Nutritional Consequences of Agricultural Projects: Conceptual Relationships and Assessment Approaches

World Bank Staff Working Paper No. 456

May 1981

Prepared by: Per Pinstrup-Andersen (consultant)
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Population, Health and Nutrition Department

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NUTRITIONAL CONSEQUENCES OF AGRICULTURAL PROJECTS:

CONCEPTUAL RELATIONSHIPS AND ASSESSMENT APPROACHES

This paper provides a survey of past and ongoing activities aimed at the incorporation of nutritional considerations into agricultural and rural development projects and policies. The conceptual relationships linking agricultural and rural development projects to the nutritional status of the poor are discussed and the usefulness of presently available methodology for considering nutritional effects in project design is assessed. The major gaps in methodology and empirical knowledge are identified and the paper terminates with a set of recommendations regarding: (i) the incorporation of nutritional considerations into project assessment, (ii) improvements in currently available methodology and empirical knowledge, and (iii) supporting research and testing.

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PREFACE

Per Pinstrup-Andersen is Director of the Food Consumption and Nutrition Policies Program, International Food Policy Research Institute (IFPRI), Washington, D.C. This report was prepared while the author was associate professor at the Economics Institute, The Royal Veterinary and Agricultural University, Copenhagen, Denmark.

A number of World Bank staff members contributed to this report through discussions and suggestions for improvements of earlier drafts. The author wishes to acknowledge the assistance received from these staff members in particular: Alan Berg, Graham Donaldson, Odin Knudsen, Pasquale Scandizzo, Emmerich Schebeck and Alfredo Sfeir-Younis.
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i. Explicit consideration of nutritional goals in the identification, design and assessment of agricultural and rural development projects appears to offer great potentials for reducing energy-protein deficiencies among households with malnourished members. This viewpoint has gained considerable strength among national and international institutions during recent years. However, on the basis of a review of relevant past and on-going activities, it appears that very little has yet been accomplished to actually assure such explicit consideration of nutritional goals in non-nutrition projects. A number of institutions are currently in the process of developing and testing methods and approaches for this purpose. Most of these efforts have been initiated during the past couple of years and it is premature to judge as to their future usefulness. What does seem clear is that no effective and acceptable approach is currently available for incorporation into project assessment on a routine basis. The most encouraging development currently taking place is probably the development of planning and/or implementation units in a few developing countries aimed at an integrated attack on food, nutrition and agricultural problems. However, these units are few and frequently suffer from lack of resources - both financial and human. Furthermore, they are hampered in their efforts by vested interests and inertia in traditional institutions, and they suffer from a lack of effective analytical approaches for planning such integrated attacks.

ii. In general, it appears that both developing countries and aid agencies - whether national or international - are poorly equipped to deal with nutritional issues within agricultural and rural development projects. Generating the appropriate capacity and willingness to deal with these issues should take high priority within the development strategy for food and
agriculture. This would include the strengthening of the data base available to the project planner, the development of appropriate analytical procedures, supporting research, and institutional change.

iii. Some of the data needed by the project planner will be project specific, others will not. Project specific data are needed on the effect of a particular project on the production, supply and home consumption of each of the foods affected, the effect on food prices and the effect on incomes separately by malnourished and well-nourished households. Non-project-specific data and analysis are then needed to estimate what the effects on households with malnourished members and how their calorie and protein consumption will be influenced. The data and analyses must be disaggregated on households with malnourished members and households without. Additional disaggregation among the malnourished according to severity and other characteristics may be useful. The disaggregation is critical. Overall averages is of little use to estimate nutritional consequences of agricultural projects. Knowledge about who is malnourished, the character of the malnutrition and the principal causes is a precondition for the above analyses. Thus, in countries where such knowledge is deficient or absent, high priority should be placed on its generation or improvement. High priority should also be placed on estimating price and income elasticities for malnourished groups.

iv. A series of food sector strategy reviews currently being planned or underway may provide an effective vehicle for obtaining the required data and analyses. Furthermore, these reviews may strengthen national capacities to maintain effective strategies in the future. In fact, unless major emphasis is placed on strengthening national capacities, these reviews may be of very limited long term value.
v. If improved nutrition is to receive the same recognition as other goals of agricultural and rural development projects, it must enter into the decision making on project identification and design at an early state of the project cycle. For this purpose, and since there is no tradition for considering nutritional effects at the early stages of the agricultural project cycle, it would be useful to assist the project planner in identifying issues and relationships expected to be particularly sensitive to nutritional effects...

vi. While it would be premature at this time to incorporate a comprehensive quantitative nutrition assessment approach into project assessment on a routine basis, additional research and testing is needed to develop and adapt an approach that would provide reliable and useful guidance for project design, yet not be excessively demanding regarding resources and time so as to be unacceptable to the project planner. One such approach - the calorie consumption indicator - is suggested. Other research and testing which should receive high priority include the use of social demand function and/or distributional weights in the assessment of nutritional consequences of agricultural projects, development and testing of workable methods for estimating or approximating price elasticities of demand by population group and commodity, research to improve our understanding of the relationships between production and consumption decisions among semi-subsistence farmers, and ex-post evaluations of consumption and nutrition effects of agricultural policies and project.

vii. A more complete presentation of the recommendations made in this study is found in the last section of the paper.
I. **INTRODUCTION**

1.01 Problems of malnutrition have traditionally been approached through direct nutrition intervention programs. However, limited success and high costs of these programs have prohibited their widespread usage. During recent years, it has become increasingly clear that the vast and worsening problem of calorie-protein deficiencies can be diminished or solved in a sustained manner only through the explicit incorporation of nutritional goals into overall economic and social development plans and strategies. While direct nutrition intervention programs may be effective in solving selected nutritional problems, the overall problem of energy and protein deficiencies among large population segments can only be solved through the mainstream of economic and social development. Failure to explicitly consider nutritional goals in such development plans, strategies, projects, and policies may result in a worsening of the nutritional situation that by far exceeds improvements made by direct nutrition intervention programs.

1.02 Reliance on the general economic development process for the solution of nutritional problems is likely to be very unsatisfactory in most market-oriented developing countries unless the process is guided, at least in part, by nutritional considerations (Knudsen and Scandizzo 1979; Pinstrup-Andersen and Caicedo 1978). In countries with widespread calorie-protein deficiencies the trickle-down effect from economic growth is likely to be ineffective in improving nutrition significantly (Selowsky 1979). Furthermore, while necessary, expanded food production *per se* is insufficient to solve the nutritional problems.
1.03 The most effective means to diminish or remove existing energy-protein deficiencies in a sustained manner is undoubtedly the explicit incorporation of nutritional goals into development projects and policies and allocation of considerable weight to these goals relative to other goals in project and policy choice, design and implementation. The need for such an approach is being recognized by an increasing number of governments in developing as well as developed countries and international institutions. However, action to actually implement the approach is still very limited.

1.04 Partial justification of agricultural and rural development projects on nutritional grounds is not new. In fact, existing malnutrition has been used extensively to argue for projects and policies aimed at expanded agricultural production, increased farm incomes and a variety of other goals. However, in general, the nutritional effects of such projects have been assumed. At best, improved nutrition has been an implicit goal of agricultural and rural development activities. The explicit goals, on the other hand, have been such things as increased food or non-food production, improved resource productivity, higher earnings to the farm sector, expanded foreign exchange earnings, self-sufficiency in basic foods (market self-sufficiency - not nutritional self-sufficiency), low food prices or, most commonly, a combination of some of these.

1.05 Agricultural and rural projects and policies are planned, executed and evaluated on the basis of a set of explicit goals of which improved nutrition is not usually a part. As a result, projects and policies are not oriented towards nutritional goals and trade-offs between nutritional impact and the degree to which other goals are achieved are not considered. But
the degree to which nutritional goals are achieved depends on the choice of content of the particular project and policy and it is possible that considerable nutritional gains could be obtained through changes in project design or modifications of on-going projects without unacceptable losses in the achievement of other goals. In fact, efforts to improve the nutritional effects need not conflict with the achievement of other goals. But unless nutritional goals are explicitly considered along with other goals during project planning, execution and evaluation, potential nutritional gains will be obtained only by coincidence.

1.06 While, as mentioned above, the need for explicit incorporation of nutritional goals into agricultural and rural development projects and policies is becoming widely recognized, effective approaches for doing so in an operationally acceptable manner are not yet available. However, efforts are currently being made by a number of institutions and individuals to develop and test such approaches. This paper provides a survey of these efforts. Although attempts were made to represent all types of on-going activities judged to be of sufficient relevance to the topic, the survey is by no means exhaustive, partly because a number of unannounced and unpublished activities are likely to be unknown to the author and partly because some arbitrary limits had to be drawn to maintain the survey within a manageable size.

1.07 On the basis of the survey and a preceding analysis of the most important links between nutrition and agricultural and rural development projects, attempts are made to identify the major methodological gaps and the needs for further research and testing. The paper also provides a set of recommendations regarding methods for ex ante assessment of the nutritional effects of agricultural and rural development projects and policies.
1.08 The paper aims at assisting in the design of agricultural and rural development projects sponsored by the World Bank and supporting research and testing. However, the analyses are likely to be equally valid for other institutions involved in agricultural and rural development.

