riboflavin mg	Niacin mg NE**	Vit C mg
Corn Soy Milk	1,700	0.8	0.8	12.3	40
Instant Corn Soy Milk	1,700	0.8	0.6	11.3	40
Wheat Soy Blend	1,658	1.5	0.6	14.6	40
WPC-Soy	1,853	1.7	0.7	15.7	45
Soy-Fortified Bulgur	--	0.25	0.13	7.6	--
Soy-Fortified Cornmeal	760	0.66	0.27	4.5	--
Soy-Fortified Rolled Oats	5	0.74	0.14	8.2	--
Soy-Fortified Sorghum Grits	--	0.2	0.1	5.9	--
Soy-Fortified Wheat Flour	882	0.64	0.36	8.0	--
All-Purpose Wheat Flour	883	0.64	0.40	7.0	--
Bulgur	--	0.28	0.14	6.7	--
Cornmeal***	440	0.14	0.05	1.5	--
Soy Flour (Defatted)****	40	1.09	0.34	14.2	--
Corn	490	0.37	0.12	3.7	--
Rice	--	0.07	0.03	2.7	--
Sorghum	--	0.38	0.15	5.9	--
Wheat	--	0.57	0.12	6.7	--
Oil	--	--	--	--	--
NFDM	2,200	0.35	1.8	8.0	7
Peas****	120	0.74	0.29	18.1	--

*Source: Commodities Reference Guide (Food for Peace, 1977), except *** and ****.
Source: *, *, and ****, calculated from niacin and tryptophan.
***Source: ADM Milling Company (1977).
****Source: USDA (1963).

Table C-3 (continued)

NUTRITIVE VALUES* (MINERALS)
(per 100 g. finished dry commodity)

Commodity	Calcium mg	Phosphorous mg	Iron mg	Sodium mg	Potassium mg
Corn Soy Milk	1,000	800	18	300	800
Instant Corn Soy Milk	900	700	18	300	900
Wheat Soy Blend	749	562	20.8	296	624
WPC-Soy	767	627	22.9	331	697
Soy-Fortified Bulgur	54	385	4.7	0.2	424
Soy-Fortified Cornmeal	178	189	4.8	13	467
Soy-Fortified Rolled Oats	81	488	5.3	--	--
Soy-Fortified Sorghum Grits	40	180	2.1	--	500
Soy-Fortified Wheat Flour	211	162.2	5.0	2.1	374
All-Purpose Wheat Flour	110	372	3.3	3	370
Bulgur	29	338	3.7	--	229
Cornmeal**	25	99	1.1	9	225
Soy Flour (Defatted)***	265	655	11.1	1	1,820
Corn	22	268	2.1	1	284
Rice	24	94	.8	5	92
Sorghum	28	287	4.4	--	350
Wheat	46	354	3.4	3	370
Oil	--	--	--	--	--
NFDM	1,308	1,016	0.6	532	1,745
Peas***	64	340	5.1	35	1,005

*Source: Commodities Reference Guide (Food for Peace, 1977), except ** and ***.
**Source: ADM Milling Company (1977).
***Source: USDA (1963).

Table C-3 (concluded)

COMMODITIES USED IN FOUR PROGRAM TYPES, 1979 and 1981
(metric tons and percentages)

Commodity	Program Type (1979)				Total	
	MCH	SF	OCF	FFW	Amount	Percent
Blended Foods						
Amount	144,250	41,213	11,643	12,731	209,837	16.7
Percent	33.2	15.3	23.8	2.5		
Soy-Fortified Foods						
Amount	181,321	159,903	17,240	129,945	488,409	38.8
Percent	41.7	59.6	35.3	25.7		
Processed Foods						
Amount	25,101	33,376	12,026	104,653	175,156	13.9
Percent	5.8	12.4	24.6	20.7		
Whole Grains						
Amount	13,122	5,993	1,242	225,794	246,151	19.6
Percent	3.0	2.2	2.5	44.7		
Oil						
Amount	34,914	17,836	3,348	20,212	76,310	6.1
Percent	8.0	6.6	6.8	4.1		
NFDM						
Amount	36,027	10,231	3,415	11,619	61,292	4.9
Percent	8.3	3.9	7.0	2.3		
Total						
Amount	434,735	268,552	48,914	504,954	1,257,155	
Percent	100	100	100	100	100	100

Table C-4

COMMODITIES USED IN FOUR PROGRAM TYPES, 1979 and 1981
(metric tons and percentages)