1.09 The magnitudes of malnutrition, the nature of the problem and the effects of malnutrition on human well-being, income-earning capacity, economic growth and income distribution are not discussed in this paper. Readers who desire information on these topics are referred to writings by Berg (1973), Biswas (1978), Food and Agricultural Organization (1977), Knudsen and Scandizzo (1979), National Research Council (1977), Reutlinger and Selowsky (1976), and World Bank (1979). However, in order to place the above-mentioned survey and analyses in proper perspective, a brief analysis of the causes and possible solutions to the nutritional problems is provided.

1.10 Thus, the remainder of the paper is divided into four sections. The most important causes of and possible solutions to malnutrition are discussed first. Then follows an analysis of the possible nutritional effects of agricultural and rural development projects. Emphasis is placed on the conceptual relationships between nutrition and agricultural and rural projects and policies and how these relationships may be affected to improve the nutritional consequences of such projects and policies. Related empirical evidence is only discussed to the extent deemed necessary to illustrate the appropriate conceptual relationships. Project and policy modifications as well as corrective and compensatory measures aimed at the improvement of nutritional consequences are discussed and the most important parameters and related data requirements are identified.
1.11 The third section provides a survey of past and on-going activities related to the relationships mentioned above. The survey deals with methodological developments, i.e., activities with a research and testing orientation, as well as the application of methods at the operational level. Attempts are made to assess the usefulness of presently available methodology and identify major gaps in methodology and empirical knowledge relevant to the topic. Trade-offs between the degree of quantification of nutritional consequences of agricultural projects and the magnitudes of the acceptable error margin on the one hand and the applicability of methods in actual project assessment and planning on the other, are discussed. The paper terminates with a set of recommendations regarding the incorporation of nutritional considerations into project identification, preparation and appraisal, improvements in currently available methodology and empirical knowledge, and supporting research and testing.

MALNUTRITION: CAUSES AND SOLUTIONS

2.01 The nutritional status of an individual is affected by (i) the amount and kinds of food available in the market or on the farm, (ii) the ability of the household - of which the individual is a member - to obtain available food, (iii) the desire of the head of the household to obtain food to which he/she has access, and (iv) the utilization of the obtained food by the household and by the individual to meet nutritional needs.

2.02 Malnutrition may be a result of deficiencies in any one or more of these four factors. Thus, efforts to alleviate existing malnutrition or avoid its future occurrence should include an analysis to determine which of these four factors is/are the immediate reasons for malnutrition. Is it a general
shortage of food? Is it lack of access to available food on the part of the malnourished? Is it a lack of desire to obtain food to which households with malnourished members have access? Or is it a problem of poor utilization of the food obtained by the household or consumed by the malnourished? The four factors are interrelated. Changes in one may be ineffective unless others are changed simultaneously. Efforts to expand food availability will have no nutritional effect if malnourished people do not get access to the additional food. Similarly, efforts to improve the ability to obtain food may be of little use if food availability is strictly limited or if households with malnourished members do not desire to take advantage of such improved ability to obtain food but instead translate this ability into the purchase of non-food commodities.

2.03 A great deal of past and on-going efforts to improve human nutrition focuses on one of the four factors while ignoring the above interactions. Agricultural projects and policies aimed at the promotion of food production tend to pay little attention to the fact that the additional food may be unaccessible for malnourished people. Direct nutrition intervention programs such as direct feeding schemes or other food transfers to malnourished groups frequently ignore that households may not desire net additions to food consumption of the magnitudes provided by the program and thus make corresponding adjustments in food purchases. Nutrition education programs may neglect the fact that better nutritional knowledge per se does not improve the access to food.

2.04 The point to be made here is not that all past and on-going nutrition programs are ineffecti, because obviously they are not. Rather, the point is that many food and nutritional programs are based on a very narrow
perception of the problem. The lesson to be learned from the failures of many of these programs is that efforts to assess the nutritional consequences of agricultural and rural development projects should incorporate project effects on all four of the previously mentioned factors and the interactions among these factors. This point will be discussed in detail in a subsequent section.

2.05 Figure 1 is an attempt to list some of the principal determinants of each of the four previously mentioned factors and some possible programs, projects and policies that influence each of these factors.

2.06 National, regional or local food availability is determined by food production, distribution, international trade and aid, processing and food demands. Food availability should be viewed from the points of view of place and time, i.e. where and when the food is available. Seasonal variations in local food availability appear to be of great nutritional significance in many localities (Schofield 1979 and Longhurst and Payne 1979). Food shortages and corresponding high food prices during parts of the year may cause severe malnutrition even though average availability during the cropping season appears to be satisfactory.

2.07 Food availability may be affected by a series of programs, projects and policies some of which are listed in Figure 1. Some will expand, others will reduce the quantity of food available. The nutritional composition of the available food may be changed either by changes in the relative amounts of the various commodities, e.g. crop substitution, or by changes in the nutritional composition of the individual commodity, e.g. higher protein content of a given commodity.
Figure 1. Factors affecting the nutritional status.

Yield, efficiency, area expanding activities for food and non-food commodities.
- Distr., storage, proc. programs.
- Input, output price policies.
- Resource ownership policies.
- Foreign trade, aid policies.
- Programs to alter nutr. composition.

Food availability (Nat., reg., local)

Distribution (Place, time).
- Int. trade and aid.
- Processing, feed dem.

Money income.
- Prices.
- Income in kind.
- Own production.

Ability to obtain available food (household)

Intra-househ. inc. distr.
- Outside influences.
- Perceived food needs.
- Perceived nutr. needs.
- Past consumpt., traditions.
- Social, cult., religious factors.

Intra-househ. food distr.
- Child care.
- Intra-househ. food proces.
- Food characteristics & comp.
- Time constraints.

Utilization of obtained food to meet nutr. needs (household & ind.)

Desire to obtain available food (household)

Nutritional status (individual)

Income generating policies.
- Income and resource re-distribution.
- Food subsidies, rations, direct feeding.
- Price policies (commod., groups, general).
- Food supply, demand policies w/price effects.
- Production for home cons., gardens, etc.

Intr-fam. income distr. & control changes.
- Promotion and advertising.

Nutrition education.
- Public health programs.
- Water improvement programs.
- Supply programs, vitamins, minerals.
- Disease prevention and cure.
- Child care and breast feeding programs.
2.08 Changes in the amount and kinds of food available need not result in corresponding changes in the degree of malnutrition. In fact, it most likely would not. The amount of nutrients made available by a given project or policy is usually a poor indicator of the nutritional effects, and choice among alternative projects on the basis of relative contributions to the quantity of available nutrients is not likely to be effective from a nutritional point of view (Pinstrup-Andersen, Londono and Hoover 1976). The nutritional effect of changes in food supply depends on the distribution of the change between malnourished and well-nourished groups and possibly among groups with varying degrees of malnutrition. The distributional pattern depends, in turn, on how the supply change comes about, e.g. which commodities are effected, how prices are affected, and whether there are simultaneous changes in incomes of malnourished and/or well-nourished groups.

2.09 Changes in incomes and prices affect the ability of a given household to obtain available food. Decreasing food prices may reduce producer incomes while benefiting non-producing consumers. On the other hand, increasing productivity and expanded production may benefit malnourished producers and consumers. The nutritional effects of changes in prices and incomes obviously depend on how households with malnourished members are affected. Thus, the nutritional effects can be estimated only on the basis of disaggregated economic analysis, where disaggregation is done on the basis of nutritional status. Failure to perform such disaggregation is likely to result in useless and in some cases directly wrong conclusions regarding nutritional effects. But in order to perform such disaggregated analyses, undernourished groups must be clearly identified.
2.10 The ability of a household to obtain available food may be influenced by changes in (i) household money incomes, (ii) prices of food and non-food commodities, and (iii) household incomes in kind. Examples of policies and projects that may cause such changes are given in Figure 1. Although different in nature, the nutritional effects of all of these policies come about through changes in real purchasing power of the household and/or changes in relative prices of the various foods.

2.11 Efforts to bias household consumption patterns through various programs such as direct feeding of children may be less effective than originally expected because the household reacts to increased income in kind by making corresponding changes in purchasing patterns in order to maximize perceived utility of total real incomes. Thus, the nutritional effects of changes in the ability to obtain available food depends on the desires to obtain available food versus other commodities.

2.12 Increasing incomes among households with malnourished members need not result in improved nutrition. The additional incomes may be spent on food for well-nourished members of the household, it may be spent on foods with low nutritional value, or it may be spent on non-foods including investment and saving. Furthermore, increasing household incomes may cause commodity substitution towards more expensive nutrients. Two points are important in this regard. First, household spending and consumption patterns, while rational to the head of the household, may not be optimal from a nutritional point of view. Nutrition is only one of a series of considerations entering into decisions on spending and consumption patterns. Needs other than nutritional ones may carry considerable weight and there is not reason to expect that the
fulfillment of all other needs is subordinate to the fulfillment of nutritional needs. In fact, even families with severely malnourished members usually spend more than 10% of household incomes on goods irrelevant to nutritional needs. Lack of knowledge regarding food and nutritional needs by household members is another reason why the ability to obtain food is not fully exploited. Wrong information imposed from outside the household and promotion of non-foods or non-nutritious foods add to the problem.