Commodity	Program Type (1981)				Total	
	MCH	SF	OCF	FFW	Amount	Percent
Blended Foods						
Amount	117,984	33,044	18,934	12,615	182,577	15.8
Percent	26.6	11.7	35.1	3.3		
Soy-Fortified Foods						
Amount	98,480	46,896	4,576	51,858	201,810	17.4
Percent	22.2	16.7	8.5	13.7		
Processed Foods						
Amount	117,265	152,972	20,425	125,102	415,764	35.9
Percent	26.4	54.4	37.8	33.1		
Whole Grains						
Amount	10,650	8,019	2,805	164,118	185,592	16.0
Percent	2.4	2.9	5.2	43.4		
Oil						
Amount	41,882	19,738	4,321	18,192	84,133	7.3
Percent	9.4	7.0	8.0	4.8		
NFDM						
Amount	57,626	20,626	2,900	6,194	87,346	7.6
Percent	13.0	7.3	5.4	1.7		
Total						
Amount	443,887	281,295	53,961	378,079	1,157,222	
Percent	100	100	100	100	100	100

Source: Food for Peace (1981a), Budget vs. Programming Status.

Table C-4 (concluded)

DISTRIBUTION OF PL 480 COMMODITIES
BY PROGRAM TYPE

Commodity	Program Type				Total
	MCH	SF	FFW	OCF*	
Value					
Millions of $	131.0	67.9	106.3	13.6	318.8
Percent	41.1	21.3	33.3	4.3	100
Volume					
Metric Tons	402,142	236,720	483,046	55,847	1,177,757
Percent	34.1	20.1	41.0	4.8	100
Ratio of cost** to FFP/volume	326	286	220	243	271
Cost** to FFP/participant ($)	8.03	3.80	7.54	14.90	5.21

*Includes preschool feeding.
**Acquisition only.

Source: Food for Peace Annual Report on Public Law 480 (1979).

Table C-5

STRENGTHS AND LIMITATIONS OF THE TWO PROGRAM MODES

Potential Strength	Potential Limitations
On-Site	
Ensures consumption of ration in intended quantity.	Ration is frequently substituted for the home diet.
Provides opportunity for education and promotion of new foods.	Takes responsibility for child feeding away from mother.
Growth surveillance and monitoring is easy.	Generally has low geographic outreach.
New foods can be introduced.	Creates possibility of cross-infection.
	Inconvenience of daily attendance sometimes a problem.
Take-home	
Has high geographic outreach.	Sharing and selling of rations result in high diversion.
Convenient for mothers because of less frequent distributions and fewer lost wages.	May not be sufficient for the severely malnourished child.
Provides high coverage.	Distribution site may be too far for people to travel.
Less expensive than on-site because fewer facilities and staff needed.	Provides less opportunity for education because of infrequent food distribution.
Ration can be used in more frequent, smaller portions than is possible in on-site.	
Program located in a health center may promote greater use of health facilities.	
Child fed in own environment.	
Better income transfer potential.	

Based on: Austin and Zeitlin (1981).

Table C-6

DISTRIBUTION OF PL 480 COMMODITIES
BY PROGRAM MODE

Commodity	Program Mode		Total
	On-Site Feeding*	Take-Home Distribution**	
Value			
Millions of $	84.5	237.3	321.8
Percent	25.6	74.4	100
Volume			
Metric Tons	300,567	885,189	1,185,756
Percent	24.9	75.1	100
Ratio of cost** to FFP/volume $/MT	281	268	271

*Includes SF, OCF (OCF includes preschool).
**Includes MCH and FFW.
***Acquisition only.

Source: Food for Peace Annual Report on Public Law 480 (1979).

Table C-7

EQUIPMENT NEEDED FOR A KITCHEN SERVING
2000 PERSONS

Equipment	Number Needed
250-liter drums for water	2
50 to 75 liter cooking pots	4
Buckets (galvanized)	6
20-liter water kettles	2
Ladles (solid)	4
One-cup measures (soup, lentils)	6
500-ml measures (rice, gruel)	6
Measuring cups: 1 liter, 200 ml, and 300 ml	4
Large iron sheets (1x2m-if frying is required)	2
Large stove burners or support for cooking on fires	4
Cutting knives	4
Wooden stirrers/spatulas	4
Large boards for cutting	2
Record/account books	4
Registration cards	2000
Petromax or other lanterns (and necessary fuel)	2
Utensils for use of staff-glasses, mugs, plates (as far as possible, recipients should provide their own)	2
Living accomodations for non-local staff	
Rope, bamboo, wire, and tarpaulin, to construct cooking/serving area; registration desk; and roped-off channels for serving	

Source: Protein-Calorie Advisory Group of the United Nations System (1977).

Table C-8

DISTRIBUTION OF PROGRAM TYPES BETWEEN
CARE, CRS, AND WFP

Program Type	CARE	CRS	WFP
	% of Participants		
MCH	24.2	41.8	31.3
SF	43.5	26.0	14.2
FFW	27.4	15.7	27.4
OCF*	1.1	5.1	0.1
Other**	3.8	11.4	27.0
Total	100	100	100
Total number of participants	30,033,624	9,955,800	14,936,550
Total $ Value (in thousands)	124,710	134,266	73,527
Commodity cost*** ($) per participant	4.2	13.5	4.9

*Includes preschool feeding.
**Emergency assistance and general relief.
***Acquisition only.

Source: Food for Peace Annual Report on Public Law 480 (1979).

Table C-9

DISTRIBUTION OF PROGRAM TYPE BY AGENCY
PERCENT VALUE AND VOLUME*

Program Type	Agency					
	CARE		CRS		WFP	
	value $1000	volume MT	value $1000	volume MT	value $1000	volume MT
MCH						
Amount	52,345	142,021	94,639	225,475	22,896	71,431
Percent	42.9	37.5	56.0	49.9	25.2	25.5
SF						
Amount	49,436	147,845	21,058	58,766	21,288	64,022
Percent	40.5	39.1	12.5	13.0	23.4	22.8
FFW						
Amount	15,902	76,107	43,257	139,862	40,988	132,705
Percent	13.0	20.1	25.5	31.0	45.1	47.3
OCF						
Amount	4,369	12,241	9,981	27,520	5,758	12,474
Percent	3.6	3.3	6.0	6.1	6.3	4.4
Total						
Amount	122,052	378,214	168,935	451,623	90,930	280,632
Percent	100	100	100	100	100	100

*Current 1981 ISC approval levels.

Source: Food for Peace (1981a), Budget vs. Programming Status.

Table C-10

COMPARISON OF COMMODITY USE BY CARE, CRS, AND WFP IN 1979 AND 1972

Commodity	Percent of Volume					
	CARE		CRS		WFP	
	1979	1972	1979	1972	1979	1972
CSM and ICSM	10.1	28.9	12.5	7.3	5.2	0.7
WSB	2.4	2.6	9.9	4.0	0.6	0.7
SFSG	0.1	-	5.1	-	2.0	-
Wheat flour*	8.5	13.1	13.1	24.2	18.4	16.7
Bulgur*	35.0	29.7	34.6	11.1	10.5	2.0
Cornmeal*	0.1	0.3	4.3	4.4	8.7	3.5
Corn	-	-	-	1.2	-	15.9
Rice	0.5	-	2.7	-	6.1	-
Sorghum	-	-	-	-	1.9	9.1
Wheat	33.7	6.1	1.0	27.8	27.4	39.7
Oil	5.0	8.0	6.5	7.2	4.5	5.8
NFDM	2.6	9.6	5.6	9.9	7.5	4.8
Other**	2.0	1.7	4.7	2.9	7.2	1.1
Total	100	100	100	100	100	100
Ratio of cost*** to volume	26¢/kg	22¢/kg	30¢/kg	19¢/kg	24¢/kg	13¢/kg

*Both regular and soy-fortified.

**For 1979 includes corn, soy-fortified rolled oats, wheat protein concentrate, soy-fortified rice, CSB, and whey soy drink mix; for 1972 includes rice, rolled oats, rolled wheat, and soy flour.

***Acquisition only.

Source: Food for Peace Annual Report on Public Law 480 (1972, 1979).

Table C-11

COMMODITY RANKING BY COST*

Per Unit of Energy		Per Unit of Protein	
15.30	Soy Flour	Infinite	Oil
13.14	WPC-Soy	6.76	Rice
12.38	Rice	3.43	Cornmeal
11.59	ICSM	2.71	WPC-Soy
11.49	NFDM	2.51	All-Purpose Wheat Flour
11.13	WSB	2.25	Bulgur
10.53	Sf Rolled Oats	2.23	Sf Cornmeal
10.46	CSM	2.20	ICSM
9.43	Oil	2.01	WSB
9.12	Peas	1.99	CSM
8.82	Sf Wheat Flour	1.95	Sf Wheat Flour
7.94	Sf Sorghum Grits	1.86	Sf Rolled Oats
7.89	Sf Bulgur	1.78	Corn
7.49	Sf Cornmeal	1.77	Sf Sorghum Grits
7.48	Cornmeal	1.57	Sf Bulgur
7.26	All-Purpose Wheat Flour	1.51	Wheat
7.13	Bulgur	1.37	Sorghum
5.68	Wheat	1.30	Peas
4.60	Sorghum	1.12	NFDM
4.56	Corn	1.05	Soy Flour

*These figures do not take into consideration digestibility. Ranking would change if digestibility factors were included.

Source: Table C-1.

Table C-12

APPENDIX D

COMMODITY SUPPLY CONSIDERATIONS IN THE UNITED STATES

In Table D-1, we observe the evolution of the program between 1970 and 1980 in terms of changes in volume of Title II exports. Apart from the drastic decline in wheat since 1974, there does not seem to be a clear trend in the volume of exports for other commodities. Perhaps the most striking feature is the high instability through time in the commodity allocations of Title II.