2.13 Secondly, the spending and consumption patterns depend on who within the household controls incomes and decides on spending and consumption. The importance of this point has been grossly underestimated in past economic analyses. Traditional economic analysis tends to overlook the point by assuming that the household operates as a single decision-making unit and that no conflict exists between the utility function used for decision-making and the utility function of individual household members. As long as there is no change in the role of the individual household members in the decision-making process, the assumption may cause relatively little harm, except that it makes us ignore the potential nutritional effects associated with changes in these roles. However, if projects and policies influence the intra-household decision-making process, the assumption may cause considerable error in estimations of nutritional effects. Rural development projects altering the traditional distribution of income control and income generating ability among individual household members is a case in point.

2.14 Although knowledge on the subject is extremely deficient, there is reason to believe that, as a rule, the nutrition effect of real income expansions, whether in money, in kind, or through price decreases, will depend on who in the household controls such income expansions and who decides what
should be the appropriate adjustments in household consumption patterns. 1/ This is an area where additional research is likely to be very useful for future analyses of nutritional effects of projects and policies.

2.15 In addition to food availability, access to food and desires to obtain food to which the household has access, the nutritional status is affected by the utilization of the food obtained (Figure 1). The utilization of the food obtained by a household may be discussed at two levels. First, how does the household distribute the food among its members vis-à-vis nutritional needs and secondly, how is the food that the individual household member consumes being utilized for nutritional purposes.

2.16 Intra-household food distribution depends on the above mentioned intra-household decision-making process, household goals, and knowledge regarding nutritional needs of individual household members. The above mentioned potential conflict between "household rationality" and optimality from a nutritional point of view may also be apparent in the case of intra-household food distribution. Households with very limited purchasing power may be faced with some hard choices between (i) maintaining a source of income - however low - through allocation of sufficient food to income earning members of the household at the cost of malnutrition among economically inactive household members, e.g. small children, or (ii) placing high priority on the nutritional status of economically inactive members (children) at the risk of loosing the income earning capacity of the household. An inhuman

1/ Guyer (1980) provides some very useful insights on this issue with particular reference to African societies.
but for many households - real choice situation. If, as is usually the case, income earning capacity and control over spending patterns and intra-family food distribution are closely linked, nutritional needs of small children may receive low priority. Attempts to improve the nutritional status of small children by means of direct feeding programs and other interventions that can be translated into expanded household real incomes will cause adjustments in spending pattern and intra-household food distribution that would partially or totally off-set the desired effects on child nutrition.

2.17 Moving next to the utilization of food by the individual, a number of factors should be considered. Most important are health and sanitary factors, diet composition, nutritional balance, energy density, food processing and preparation as well as general child care and extent of breast feeding. The most important topics from the point of view of design of agricultural and rural development projects are probably (i) the influence of such projects on the time allocation of women and the resulting nutritional impact through changes in breast feeding, child care, food preparation and eating habits in general, and (ii) identification of the health and sanitary factors which significantly hamper the attainment of a satisfactory nutrition status in order to incorporate the change of these factors as an objective of the rural development project.

2.18 The purpose of this section has been to provide a general overview of the causes and possible solutions to malnutrition. The section to follow will focus more specifically on the nutritional effects of agricultural and rural development projects.
III. NUTRITIONAL EFFECTS OF PROJECTS: LINKAGES AND PARAMETERS

3.01 Agricultural and rural development projects are frequently designed to achieve a number of simultaneous objectives. Expanded food or non-food production, better resource utilization, and higher incomes to participating farmers are likely to occupy a prominent position among such objectives. Other frequently found project objectives are increased employment and improved standards of living for small farmers. While improved nutrition may be an expected outcome, at least up until very recently it has not usually been stated as one of the explicit project objectives. It is even more rare to find cases where nutritional goals and considerations have influenced project design.

3.02 Nutritional considerations may be incorporated into project planning and execution either by orienting the project itself towards the achievement of nutritional goals or by implementing associated measures to facilitate the achievement of these goals or correct or compensate for undesired nutritional effects of projects. Such measures may consist of sub-projects or policy measures of various kinds. Whether nutritional considerations are best dealt with in project design or in complementary measures depends on the particular set of circumstances. In either case, however, it is essential to pay explicit attention to nutritional effects of projects, if the achievement of nutritional goals is of high priority. Modifications in project design or introduction of complementary measures may have significant nutritional effects without causing unacceptable changes in the achievement of other project goals. Which trade-offs related to the achievement of conflicting goals are acceptable is, of course, a political question. But to deal effectively with this question,
the trade-offs must be explicitly considered. Merely assuming that increasing food production will result in improved nutrition or that increasing production of non-food crops will have adverse nutritional effects is to avoid the issue. Positive nutritional effects may be greatly enhanced and negative effects avoided if nutritional issues are considered along with other issues in project planning.

3.03 A conceptual framework for the estimation of nutritional effects of an agricultural or rural development project or policy is shown in Figure 2. Its purpose is to show the most important linkages between a project/policy and the nutritional status as well as the key parameters for which data should be sought and analysis performed. On the basis of the conceptual framework, suggestions as to how the nutritional effects may be explicitly dealt with project identification, preparation and appraisal are presented in a subsequent section.

3.04 An agricultural or rural development project or policy may influence nutrition through changes in food output, food prices, and incomes. The output effect may be direct, e.g. expanded production or change in the nutritional composition of a commodity towards which the project is aimed, or it may be indirect, e.g. commodity substitution or output effects of input oriented projects. The output effect on nutrition may be positive, neutral, or negative. Changes in output are reflected in either home consumption, market supply, or both. Changes in home consumption may or may not affect households with malnourished members. Changes in market supply may, in turn, influence prices and consumption by malnourished and well-nourished households. The key question from a nutritional point of view is not how the aggregate output of nutrients is affected but the resulting change in the consumption by malnourished households.
Figure 2—Illustration of linkages between policy/project and nutritional effects

WN = well-nourished households
MN = malnourished households
3.05 If the change in market supply is sufficiently small not to have any impact on prices - a common assumption in agricultural and rural development projects - or prices are otherwise kept constant in such a way that scarcities do not develop in the market, then the nutritional effect of output changes per se is limited to a possible change in home consumption by malnourished households. Consumption by malnourished households obtaining their food through the market exchange will not be affected. This will be the case whether nutrient output is expanded or reduced.

3.06 Agricultural and rural development projects and policies may affect food prices directly or indirectly through changes in output or incomes. Whether direct or indirect, the price effects may be important for the distribution of food and real income among population groups, e.g. malnourished and well-nourished, and should be considered in project planning. In the case of most agricultural and rural development projects, price effects are likely to be indirect. However, existing or suggested project related policy measures of various kinds, e.g. price support and foreign trade policies, may, of course, have significant direct price effects. Such effects should be considered in project planning.

3.07 The most significant nutritional effect of agricultural and rural development projects is probably brought about by changes in incomes of malnourished groups. Low-income farmers, agricultural workers, workers in rural service and input supply sectors are some of the most obvious potential beneficiaries. Changes in incomes by these groups affect their demand for food which, in turn, alters their competitive position in the market and as a result their food consumption. Furthermore, changes in incomes by producers may alter their home consumption.
3.08 Income changes among well nourished groups is also likely to influence food demand, the competitive market position of the various consumer groups and, thus, consumption of well and malnourished groups. Increasing incomes among well-nourished groups may bid up food prices and reduce consumption among malnourished groups. If prices are kept constant and the market supply is adjusted to avoid market shortages, income changes among well-nourished households will not influence nutrition.

3.09 Agricultural and rural development projects and policies may influence consumption and nutrition in ways other than those mentioned above. In particular, some projects and policies may alter the intra-household distribution of incomes and household budget control. Furthermore, the demand for time by the various household members may be changed. The potential nutritional implications of these and related issues were discussed in a previous section. Also discussed previously were the factors influencing the extent to which consumption changes among malnourished households will result in nutritional changes.

3.10 Only the first-round effects have been discussed. This should not be interpreted to mean that agricultural and rural development projects are expected to have no sustained nutritional effects or that nutritional changes have no impact on future economic growth and equity. On the contrary, by focusing development projects on nutritional and other basic needs as an integral part of economic growth, improvements in human resources and a more equal access to the benefits of growth are facilitated. Furthermore, investments and savings resulting from agricultural and rural development projects may facilitate significant future nutritional changes. However, in order
to keep the analysis within reasonable limits, only the first-round effects are explicitly considered. This is in line with most other project appraisal work. Differential weights on consumption versus investment may, of course, be introduced in project appraisals irrespective of nutritional considerations. The possible introduction of nutritional effects into cost-benefit analysis and the relationship to distributional weights are treated in a subsequent section.

Key Parameters

3.11 Figure 2 illustrates the key relationships and parameters. The relationships were discussed above. Key parameters may be divided into two groups: (i) project specific, and (ii) non-project specific parameters. Project specific parameters refer to the output, price, income and other effects illustrated in Figure 2 by (1), (2), (3), (4), (5), and (6). Overall direct output and income effects are usually considered in project assessment irrespective of whether nutrition is an issue or not. However, the effects are not usually disaggregated on malnourished and well-nourished groups. Indirect output effects, e.g. commodity substitution, are considered in some but certainly not all projects where they could be expected to have significant nutritional effects. Project effects on the seasonal food availability - an issue of considerable importance for nutrition in many cases - are not usually incorporated. The impact of non-food oriented projects on local food supply and food prices is also frequently ignored.