Tables D-2 and D-3 show the volume of U.S. production and exports of each of the Title II commodities between 1970 and 1980.

Tables D-4 and D-5 show Title II exports as a percentage of U.S. agricultural production and exports. The most notable feature here is, on the one hand, the very marginal significance of Title II exports as a percentage of U.S. production and exports for wheat, corn, and rice, and on the other hand, the high dependence of NFDM and blended food exports on Title II programs. One should, however, notice that as a percentage of U.S. production, Title II NFDM and oil exports are much lower--13.4 for NFDM, and 2.1 for oil. In contrast, the blended food industry, according to this figure, seems to be highly dependent on Title II exports: almost 100 percent of their production sells under Title II programs.

Table D-6 presents the evolution of average export prices for each commodity during the period 1967 through 1979. The purpose of this Table was

TITLE II, PUBLIC LAW 480: SUMMARY OF COMMODITIES EXPORTED BY FISCAL YEAR
(IN '000 METRIC TONS)

Year	Commodity					
	wheat*	corn**	rice	NFDM	oil	blended*** foods
1970	1,234	324	10	134	81	149
1971	1,142	282	--	141	86	178
1972	1,389	150	247	115	187	265
1973	1,305	123	33	25	111	269
1974	484	161	--	--	53	275
1975	277	78	5	44	41	169
1976	273	112	--	35	60	161
1977	642	23	24	57	38	148
1978	446	41	64	68	62	158
1979	414	82	67	65	97	199
1980	431	252	148	67	128	202

*Includes wheat flour grain equivalent.
**Includes cornmeal grain equivalent.
***Blended foods include: CSM, ICSM, CSB, WSB, CSM-Sweetened, WSB-Sweetened.

Source: USDA (1981).

Table D-1

TOTAL U.S. AGRICULTURAL EXPORTS (IN '000 METRIC TONS)

Year	Commodity					
	wheat*	corn**	rice	NFDM	oil	blended foods
1970	17,350	15,150	1,775	188.5	645	82.1
1971	19,718	12,736	1,621	154.3	791	188.9
1972	18,296	19,939	1,868	155.7	635	233.4
1973	37,022	31,544	1,675	21.8	484	231.4
1974	27,585	31,006	1,694	2.9	652	165.7
1975	30,116	28,822	2,214	52.6	467	139.5
1976	30,881	43,126	1,950	37.5	443	144.0
1977	25,073	42,454	2,319	56.4	703	154.9
1978	33,208	49,112	2,276	89.3	933	169.6
1979	32,538	53,885	2,396	71.9	1,059	192.2
1980	37,271	61,417	2,955	96.4	1,220	213.6

*Includes wheat flour grain equivalent.
**Includes cornmeal grain equivalent.

Source: USDA (1980e).

Table D-2

U.S. PRODUCTION OF SELECTED AGRICULTURAL COMMODITIES (IN '000 METRIC TONS)

Year	Commodity					
	wheat*	corn**	rice	NFDM	oil	blended foods
1968	42,340	74,884	4,725		2,963	82.1
1969	39,241	81,327	4,170		3,586	188.9
1970	36,762	71,985	3,802		3,750	233.4
1971	44,027	101,753	3,876	643	3,580	231.4
1972	42,057	103,407	3,560	555	3,403	165.7
1973	46,533	109,813	4,209	416	4,081	139.5
1974	48,468	93,705	5,099	463	3,346	144.0
1975	57,531	118,038	5,827	458	4,369	154.9
1976	58,272	125,965	5,247	420	3,892	169.6
1977	55,388	124,383	4,502	502	3,956	192.2
1978	48,925	141,291	6,252	418		213.6

*Includes wheat flour grain equivalent.
**Includes cornmeal grain equivalent.

Source: USDA (1979).

Table D-3

EXPORT VOLUMES OF TITLE II PL 480 AS A PERCENTAGE OF TOTAL U.S. AGRICULTURAL EXPORTS FOR SELECTED COMMODITIES

Year	Commodity					
	wheat	corn	rice	NFDM	oil	blended foods
1970	.071	.022	.005	.710	.125	1.000
1971	.058	.022	0	.914	.108	.942
1972	.076	.007	.132	.738	.294	1.000
1973	.035	.004	.019	1.000	.229	1.000
1974	.017	.005	0	0	.081	1.000
1975	.009	.003	.000	.836	.087	1.000
1976	.008	.002	0	.933	.135	1.000
1977	.025	.000	.010	1.000	.054	1.000
1978	.013	.000	.028	.761	.066	1.000
1979	.013	.001	.027	.904	.091	1.000
1980	.011	.004	.050	.695	.104	.945
Average	.030	.006	.033	.849	.124	.989
Average Percent	3%	.6%	3.3%	84.9%	12.4%	98.9%

Source: Tables D-1 and D-2.