3.12 Direct price effects are uncommon and project effects on intra-household income distribution, budget control and time allocation are usually ignored. Thus, to incorporate nutritional considerations, output and income effects would ideally be estimated by group, e.g. malnourished farm households,
malnourished landless labor, etc. Furthermore, in cases where they appear to be important, attempts should be made to estimate project effects on intra-household variables mentioned above.

3.13 Other project specific parameters refer to the distribution of the output effect between home consumption and market supply (7), (8), and the resulting change in home consumption by malnourished farm household (9).

3.14 Once the market supply for a given commodity has been affected, its impact on market prices is not likely to depend on the particular project. A similar argument can be made for changes in a particular household's or group's market demand for a particular commodity due to income changes. Thus, parameters needed to estimate the indirect price effects of supply and demand changes (10) and (11), are non-project specific. Similarly, the relationship between the demand for individual food commodities and incomes of a particular household, i.e. the change in demand caused by a change in incomes, is not a function of the particular project. But the parameters for this relationship may differ from one household or group to another. Thus, parameters must be estimated for each of the groups of interest. Since, as mentioned above, income changes among well-nourished groups may influence consumption by malnourished households, the analysis must include both well and malnourished groups (12) and (13).

3.15 The relationship between commodity demand and incomes may depend on the intra-household distribution of incomes and budget control. Thus, if a project shifts incomes or budget control from one household member to another, the value of the above parameters may change. In other words, if greater household budget control is gained by a certain household member, a larger or smaller proportion of incomes or income changes may be spent on food. This
implies that the parameters explaining income-food demand relationships must be re-estimated. In such cases, reliance on existing non-project specific parameters may cause large errors. Projects affecting the role of women in low-income households are of particular interest in this respect.

3.16 On the basis of estimates of changes in the market prices for foods and changes in the relative competitive position of the various consumer groups, the distribution of the market supply between malnourished and well-nourished groups may be estimated (14) and (15).

3.17 It has been assumed but not explicitly stated throughout the above discussion that malnourished households were already identified and grouped. This, of course, is not necessarily so. Therefore, the most critical non-project specific information is that needed to identify households with malnourished members and to group these households according to the type of nutritional problem (what and who) and primary causes. These are the groups for which the above disaggregated analyses must be carried out.

3.18 The discussion presented in this section on key relationships and parameters may be briefly summarized as follows. Efforts to estimate ex ante the nutritional consequences of agricultural and rural development projects should ideally seek answers to the following questions:

1. What is the nutritional problem: "Who is short of what and why"? (Joy and Payne 1975, p. 15). The information needed to answer this question is not project specific. Rather, it should be considered as essential background information for all development activities and public policy in countries with extensive malnutrition. Thus, the cost of obtaining and up-
2. How does the project affect the output of each individual food commodity? Both direct and substitution effects should be considered. For example how would a non-food oriented project affect food production through area substitution? Are there complementary measures (sub-projects or policies) that are expected to influence food availability?

3. What proportions of output increases or decreases are expected to be reflected in home consumption by malnourished households and what proportions are expected to be added or subtracted from market supply?

4. Is the project expected to change the seasonal food availability?

5. Are expected changes in market supply likely to have an effect on commodity prices (relative to a situation without the project)? If the answer is affirmative, attempts should be made to quantify the effect. How would such price changes affect future food production and consumption by malnourished households? Such analysis would rely on estimates of the appropriate elasticities by population group. These are discussed below.

6. Is the project likely to have a direct price effect? If the answer is affirmative, attempts should be made to quantify the effect.
7. How are incomes and costs (direct or reduced incomes) from the project expected to be distributed among the population groups of interest, i.e. identified functional classes of malnourished households (low-income farmers, landless labor, etc.) and well-nourished as a single group?

8. What are the income and price elasticities for each of the principal food commodities within each of these groups? These estimates are not project specific and should be considered as essential background information. How are the income changes expected to affect the demand for the various food commodities and home consumption?

9. What is the net effect of changes in supply and demand on commodity prices?

10. What is the net effect of changes in incomes, prices and home consumption on food consumption by malnourished households?

11. Does the project alter existing intra-household distribution of incomes, budget control and food? If the answer is affirmative, efforts should be made to judge how this might affect the income-consumption relationships, the consumption patterns and the nutritional effects of changing household consumption. Until additional research has been done, only qualitative judgements can be made on this topic.

12. Is the project expected to affect any of the factors that determine the extent to which changes in consumption by malnourished households will affect nutrition, e.g. health and time constraints (see Figure 1 for other related factors)?
13. Are there any obviously important second-round nutritional effects that should be considered?

3.19 Some of the information needed to answer the above questions is non-project specific, i.e. it need not be obtained for each project. Thus, an effective functional classification of the population, estimates of income, supply and demand elasticities and descriptions of the market structure are examples of things that - once obtained and periodically updated - may serve for any project, provided an effective disaggregation is performed. In fact, whether the focus is on project specific or non-project specific parameters, the primary difference between the information needed for current project assessment and that needed to assess nutritional effects is the level of disaggregation. As a rule, average estimates for the population as a whole are of little value for the assessment of nutritional consequences.

3.20 Obtaining solid quantitative estimates on all the relationships discussed in this section is likely to be excessively resource and time demanding. Surely such efforts would present diminishing returns and attempts to obtain quantitative perfection could result in very low or negative marginal net returns. Thus, short-cuts that would provide effective project guidelines without requiring excessive amounts of resources and time must be sought. In order to arrive at such short-cut approaches, a survey of related past and on-going activities is presented in the next section. Following the survey, attempts will be made to suggest how nutritional considerations may be incorporated into the identification, preparation and appraisal of agricultural and rural development projects in a workable manner and how research and testing may support such incorporation.
IV. SURVEY OF PAST AND ON-GOING ACTIVITIES

4.01 This section is focused on a survey of what has been done during recent past and what is currently being done to incorporate or facilitate the incorporation of nutritional considerations and goals into the planning and design of agricultural and rural development projects and policies. What is of principal interest here is to identify the various approaches and methods and assess their usefulness. The subsequent section will attempt to suggest what needs to be done to improve these approaches and methods or to develop alternative ones. No attempt is made to provide an exhaustive survey of the relevant activities. Rather, the focus is on the identification of the various types of approaches and methods, while specific activities are used merely as illustrations.

4.02 There is no clear and unique borderline between activities aimed at incorporating nutritional considerations into agricultural project and policy planning and a series of other activities related to food and nutrition. Thus, the limits established for this survey are somewhat arbitrary. Certain non-project specific, broader activities such as nutrition planning and food sector strategies are discussed along with project specific approaches. The problem of delimitation was biggest in the area of reasearch, because research activities with little apparent relevancy may produce results that are highly relevant for the topic under consideration.

4.03 The remainder of this section is divided into six parts. A brief discussion of the expressions of need for a nutrition orientation of agricultural projects and policies is provided first. Then follows a survey of non-project specific activities. The third part discusses national nutrition monitoring units and the fourth is focused on activities tied to the
individual project. A survey of research activities aimed at - or with implications for - the development and testing of approaches and methodology is presented in the fifth part and the section concludes with a brief assessment of the "state of art".

Expression of Need

4.04 Why be concerned with the incorporation of nutritional considerations into agricultural and rural development plans, projects and policies? And who are, in fact, expressing such concerns?

4.05 The first question was dealt with in previous sections. It is clear that the general course of development is unlikely to effectively deal with existing and potential future nutritional problems. If nutritional goals are not explicitly stated, they will be met only by coincidence. Yet, the nutritional problems are much too important to be left to coincidence. On the other hand, solving the problem apart from the general development process through direct intervention schemes may be excessively costly and is not likely to be self-sustaining. Furthermore, ignoring nutritional goals in development plans, projects and policies may result in adverse nutritional effects that off-set any benefits from direct interventions. But if improved nutrition is stated as one of a set of development goals, trade-offs between this and other goals may be explicitly considered and projects and policies may be designed and oriented accordingly.

4.06 Turning now to the second question, it appears that the concerns are closely related to the broader concerns for meeting basic needs. In fact, nutritional concerns could be considered as forerunners for these broader, basic needs concerns. There are some indications, that the concerns for
the nutritional and basic needs effects of agricultural and rural projects are stronger among international and national aid agencies than among governments of developing countries. Such generalization should be made only with some reservation. A number of developing countries are in fact showing genuine interest, as will be further discussed in this section. Some such countries, e.g. Cuba and Sri Lanka, have focused development plans on the fulfillment of basic needs long before the term took on its current significance. It is possible, however, that the concerns expressed by some countries—and possibly some international agencies—are merely limited to giving lip-service, with no great desire to translate the concerns into action. If this is so, there is a great risk that the topic will fade away before it has had an opportunity to demonstrate its utility. Other good ideas have suffered such a fate! Development, testing and demonstration of effective methods are urgently needed to translate concerns into action and to separate rhetoric from genuine desires to improve nutritional effects of agricultural and rural development projects.

4.07 The World Food Council and FAO have been particularly vocal in suggesting an integrated food and nutrition approach to agricultural development and nutritional improvement. The World Food Conference, Resolution V emphasized integration of food and nutrition improvements into development programs as one of their major objectives. World Food Council efforts have been directed at the translation of the World Food Conference recommendations into specific goals, policies and programs. Furthermore, the Council has "participated actively in re-examination of the problem and development of new perceptions" (World Food Council 1979, p. 25).
4.08 The Council has placed considerable emphasis on the question of how to best integrate nutritional objectives into development efforts in food and agriculture. Of particular interest for this analysis is recommendation No. 14 of the Council's Mexico declaration:

4.09 The Council recommends that:

"Governments, international agencies and financing institutions include, as far as possible, in the preparation of major development projects, particularly in the agricultural and rural sector, an assessment of their impact on hunger and malnutrition, giving priority to projects contributing to nutrition improvement; and that full use is made of the opportunities offered by many projects to incorporate specific nutrition components into the design of development projects, such as nutrition education and training, distribution of food supplements, development of production of nutrition indigenous foodstuffs and primary health care, with emphasis on the neediest sectors of the rural and urban population, especially women and children." (Mexico Declaration)

4.10 Among Council activities in the area of concern here, efforts to promote integrated food and nutrition strategies and plans at the national level have enjoyed considerable progress. These efforts will be discussed in more detail later on in this section.

4.11 FAO is another international institution which has placed considerable emphasis on the integration of nutritional considerations into agricultural and rural development projects. The Committee on Agriculture, at its first session in 1972, stressed the importance of incorporating nutrition considerations in economic and social development plans (FAO 1979a). Furthermore, "resolution 8/77 called for a review of the nutrition impact of FAO programs, and for the development of methods to ensure that nutritional considerations are included in FAO's planning and execution of agricultural programs and projects." (FAO 1979a, p.6.).
4.12 FAO's action to implement the resolution include the following activities:

"1. Desk review to assess the nutritional impact of selected FAO programs in certain countries,

2. Studies in-depth of the nutritional impact of FAO programs in Bangladesh and Tunisia,

3. Preparation of guidelines for the introduction of nutrition considerations into agricultural programs and projects,

4. Application of the guidelines in projects,

5. Training in introducing nutritional considerations in agriculture and rural development, and


4.13 Some of these activities will be discussed in more detail in the section on project-specific activities.

4.14 At its meeting in April of 1979 the Committee on Agriculture recommended that:

"Member Nations should explicitly consider nutrition objectives both in their plans for agricultural development and in the formulation and assessment of agricultural and rural development programs and projects."

4.15 It further recommended that:

"FAO strengthen the necessary coordinating mechanism within the Organization to enhance the effectiveness of institutional support to Member Nations in the introduction and nutritional considerations in agricultural and rural development programs and projects."

4.16 Among other international agencies expressing keen interest and promoting activities in the areas of concern here are the United Nations University through its World Hunger Program, the World Bank, UNICEF, WHO, and the ACC Sub-Committee on Nutrition. One expression of much interest was the "symposium on Introducing Nutritional Considerations into Agricultural and Rural Development" held in Rome on March 2, 1981 under the auspices of the ACC/SCN."
4.17 Among national donor agencies, AID has shown great interest in nutritional planning and integration of nutritional and agricultural agriculture for a number of years. More recently, the Danish and Swedish aid agencies - DANIDA and SIDA - have expressed interest in activities aimed at nutritional improvements through agricultural and rural development projects. A large number of other countries - both developing and industrialized - are supporting ideas and activities aimed at similar goals through international agencies, e.g. the World Food Council and FAO, and bilaterally. Some of these activities are discussed below.

Non-project Specific Activities

4.18 Attempts to introduce nutrition consideration into the design of agricultural and rural development projects are frequently abandoned because of excessive data requirements. No clear distinction is made between project specific and non-project specific information. As a consequence, is cases where required non-project specific information is absent, total information requirements are visualized as project specific. The judgement is made - and probably rightly so - that the cost, time and resources required to obtain such information cannot be justified. Hence, nutritional considerations are dropped or merely given lip-service.

4.19 But non-project specific information may be useful for the design of a number of projects. It is basic information without which, project specific information on factors affecting nutrition is of little use. Thus, successful efforts to incorporate nutritional considerations into agricultural and rural development projects must begin by generating and/or updating a solid information base - if such base is not already available - on non-project specific relationships and parameters as outlined in an earlier section of this paper.
A survey of past and on-going approaches for the generation of such information is provided below. Some of the approaches are aimed at the generation of overall logical frameworks or strategies for improving nutrition while others focus on selected elements of such frameworks. Nutrition planning approaches are discussed first. Then follows a discussion of food sector plans, strategies and analyses. The third and final part discusses efforts to obtain non-project specific information on selected topics within the overall framework.

Nutrition Planning.

4.20 Lynch (1979) provides a very useful review of "nutrition-planning methodologies". He groups the methodologies into four types while emphasizing that the "classification is not meant to be definitive or taxonomic", but merely "an ad hoc working categorization" (Lynch 1979, p. 2). These four types and some related characteristics are shown in Table 1. Lynch (1979) discusses and compares the various methodologies and presents a number of cases where they have been applied. 1/ Common for all the methodologies is their emphasis on the identification of 1) the nature of the nutritional problem and 2) the population groups affected. Such identification is essential for successful incorporation of nutritional consideration into agricultural and rural development projects. Unless we know what the nature of the nutritional problem is, we cannot assess how it will be affected. Furthermore, the earlier mentioned disaggregation of the analysis must be based on knowledge about which population groups are at risk. Schofield (1979)

1/ Sahn and Pestronk (1979) present a number of other nutrition planning activities.
Table 1. Selected Aspects of Four Types of Nutrition Planning Methodologies.

<table>
<thead>
<tr>
<th>Type of Methodology</th>
<th>Major Proponents</th>
<th>Main Features</th>
<th>Institutions using the Methodologies</th>
<th>Countries Employing Methodologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy formulation approach</td>
<td>Toro</td>
<td>Formulation of food and nutrition policies for inclusion in development plans. Stimulation of awareness of nutrition factor. Problem diagnosis, policy definition and programme area determination. Incorporation of nutrition objectives, policies and programmes in national and sectoral plans.</td>
<td>PIA/PNAN</td>
<td>Nine Caribbean and Latin American countries</td>
</tr>
<tr>
<td>Community nutrition approach</td>
<td>Wilson</td>
<td>&quot;Bottom-up&quot; as opposed to &quot;top-down&quot; planning. Systematic approach at local level. Community involvement and action encouraged. Co-operatives formed. Self-help approach. Community members serve as extension workers.</td>
<td>FAO</td>
<td>Colombia Philippines, Chile</td>
</tr>
</tbody>
</table>

Source: Lynch, 1979
divides the efforts to identify malnourished people into five approaches: (i) functional classification, (ii) ecological classification, (iii) case studies and typical profiles, (iv) community diagnoses, and (v) village typologies. Functional classification relates nutrient-deficiency patterns to spatial, ecological, socio-economic, and demographic characteristics of the malnourished groups (Lynch 1979). The ecological classification is - as the term suggests - focused on the grouping of malnourished people on the basis of ecologically determined factors, e.g. food supply patterns in the various ecological zones. The ecological classification is generally much less complete than the functional classification. Case studies and typical profiles are usually more in-depth surveys aimed at the identification of a series of variables that determine the nutritional status of a particular group. Community diagnosis focuses on the identification of the nutritional problems within any group of people living and acting as a community (Schofield 1979). Obviously, the above mentioned approaches are not distinctly different; they overlap in various ways. The village typologies approach is an attempt to combine the profile and the community approaches. The village approach, the types of data required, analytical methods and results from a number of villages are discussed in detail by Schofield (1979).

4.21 The methodologies discussed by Lynch (1979) are all based on the premise that nutritional deficiencies are to be tackled as a development problem rather than a disease problem. While nutrition planning is not generally focused on specific agricultural and rural development projects, it provides an essential framework within which the nutritional effects of such projects may be assessed. Of particular utility for this purpose is the identification of the nutrition problem, the groups affected and the principal
causes. Most of the methodologies discussed here place relatively little emphasis on some of the key parameters such as income and price elasticities by group. Furthermore, as would be expected, they tend to focus on strategies and policies for which improved nutrition is a principal goal rather than strategies and policies where nutritional effects may be secondary goals or mere side effects. Nevertheless, they provide valuable guidelines also for the latter.

**Food Sector Plans, Strategies and Analyses**

4.22 While agricultural and food strategies are treated by some as two terms for the same thing, the difference between the two is, in fact, of great significance. The agricultural sector is only one - although a very important one - of the elements of the food sector. In addition to domestic agriculture, food sector plans and strategies must consider alternative sources of supply, e.g. import; food processing alternatives; food distribution; food demand aspects, e.g. incomes; their changes and distribution; food utilization and nutrition; and a series of other factors.

4.23 While attempts to deal with the food sector as a whole are plentiful, they have primarily been focused on either the supply side or on food marketing. Supply/demand projections, agricultural sector analyses, analyses of investment needs in the agricultural sector to meet a certain growth rate in production or a certain degree of self-sufficiency (market self-sufficiency, not nutritional or need self-sufficiency) and various types of food distribution schemes and analyses are examples of such attempts.