Table D-4

EXPORT VOLUMES OF TITLE II P.L. 480 AS A PERCENTAGE OF TOTAL U.S. AGRICULTURAL PRODUCTION FOR SELECTED COMMODITIES

Year	Commodity					
	wheat	corn	rice	NFDM	oil	blended foods
1970	.033	.004	.002		.021	1.000
1971	.026	.002	0	.219	.024	.942
1972	.033	.001	.069	.207	.055	1.000
1973	.028	.001	.007	.060	.027	1.000
1974	.009	.001	0	0	.015	1.000
1975	.004	.000	.000	.096	.009	1.000
1976	.004	.000	0	.083	.015	1.000
1977	.011	.000	.005	.113	.009	1.000
1978	.009	.001	.023	.162		1.000 (1979, 80?)
Average	.017	.001	.017	.134	.021	.989

Source: Tables D-1 and D-3.

Table D-5

AVERAGE PRICES/MT OF SELECTED COMMODITIES
IN CONSTANT 1967 DOLLARS

Year	Commodity						
	sorghum	corn	oil	rice	wheat	blended* foods	NFDM*
1967	39.04	40.54	231.42	109.22	51.06		430.
1968	38.14	41.32	222.60	107.26	44.45	220	432.
1969	37.70	42.89	271.09	101.87	42.97	180	474.
1970	40.54	47.23	290.93	102.85	47.75	154	515.
1971	35.89	37.39	244.64	102.85	42.97	166	528.
1972	45.26	51.95	328.39	123.91	54.36	168	444.
1973	62.58	74.38	539.98	225.79	107.63	193	502.
1974	68.09	74.38	456.23	154.28	93.67	187	708.
1975	53.13	58.25	290.93	104.81	74.57	200	578.
1976	44.87	46.05	350.44	84.24	54.73	213	745.
1977	36.88	40.93	304.15	107.26	43.71	201	415.
1978	37.98	42.11	346.03	90.61	52.16	172	161.
1979	38.88	42.11		102.85	59.50	140	163.
1980							123

*Simple average export price.

Source: USDA (1980a).

Table D-6

to examine the extent to which we can detect clear long-term upward or downward trends in export prices. We could easily adjust statistical trends analysis to these data. Visual inspection of the time series shows a high instability of most prices through time, a slight increase in the real price of oil compared to 1967 through 1969, and a decline in the price of blended foods and NFDM since 1978. As expected, the years 1973 through 1975 show prices above trend for almost all commodities except blended foods and NFDM.

Finally, Table D-7 presents stocks owned by the Commodity Credit Corporation: these correspond to the commonly used definition of surplus commodities. It would be useful to update this table to 1981. Using this definition of surplus commodities, the major surpluses would likely be found in dairy products. For grains, Commodity Credit Corporation stock represents a very small fraction of U.S. exports.

COMMODITY CREDIT CORPORATION: PRICE-SUPPORTED COMMODITIES USED IN P.L. 480 PROGRAMS OWNED AS OF DECEMBER 31, 1965-79* (METRIC TONS)

	Commodity					
Year	corn	dry beans	sorghum	NFDM	rice***	wheat
1965	13,466,424	4,537	12,526,315	59,437	36,297	15,571,687
1966	3,963,702	**	8,435,571	**	18,148	5,880,217
1967	3,506,352	13,611	4,903,811	86,660	4,537	2,967,332
1968	6,631,578	**	4,878,402	121,597	**	2,967,323
1969	7,520,871	**	4,776,769	96,188	290,381	4,573,502
1970	5,462,794	4,537	4,141,560	53,992	313,067	7,704,174
1971	3,658,802	**	1,473,684	36,297	222,323	10,127,041
1972	3,557,168	0	940,108	11,796	27,223	7,268,602
1973	1,778,584	0	203,266	907	**	3,784,029
1974	152,450	--	25,408	78,039	--	408,348
1975	**	--	--	200,544	**	**
1976	**	--	**	205,535	866,606	**
1977	25,408	--	25,408	321,234	843,920	925,589
1978	1,956,442	--	940,108	298,548	471,869	1,361,161
1979	2,540,834	--	1,143,375	240,018	367,513	1,361,161

*Commodities which were owned by CCC in some years but not shown in this table are as follows: wheat products, corn products, oat products, rice products, and vegetable oil.

**Small quantity, unreported.

***Rough basis: includes milled rice in rough equivalent.

Source: USDA (1980d).

Table D-7

APPENDIX E

CRITERIA FOR SELECTING PROCESSING SITE

The approved commodity list includes a number of processed grains and nutritionally fortified foods. In theory, these commodities can be processed from whole grains or blended either in the United States or in a recipient country. Each of the commodities presently available has different requirements for primary processing and for final preparation into food. It is beyond the scope of this report to elaborate on these requirements. Instead, criteria are provided to assist in specific decisions on the appropriate location for processing.