4.24 On the other hand, attempts to develop integrated food plans and strategies on the basis of nutritional needs have been scarce, although some of the earlier mentioned approaches to nutrition planning have been aimed in that direction. It appears that food sector strategies, to the extent they
have existed, have been guided by effective demand with little or no disaggregation at the consumer level. Nutritional planning, on the other hand, has emphasized the disaggregation of consumers on the basis of their nutritional status. But why not integrate the two approaches? Why not develop a food strategy based on disaggregated consumer and producer sectors and aimed at meeting nutritional needs along with other goals related to food and agriculture? The utility of such an approach would extent far beyond nutritional considerations into more general equity issues.

4.25 At its fifth session in Ottawa in September 1979, the World Food Council encouraged developing countries to develop such food strategies. The Council suggested that a food sector strategy be prepared in the context of broader national development plans and programs and defines the strategy as:

"an action-oriented planning mechanism which proposes specific measures to attain food objectives. It links food consumption and nutrition measures with food production efforts, more equitable food distribution systems and food security infrastructure in a coherent framework. Creation or strengthening of the necessary institutions for continuous food policy and program review is an essential part of the food strategy approach." (World Food Council 1980, p.1).

4.26 The details of a food sector strategy must necessarily be country specific. The World Food Council proposes that the strategy would ideally aim to satisfy the following objectives:

"1. provide a rational framework, within the context of the national development program for concerted action to overcome hunger and identify, in a progressively more precise way, specific food consumption, nutrition, food production and food security objectives and policies at the national and local levels; and provide a basis for government decisions on changes or adjustments;

2. establish on this basis a high priority for attention to food and nutritional problems and reconcile this priority with other national objectives;"
3. indicate how these objectives can be achieved in an accelerated way through the identification and formulation of projects and programs in food production, distribution, consumption and nutrition;

4. generate estimates on technical and capital resources required, both internal and external, so that the country can approach the development assistance community, through consultative or special food investment group meetings if necessary, in the expectation that the necessary resources will be mobilized;

5. increase the country's absorptive capacity to implement food and nutritional programs and projects by providing expanded support;

6. suggest the institutional means to carry out the strategy, and provide for continued food systems research required to refine the strategy over time and improve its implementation" (World Food Council 1980, p. 1).

4.27 Preparation of food sector strategies along the lines proposed by the World Food Council has gained considerable interest among developing countries and foreign assistance agencies. According to the Council, as of February 1980, 29 developing countries had indicated their intention to undertake food sector strategy reviews. Among foreign assistance agencies and donor countries showing interest in supporting such reviews are the World Bank, FAO, Canada, Inter-American Development Bank, Denmark, Belgium, the Netherlands, and Italy. Except for a World Bank supported study in the Philippines, which is expected to be completed soon, the food sector strategy reviews are not yet beyond the planning and preparation stage. 1/

4.28 If the food sector strategy reviews proceed along the lines suggested by the World Food Council, the information base needed for ex ante assessment of nutritional consequences of agricultural and rural development projects

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1/ Republic of the Philippines (1980) provides a preliminary report of the Philippine study.
could be greatly improved. However, it is still too early to assess how this work will proceed and how useful it will be for project assessment.

4.29 The long-term utility of the work will depend to a very large extent on the degree of emphasis placed on creating or strengthening national institutions for continuous food policy and program review. An integrated approach to food strategies requires some institutional changes in the various developing countries. Existing barriers to the integration of agriculture, health, nutrition, and a series of other elements of such strategies, must be broken down. Some such barriers are caused by existing institutions; others are reflections of existing attitudes and past training. Efforts to introduce and maintain an integrated food strategy approach must deal with those issues. Unfortunately, the food sector strategy reviews, as their plans begin to develop, appear to be focused more on a one-shot analysis including the establishment of food priorities and strategies rather than a sustained effort to improve the capacity of the individual countries to establish and continuously review an integrated food strategy. Hopefully, this impression will turn out to be wrong.

4.30 Independent of current efforts to develop food sector strategies along lines suggested by the World Food Council, a small number of countries are developing or attempting to develop national institutions and capacities to improve the nutritional effects of agricultural and other economic policies. While these efforts are discussed in a subsequent section of the paper, the point to be made here is that the food sector strategy efforts might be very useful in strengthening these attempts and, thus, improve the national capacity to deal with nutritional assessment of agricultural and rural development projects and policies.
Among other efforts to incorporate nutritional goals into overall agricultural development plans in a major way, two should be mentioned. In Colombia, serious efforts have been made to design various aspects of agricultural and rural development projects on the basis of nutritional considerations. Included in these efforts was a major nation-wide survey of consumption-related variables undertaken during the first half of the 1970s. While some agricultural projects with a definite nutrition focus have resulted, e.g., promotion of home gardening among low income rural workers and small farmers, it is not clear whether nutritional considerations are playing a major role in the design of broader agricultural policies, e.g. price and foreign trade policies.

The other case to be mentioned here refers to a study carried out for the Samar Island in the Philippines. This study attempts to determine the nature and causality of malnutrition, identifies the high risk groups, examines the proposed development plans and programs as to their short and longer term effects on the nutritional status of the high risk groups, and reformulates projects and programs – where feasible – to maximize the positive nutritional impact.

In addition to providing a detailed functional classification, the study examines a large number of agricultural programs and projects and recommends appropriate changes in these programs and projects to better meet nutritional objectives. Although the examination is largely qualitative; it provides some very valuable insights and suggestions as to how nutritional goals may be more effectively achieved without unacceptable negative effects on the degree to which other goals are met.
Other Non-Project Specific Information

4.34 While the above mentioned activities are aimed at providing a comprehensive planning framework and, thus, are of utility for project design; another set of activities are focused on providing information of selected elements of such a framework. Of particular interest here are the efforts to estimate price and income elasticities because such estimates are crucial to the assessment of nutritional effects of agricultural and rural development projects. Estimates of income elasticities for individual foods are now available for many developing countries. However, in most cases such estimates are not available for individual groups of interest from a nutritional point of view, e.g. functional classes. If functional classes can be represented by income strata, the situation is better because income elasticities for each of the strata are easily estimated from the general set of incomes and consumption data, either discretely for predetermined strata (e.g. Pinstrup-Andersen, et al, 1979) or continuously from an overall consumption function (e.g. Knudsen and Scandizzo, 1979).

4.35 Like the case of income elasticities, price elasticities for individual foods are not usually available for individual functional classes. Furthermore, and contrary to the case of income elasticities, price elasticities as a function of income level are not easily estimated. While time series data offer some promise, such data are not usually available by income group. Attempts to estimate price elasticities directly from cross-sectional data are unlikely to be successful because the price variation found in such data set reflects difference in product quality, level of processing, packing and other product characteristics along with differences in the type of sales
As a consequence, there are very few reliable estimates of price elasticities by income group let alone by functional class.

One study presents complete price elasticity matrices for 22 foods for each of 5 income strata (Pinstrup-Andersen, et al, 1976). However, these estimates were obtained under the very restrictive assumption of want independence. The most promising avenue for obtaining price elasticities by functional class appears to be through the collection of time series data for each of these classes. Such efforts are currently being planned in some countries, e.g. Costa Rica. Furthermore, efforts are being made to explore whether data from past consumption surveys might be grouped to provide the necessary information. However, past work on the estimation of price elasticities has been focused almost exclusively on average rather than disaggregated estimates and its utility for the assessment of nutritional effects of projects and policies is very limited.

A recent study estimates price and income elasticities for calories using a characteristics demand analysis (Scandizzo and Knudsen 1979). The study specifies a demand function for calories which in turn is utilized to estimate price and income elasticities at various income levels. This very innovative approach looks promising and deserves additional research attention.

Other activities aimed at obtaining non-project specific information include an almost uncountable number of consumption and/or nutritional surveys. Consumption surveys may provide the basic data for the above mentioned estima-

1/ Timmer and Alderman (1979) present such an effort.
tion of income elasticities and might, if properly designed, provide the data required for estimation of price elasticities by functional class or income stratum. Furthermore, consumption and nutritional surveys may assist in defining the nature of the nutritional problem and identifying functional classes. Unfortunately, a large proportion of these surveys were not properly designed and/or executed and the reliability of the data is frequently low. Common among the problems of design is the lack of an effective analytical framework as a point of departure for survey design. Large amounts of data are collected without a clear specification of their subsequent use.

4.39 Recent emphasis on basic needs has been reflected in an expansion of nutritional surveys to surveys of basic needs. Such basic needs surveys are likely to be more useful than the narrow nutritional surveys because they provide information on issues which may be as important for the poor as nutrition.

**National Nutrition Monitoring Units**

4.40 As mentioned above, some countries have developed or are developing institutional capacity to deal with the food and nutrition issues in an integrated manner. Existing institutions and the sharp division of responsibility among them, make an integrated effort difficult in many countries. The Ministry of Agriculture, the Ministry of Health, the Ministry of Planning, the Ministry of Industry and possibly other ministries together with a series of semi-autonomous agencies may each be responsible for elements of what would logically be an integrated food sector strategy. Thus, attempts to integrate the appropriate activities run counter to vested interests and traditions. Nevertheless; some countries are attempting such integration or at least some level of coordination.
4.41 Formalized periodic consultations among representatives from the relevant ministries and agencies is one approach. Such consultations may take the form of task forces focused on the solution of specified food and nutrition problems, they may be periodic meetings aimed at the exchange of information about on-going and planned activities, or they may take a variety of other forms.