Cost. Program costs and tonnages are of primary concern. Price comparisons of grains vs. processed food would indicate an advantage in shipping unprocessed commodities since whole grain costs Food for Peace less than flours or blended foods. However, with few exceptions, grains are rarely distributed.

At the present time, if all costs are to be borne by Food for Peace, it would appear that processing in the U.S. would be advantageous. However, in some situations, the recipient country might bear some or all of these costs. In such cases, it would be more cost-effective for Food for Peace to process overseas.

Infrastructure. In order to develop an industry, a number of factors are needed, such as physical facility, skilled labor, investment capital, management, and supplies. In the U.S., the processing capacity is already

available and operational. This permits an efficient and cost-effective system.

Quality control. Food for Peace has standards of quality for each commodity, since maintenance of quality and product integrity is important to the program. Quality control in the U.S. is accomplished through the development of purchase specifications and an inspection system under the supervision of the USDA, with provisions for discount for failure of compliance. Processing overseas would require the development of an alternate quality control system.

Handshake symbol. This symbol identifies commodity packages as gifts from the American people, emphasizing the people-to-people aspect of the program, and providing uniform product identity throughout the distribution system. This is important to the U.S. from a public relation's standpoint; it also prevents, to a degree, "the comingling" of these commodities into the commercial trade in the developing country.

Prototype for eventual commerical products. Many of the fortified and blended foods processed for the Title II program are prototypes for commercial production both domestically and internationally. The relative advantages to the U.S. or to the recipient country depend upon their respective goals.

Reliability of supply. Once the program depends on a specific commodity to be used in a recipient country, it is important that a continuous supply of that commodity be available. The processing industry has to plan and project for future needs. The current system in the U.S. ensures supply, as well as a processing reserve for "rapid responsiveness" when needed for relief programs.

Promotion of markets for high-protein crops. Many beneficiaries of food aid are not familiar with high-protein foods. Local processing of such

foods could serve as an incentive toward producing high-protein crops.

Development of local capability of food industry work force. Food processing plants require labor, which presumably would be provided by the recipient country. The development of local food production capabilities, as well as program phaseout and takeover by the recipient government, would also be encouraged.

In balance, it appears that it is now more advantageous to continue processing Title II commodities in the U.S. Each opportunity for phaseout to local processing, however, should be evaluated according to the criteria listed above.

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STATEMENT OF EXCEPTION*

W. Hoover

The summary report by the Food and Nutrition Board Subcommittee on the Nutritional Analysis of PL 480 Title II Commodities reflects the result of a conscientious effort to suggest improvements in the Food for Peace Program. Certainly, a great amount of information has been considered and incorporated into the report, which will be of value to program directors within the Food for Peace organization and in voluntary agencies.

In spite of this, the report is flawed in several ways. Basically, the Subcommittee struggled to make major recommendations for changing the Food for Peace Program. An underlying failure to recognize that the current program is the mature product of nearly 30 years of legislative and administrative evaluation resulted in an overly academic economic modeling approach to commodity selection criteria. This emphasis is, at least in part, the result of the limitations or constraints presented to the Subcommittee in the parameters of the study. The Subcommittee was asked to evaluate the present PL 480 commodity list and develop criteria for commodity selection, but not to concern itself with program priorities, mode, operation, administration or

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*Current policies of the National Research Council provide that, whenever on a given issue there are irreconcilable differences of opinion, the dissenting individual be provided opportunity to enter a statement of exception. These statements represent the views of the indicated author and are therefore not subjected to the external review process that is invoked for the body of the report.

budget levels.

Alas, the report will be of limited value--it overemphasizes certain factors in commodity selection and essentially ignores international and domestic political and economic realities.

PL 480 is a multipurpose law with the basic tenets of stabilizing the United States agricultural system; to meet famine or other urgent or extraordinary relief requirements; to combat malnutrition, especially in children; to promote economic and community development in friendly areas; and for persons and nonprofit school lunch and preschool feeding programs outside the United States. The law requires that the programs of assistance should be directed toward the attainment of humanitarian and developmental objectives as well as the development and expansion of agricultural markets in the U.S. and in recipient countries.

The basic shortcoming of the report is that the criteria for selection of commodities, given acceptability, are based on "least-cost" nutrient presentation in direct feeding programs and maximizing "income transfer" in the indirect feeding mode without appropriate considerations being given to the effect on U.S. agricultural programs, economic development, and expansion of U.S. agricultural markets.

Nutritional Considerations

The information and nutritional criteria contained in Chapter III of the report should be of value in program and commodity development. However, the report considers only the calorie and quantity of protein as being important in its least-cost approach.