4.42 Some countries have gone one step further to establish agencies or units with the sole purpose of developing guidelines for an integrated food strategy or monitoring the nutritional effects of existing and planned development activities and policies and suggesting changes in policies and projects. These agencies or units offer great potential for the assessment of nutritional effects of agricultural and rural development projects. Examples of such units are discussed below.

Costa Rica

4.43 In Costa Rica, a Nutrition Information System Unit was created in 1978 directly under the Presidency to "provide planners and administrators in various sectors with data on diagnosis and surveillance of nutritional status, social and economic problems, selection, control, follow-up and evaluation of activities" (Sistema de Informacion en Nutricion, 1978). The Unit assists various ministries and offices in the selection and evaluation of programs on nutritional grounds. Of particular interest here are efforts of agricultural and other economic policies (Pinstrup-Andersen, 1979). Initially, emphasis is placed on identifying functional classes and estimating income and price elasticities for these classes. These efforts are supported by professional and financial resources from the United Kingdom.
Kenya

4.44 For the purpose of strengthening its capacity to obtain additional nutritional data and effectively incorporate nutrition objectives into its overall planning process, Kenya requested assistance from FAO. The objectives of the FAO assistance included (FAO 1979b).

"1) interpretation of data from the recent Integrated Rural Surveys to define nutrition objectives, related to priority target groups, for development planning, initially as a contribution to the 1979–83 National Development Plan;

2) identification of means by which rural development programmes can be oriented to meeting the objectives for nutrition improvement of identified priority groups, through removing the causes of their malnutrition;

3) strengthening the capacity of the Ministry of Finance and Planning, through in-service training, to assess data and analyse and formulate relevant programmes, including identification of requirements for investment, so that meeting nutrition objectives becomes part of the continuing planning process;

4) establishing a method for monitoring the effects of such programmes on the nutritional conditions of target groups."

4.45 As an outcome of the project, a food and nutrition planning unit was established in the Ministry of Economic Planning and Community Affairs. 1/ The Unit places primary emphasis on ways to orient rural development programs towards nutrition objectives. The Unit is strategically located because the Ministry exercises considerable power through its financial control, and because it offers the opportunity to keep an acceptable balance between agricultural and health/nutrition interests expressed by the respective ministries.

1/ Other results of the project are presented in (FAO, 1979b).
Tanzania

4.46 A third example of the kind of institutions discussed here is the Tanzania Food and Nutrition Center (TFNC) established in 1973 as a parastatal agency. The overall purpose of TFNC is "to enable the planning, coordination and effective execution of all different activities by ministries, parastatal organizations and the people of Tanzania to eliminate malnutrition in the country" (Christensen, et al 1980). Included in the functions of the TFNC are (Christensen, et al 1980):

"1. To undertake review and revision of food and nutrition programs,
2. To advise the government, the schools and other public organizations on matters relating to food and nutrition, and
3. In collaboration with the Ministry for Development Planning, to formulate, for incorporation in the national development plans, plans relating to food and nutrition for the benefit of the people".

4.47 The aim of TFNC is to formulate and assess food and nutrition activities and to assess the nutritional effects of other development programs in close collaboration with the appropriate ministries and agencies.

Bangladesh

4.48 The fourth example of integrated food planning institutions refers to a proposed Food Planning Monitoring Unit for Bangladesh. The overall purpose of this Unit is to provide a focus and framework for a comprehensive overview and continuing analysis of the food problem, both short-term and long-term, with its many interrelated facets, which can effectively serve food policy formulators and planners. The primary responsibility of the Unit would
be to undertake analyses designed to develop and specify food policy options and to suggest concrete solutions for fundamental food policy problems. The analysis would focus on such issues as (i) the determination of appropriate price levels, (ii) supply projections, (iii) the determination of inter-relationships between ration distribution, food-for-work, relief operations and open market sales, (iv) appropriate levels of operational and security stocks to be maintained, (v) import requirements and scheduling, (vi) projection of requirements of storage facilities, port utilization and transportation capacities, and (vii) assisting in the formulation of fertilizer policies. Furthermore the unit would (viii) evaluate the effectiveness of the implementation of food policy measures, (ix) establish early warning systems on basic food supplies, and (x) assist in identifying data needs for policy analysis and building the necessary links with data collecting agencies.

4.49 There appears to be a considerable area of overlapping between the concerns of the above mentioned institutions and the food sector strategies suggested by the World Food Council. The overlapping seems to be particularly pronounced in the case of the Bangladesh Unit. Although the proposed unit for Bangladesh appears to be supply oriented, it need not be. It is focused on the development of national capacity to deal with the food sector in an integrated and continuous manner. Were the food sector strategy efforts to focus on the development of such capacity, the probability of effective long-run sustained impact on food strategy and policies is likely to be high.

Brazil, Colombia and Indonesia

4.50 World Bank nutrition projects in Brazil, Colombia and Indonesia include various elements of the kind discussed above. Thus, the Indonesia project includes the development of an administrative unit to monitor and
analyze nutritional implications of agricultural policies. The Brazilian project includes various monitoring and evaluation schemes. However, these appear to be project specific activities rather than institutional change and will be discussed in a subsequent section. All three projects provide support to institution building aimed at improved food and nutrition planning.

Project Specific Activities

4.51 Project specific activities refer to activities linked with a particular agricultural or rural development project as opposed to non-project specific activities which are carried out independently of any given agricultural or rural development project. The two types of activities are not as clearly separable as might appear from this presentation. Some activities may be considered project specific, yet they turn out to be useful for future projects. Similarly, activities which appear to be non-project specific may in fact be useful only to a single project. Thus, the distinction made in this paper is somewhat arbitrary. Nevertheless, it is important to attempt a distinction in order to decide to what extent certain activities can be justified.

4.52 Four sets of project specific activities will be discussed here. FAO activities are discussed first. Then follows a brief discussion of an AID project. The third set consists of a series of World Bank activities linked to individual projects, and the fourth and final set includes two other approaches.

FAO Activities

4.53 Six types of FAO activities relevant to the issues discussed here were presented in an earlier section of this paper. Four of these are project specific and will be discussed below. These are: 1) desk reviews, 2) in-depth studies, 3) preparation of guidelines, and 4) application of guidelines.
The possible impact on nutrition of 39 FAO projects in nine countries was studied. Included in these studies was an assessment of the potential of the method applied for future analysis of FAO projects and data requirements. The general conclusion from these "desk studies" were that a) the projects, as currently formulated, did not identify target groups sufficiently well, and b) there was a serious lack of data required for the analysis of nutrition effects.

Following the desk studies, FAO undertook an evaluation of the nutrition impact of three FAO projects in Bangladesh, the so called "in-depth studies". The procedures for these studies included: (i) nutrition problem identification, (ii) establishing a working hypothesis of possible nutrition impact, (iii) estimating probable or actual project impact, and (iv) identification of opportunities for improvement.

The two types of studies were aimed at the development of methods to be applied to ensure that nutritional considerations could be included in agriculture (FAO, 1979a, p. 9). On the basis of the experience gained, FAO established "guidelines for the introduction of nutritional considerations into development projects". The "guidelines" are divided into two stages. The first-stage analysis, which is based on a series of questions, is focused on getting "a first idea as to whether nutrition considerations are relevant to a project; if so, whether the impact on nutrition is likely to be positive, and how this impact can be enhanced" (FAO, 1978, p. 2). No data analysis is intended at this first stage. Rather the exercise is based on subjective judgement.
4.57 If it appears that possibilities exist for enhancing the nutritional effect of a given project, the "guidelines" proceed to stage two. Second-stage analysis refers to "detailed study of possible nutritional impact, including data analysis and very possibly additional data collection" (FAO, 1978, p. 15). The analysis is visualized as consisting of two parts: (i) definition of the nutritional status of project target groups, and (ii) analysis of possible impact on target groups. In the first part, data would be sought on household budget items, food consumption, and nutritional status. Such data would be disaggregated with respect to the relevant population groups.

4.58 A project with financial support from the Swedish Aid Agency (SIDA) is currently being completed by FAO. The immediate objectives of the project are (Project Proposal 8/22/79):

"1. To develop and test methods for integrating nutrition in agricultural and rural development projects,

2. To reproduce and provide case-studies based on this experience, and

3. To strengthen the administrative and technical capacity of local institutions for providing a nutrition focus to activities in agriculture and rural development".

4.59 Project activities include a "rapid assessment" and "survey and project analysis". Case studies are currently under way in Kenya, Philippines, Sri Lanka and Zambia. In addition, the approach is being used in Puno region of Peru and in Haiti (Internal Progress Report prepared for the 6th session of the ACC-SCN, 1980). It is expected that the FAO/SIDA project activities will be completed in 1981 (see Lunver and Sabry (1981) and FAO (1981) for additional details related to this project).
4.60 The FAO activities mentioned above utilize both project specific and non-project specific data. However, some of the data which are argued in this paper to be non-project specific including data on consumer incomes, food consumption, nutritional status, appear to be treated as being project specific. Failure to distinguish between project specific and non-project specific data is likely to place excessive data demands on the individual project with the likely consequence that the whole exercise will be rejected by those responsible for project preparation.