The report implies that other nutrients (vitamins and minerals) can be better handled pharmacologically and that the use of a blended food for its vitamin and trace mineral content is not a cost-effective way of delivering

these nutrients. The Subcommittee did not develop any information which would lead to that implication. Certainly, if there are instances when isolated individuals with specific deficiencies are encountered, it would be appropriate to treat them medically and not through a change in a massive feeding program to supplement a ration when a general deficiency is not found. However, to imply that enrichment and fortification is not a cost-effective nutritional intervention is wrong. Very important nutritional contributions have been, are, and should continue to be made through the consumption of enriched and fortified foods throughout the world and certainly through the blended and fortified products in the PL 480 commodity group.

Cost-effectiveness of enrichment programs vs. pharmacological means of dietary supplementation should be studied operationally, culturally, and economically before drawing conclustions or making commodity changes.

Nutritional Cost-Effectiveness Considerations

Presently, three-fourths of the program recipients receive food through indirect or take-home programs such as "food for work" or by distribution through maternal and child health centers. Naturally, of great concern is maximizing the nutritional impact on the targeted individual or the entire family. The Subcommittee focused its attention on just how commodity selection could influence nutritional cost-effectiveness of the program in this diffused situation.

An interesting theory was introduced which concluded that the nutrient composition of the commodities in take-home programs is of little importance in relation to the income transfer value of the commodity of the product in the local marketplace. The theory is that if you maximize the income transfer value of the commodity, the recipient family will spend the money for better (higher nutritional value) foods or even just for more food than otherwise

possible, and thus improve their nutritional status irrespective of the nutrient content of the commodity received.

This theory was developed into a simple ratio which would allow program planners to compare and select commodities for indirect feeding programs. The ratio of the dollar value of the commodity in the local marketplace to the cost to the "food for peace" program (acquisition cost and transfer cost) is called the "α" ratio. In Chapter IV of the report, the theoretical effect of applying this ratio was explored at length using a wide range of assumptions (some quite questionable) and many qualifications and other factors were recognized as important to commodity selection.

Unfortunately, the summary statement and the results and conclusions of the report emphasize the "α" value as the major new thrust in commodity selection criteria. It is incredible and bordering on irresponsibility to recommend commodity purchases, involving hundreds of millions of dollars, based on theory that natural behavioral response leading to the purchase of more nutritional food will result from maximizing the income transfer characteristics of the donated commodity.

The report does urge that studies be conducted to see if the theory really works. Indeed, such studies should be made before any significant program shift is even suggested as the evidence on changes in family purchasing patterns for food or non-food items is fragmentary at best.

The emphasis on the development of the "α" value in the report reflected the Subcommittee's primary thrust--concern with optimizing the nutritional improvement of the recipient. Now, this is indeed important, but the result, taken to the extreme ignores the other purposes of PL 480. Commodity selection based upon "α" value does not reflect possible effects on stabilization of the U.S. agricultural sector, the expansion of U.S. agricultural markets, or the developmental influence within the food industry

in the recipient country.

Distribution of high value foods certainly will provide incentive for participation, but the nutritional implications are fuzzy with the potential for nutritional improvement lessened by leakage for non-food expenditures. There are other disadvantages which must be noted. High value commodities will heighten the potential for thievery, graft and corruption in the delivery system and encourage "black marketing" of the commodities.

The report suggests that vegetable oil is the likely choice of commodity if high "α" value is used in the selection process because in most countries, the price of oil is high. The report ignores the fact that the price of vegetable oil is almost universally either price supported to encourage local industry development or subsidized to assist the consumer. The impact that the high priced commodity, in any significant quantity, will hve on the local food industry could actually be discouragement of vegetable oilseed production and processing, for example. At least two other drawbacks to this approach can be cited. Selection of high value commodities encourages consumption of high priced foods that may not be available if the program stops. Also, the use of high value commodities does nothing to encourage phase-out of the program.

The "α" ratio itself has basic flaws. The numerator will be often based upon contrived values resulting from the recipient food policies of each government and thus the "α" ratios will be locally specific. Also, inherent in the definition of the numerator, no nutritional contributions of the commodity are considered.

The denominator is based upon the cost of the commodity (acquisition costs and transfer costs) to the Food for Peace Program. This builds in U.S. agricultural programs of support prices and subsidies as well as subsidization of the U.S. maritime fleet. A much more appropriate denominator would be the

"net" cost to the United States Government. This would recognize the tax income generated by the value added through the increased economic activity involved in the production, processing, and transportation of the selected commodity.

It is strongly urged that "Food for Peace" endorse and support a "value added" study of all of the current commodities on the approved list to develop an understanding and appreciation of the net cost factors with each commodity. This information is crucial for any nutritional-economic evaluation of effectiveness of commodities, and will assist the agency in its program development and commodity assessment--and perhaps more importantly in future budget allocations for the food for peace program.

The summary statement expresses the belief that the Subcommittee is cautiously optimistic that implementation of its recommendations will lead to a substantial increase in the number of people receiving currently conveyed nutritional benefits or alternatively, in the nutritional benefits, obtained by the population currently served by the program.

As a practical matter, with a declining "Food for Peace" budget, the denominator of the "α" ratio (cost to the program) becomes the determinant of program size. As a generalization, the higher the "α" ratio, the higher the commodity cost per unit (non-fat milk solids, currently in surplus, an obvious exception). Given the budget constraint, it is just not possible to serve more people by buying the most expensive commodities. The Subcommittee in its optimism for increased budget levels, has engaged in wishful thinking.

At least two recommendations made by the committee deal with issues beyond the scope of the report. The "minimum tonnage requirement" in the PL 480 Law is such an issue. Yet, faced with a finite budget, the Subcommittee concluded the "minimum tonnage" to be an impediment to its recommendations and thus recommended that budget level and minimum tonnage be brought into alignment to

permit operation of a nutritionally cost-effective program. As desirable as this might seem, it is inappropriate for the Subcommittee to make such a recommendaton without a detailed and authorized study of all the implications involved in changing the legislative requirement for "minimum tonnage".

A similar situation is involved in the Subcommittee recommendation that voluntary agencies be given increasing authority for selecting commodities and in the budgeting process. This is clearly outside the scope of the present study.

While this minority report has emphasized shortcomings of the report, there has been a value in the collective study of the nutritional analysis of the PL Title II Commodities. Many issues and questions have been identified or raised which hopefully will lead to a series of continuing studies and assessments which will fine tune what generally has been a very successful program of foreign aid.

Location of Processing*

The extent of processing and the location of the processing operation for the nutritionally improved foods offered under Title II, PL 480 is a key issue in determining the appropriate array of products to be provided and affects the entire system from the view of the donor, the voluntary agency and the recipient country.

Each of the commodities available presently through the Title II program will have slightly differing requirements for primary processing and for final preparation into foods. It is beyond the scope of this report to elaborate on each of the commodities and their special requirements. Instead, an overview

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*This section of the statement of exception is proposed as a replacement for Appendix E, "Criteria for Selecting Processing Site," pages 187-189 of the report.

of the advantages and disadvantages of processing these commodities in the United States and overseas is offered.

Program costs and tonnages are of primary concern. Price comparisons of grains versus processed foods would indicate an advantage to unprocessed commodities. However, that is not the complete story. A recent staff report of the United States Department of Agriculture, entitled "Expanding the Products Share of the U.S. Agriculture Exports" explored the multiplier effect of value added of processing of raw agricultural commodities in the United States prior to export. When the tax implications of expanded economic activity are considered, a lower net cost to the United States government by providing processed products rather than raw agricultural commodities is indicated. (Based on an evaluation of the value added implications of wheat vs. wheat flour--the only Title II commodity data in the USDA report). Food for Peace should encourage the expansion of the value added study to include all commodities on the current list.

Processing of the current range of commodities available under Title II in the United States, provides commodities of designed nutritional and organoleptic quality through a competitive bid purchasing system.

The cost to the program at the present time indicates that processing in the United States is valid, as central processing permits an efficiency of scale and the incremental costs of processing are lower in the U.S. since the processing capacity for most blended foods is already installed.

Maintenance of quality and product integrity is important to the program. Quality control of processing in the U.S. is affected through the development of purchase specifications, and an inspection system under the supervision of the United States Department of Agriculture with the provision for discounts for failure of compliance with specifications. Processing overseas would require the development of an alternate and probably expensive quality control

system.

The use of the Food for Peace "handshake" symbol uniformly on the packaging on PL 480 commodities provides a uniform product identity throughout the distribution system. This is important from a public relations standpoint to the United States, and prevents, to a degree, the "co-mingling" of these commodities into the commercial trade in the developing country.

Title II programming should lead in the development of nutritionally improved foods. Processed and blended foods provide prototypes for eventual "commercial" products both domestically and internationally.

Reliability of supply is of critical importance to operational programs and, of course, to recipients. The current system of processing in the United States provides an insurance of supply and in addition, provides a processing reserve for "rapid responsiveness" when rapid relief programs are needed.

One objective of the Food for Peace program is to assist the development of food production capabilities in underdeveloped countries. The current system of supplying processed commodities discourages the processing and thus the production of high protein crops in developing countries. Also, processing in the United States does not encourage overseas commercial development of nutritionally improved foods, except in instances where the processed foods become ingredients for further local processing. Also, from the donor's viewpoint, processing in the United States does not encourage the development of a basis for phase out of the program and take over by the recipient government.

At present, it appears advantageous to continue processing Title II commodities in the United States. Each opportunity for phase out to local processing, however, should be evaluated from the viewpoint of cost and investment opportunities, quality, and infrastructure to assure merit of the proposed change.