4.61 The FAO activities place considerable emphasis on data collection through field surveys while the analytical framework appears to be descriptive in nature. Stage one of the "guidelines" is merely an attempt to focus the attention of the project analyst or planner on the relevant questions and have him make subjective judgements. This is undoubtedly a useful exercise and no further analytical framework is required. However, in stage two of the guidelines and the case studies carried out under the FAO/SIDA project some formal data analysis is visualized. The data collection efforts should be focused on meeting the needs of the analytical procedure. But, judging on the material available to the author, including recent reports of preliminary results from the FAO/SIDA project (FAO, 1981a, FAO, 1981b), such procedures are not specified. FAO (1978) states that "methods for such analysis can be derived from procedures that are already well-known, and extensive research should not be needed before these are applied" (p. 15).
AID Project

4.62 Over the years, AID has undertaken a large number of projects and other activities related to nutrition and agriculture. One of these projects—the "Consumption Effect of Agricultural Policies and Project"—is of particular relevance to the topic of this paper.

4.63 It is the objective of AID to "develop and make operational within AID and LDC planning units techniques for taking what is known about a policy's effects, particularly on income and prices, and predicting what will happen to the consumption patterns and nutrient intakes of groups most likely to be nutritionally at risk" (AID, Consumption Effects of Agricultural Policies, mimeo, p. 1). The above project (hereafter called CEAP) "is designed as a first step towards this objective" (ibid).

4.64 The CEAP project includes three principal components: (i) two sub-projects on short-term policy and project impact, (ii) a number of longer-term collaborative projects with the objective of developing, testing, and internalizing within appropriate agricultural planning units the methodologies for estimating the consumption and nutritional impacts of alternative development policies, and (iii) consultancy to assist in adding nutritional concerns to agricultural sector assessments and agricultural program reviews and similar issues.

4.65 The two sub-projects are designed to explore particularly important economic, policy, and nutrition relationships. While these sub-projects will be carried out as case studies in selected countries, they are not designed to strengthen these countries' planning systems directly. Rather the case studies should be considered as research needed to better understand certain key relationships and, thus, support longer-term collaborative projects that, in fact, are aimed at a strengthening of national capacities.
4.66 One of the two sub-projects focuses on the development of relatively simple methods for analyzing how agricultural policies affect food availability, employment, incomes, and prices and how changes in each of these in turn affect food consumption patterns and implied nutrient intakes. This sub-project is expected to be carried out as four country case studies.

4.67 The other sub-project focuses on the development of relatively simple methods for analyzing how agricultural projects affect the factors mentioned above. Case studies will be carried out on both integrated and single-focus projects.

4.68 Development and testing of analytical approaches is an important element of these short-term projects. Thus, if successful, the case studies will result in appropriate analytical approaches to be used in longer-term collaborative projects. If such appropriate and field-tested analytical approaches with general applicability across countries are developed, the probability of success in the planned longer-term projects will be greatly enhanced. Furthermore, if as currently visualized, emphasis is placed on the development of institutional and professional capacities in the collaborating country, it appears that the principal ingredients for success are present.

**World Bank Activities**

4.69 World Bank activities in the area of nutrition are discussed elsewhere (e.g. World Bank 1979). Only selected activities of particular relevance to the question of incorporating nutritional considerations into agricultural and rural development projects are discussed here (the discussion which follows has drawn on a number of internal World Bank documents as well as interaction with Bank staff).
4.70 The World Bank activities related to nutrition may be divided into four types: (i) integrated nutrition projects, e.g. earlier mentioned projects in Brazil, Colombia, and Indonesia; (ii) incorporation of nutrition components into non-nutrition projects; (iii) incorporation of nutritional considerations and goals into agricultural and rural development projects; and (iv) economic research related to nutrition and agriculture.

4.71 It appears that nutritional considerations and goals have played a very insignificant role in the design of World Bank projects with the exception, of course, of the actual nutrition projects. To the extent that nutrition has entered into the planning of agricultural and rural development projects, it has been principally in the form of specific components or sub-projects rather than in the form of providing guidance to the design of the principal project. Most of these components have focused on specific interventions, nutrition education or surveys for use by possible subsequent nutrition projects. It may be hypothesized that the nutritional effect of these components has been marginal relative to the potential effect from modifications in the design of some agricultural and rural development project. It may further be hypothesized that some such modifications might not have had unacceptable effects on the degree to which other project objectives were achieved. Of course, these are only hypotheses and they may be valid only for certain projects.

4.72 In spite of the above-mentioned general impression, however, some efforts have been made to influence project design on nutritional grounds. Review of project documents and identification of nutrition related issues by World Bank staff is one such effort. Such review appears to have been focused on identifying project elements with high risk of negative nutritional effects and ways to reduce such negative effects and enhance positive ones.
A somewhat more formal attempt to incorporate nutritional considerations into agricultural and rural development projects was made in an internal document distributed to agricultural projects departments and regional agricultural divisions. The document discussed the relationships to consider and outlines a large number of topics for which data collection and/or analysis may be appropriate. A two-step process is advocated. The first step involves analysis of food and nutrition problems and formulation of strategies. Identification of nutrition targets, alternative methods of intervention and recommended nutrition-oriented activities is to be performed in stage two. It is visualized that stage two could be undertaken by project identification and preparation missions. The importance of the incorporation of nutritional considerations at as early a stage as possible in the project development cycle is stressed.

In late 1978, agreement was reached with the FAO/World Bank Cooperative Program to include nutrition components and/or nutritional considerations as a basic objective in agriculture and rural development projects prepared by the Program, where feasible. Such activities are currently under way for rural development projects in Haiti, Ecuador and Morocco.

The Program also assisted in the preparation of a nutrition assessment of the rural development project for Puno, Peru. The approach used in this assessment looks promising and would be worth considering for other rural development projects. It begins by determining the nature of the nutritional problem in the region. It then proceeds to identify the population groups at risk and the possible causes of malnutrition among these groups. Output and income effects of the project are estimated (estimating
procedures are unclear) and the assessment finalizes by suggesting a set of guidelines for on-going monitoring and evaluation of the progress of the project.

4.76 A recent study for the Chatina Region of Mexico proposes an approach for evaluating and monitoring rural development projects with respect to nutritional effects. This approach consists of: (i) a background study of the relevant factors and functional classification, (ii) preparation of a nutrition policy plan for the region, (iii) evaluation of nutritional impact of projects, (iv) readjustment of nutrition policy, plans and projects, (v) further evaluation and readjustment. The preparation and readjustments of policy plans and projects would be undertaken through seminars. Thus, the approach is based on periodic readjustments in policies and projects based on feedback provided by evaluation and monitoring. Active participation of the people involved in or affected by the project including villagers, is stressed.

4.77 Monitoring and evaluation procedures have also been developed for the World Bank project in Brazil (Deboeck, 1978). These procedures aim at measuring the effectiveness of nutritional intervention through three alternative delivery system: rural extension services, urban and rural health services and commercial markets, and the school infrastructure. Analyses related to the extension component include production function analysis, income-consumption analysis and nutritional status equations.

4.78 Appraisal reports for agricultural and rural development projects supported by the World Bank only rarely mention expected nutritional effects of the projects. A few reports provide some qualitative overviews. As a
rule, these overviews are of little or no utility for project design or modification. One report was encountered where expected nutritional effects were measured in terms of the calorie content of the expected increase in food supply caused by the project. The report showed no estimates for (i) the distribution of the additional food supply between well-nourished and malnourished, (ii) price effects, or (iii) income effects on nutrition. Such an approach is not likely to be useful unless all consumers affected are malnourished and malnourished to the same degree.

4.79 World Bank economics research related to the issues discussed here will be discussed in a subsequent section.

Other Project Specific Activities

4.80 A number of other project specific activities have resulted in analytical methods and findings of interest beyond the particular project. 1/

Two such activities are mentioned below. Evaluation of a project aimed at expanding production and improving marketing of milk in India resulted in some very interesting findings (Jul 1979). While one of the project objectives was improving the nutritional status of low-income households through expanded milk consumption, ex post evaluation showed that low-income consumers did not increase milk consumption significantly. Thus, the direct output effect of the project on nutrition was negligible. The additional milk supply was

1/ Ex post evaluation has been carried out for a number of direct nutrition intervention programs. Since the focus of this paper is on the interaction between nutrition and agricultural projects and policies and not on nutrition programs per se, this work is considered to be of only peripheral relevancy and will not be discussed here. Reference is made to Gwatkin, Wilcox and Wray (1980), Klein, et al (1979); Sahn and Pestronk (1979), and Beaton and Ghassemi (1979) for work in this area.
consumed by high-income consumers. However, low-income milk producers experienced large income gains which, in turn, were partially spent on other foods. Thus, the income effect on the nutrition of low-income dairy farmers was positive and large. The findings from this study clearly illustrate the potential fallacies associated with the use of nutrient supply changes as an indicator of nutritional impact of a given project. The importance of considering both output and income effect are also pointed out by these findings.

The above findings correspond closely to what one would expect from expanded productivity of a non-food cash crop among low-income farmers provided that these farmers have access to additional food. However, if the production of non-food cash crops is expanded through the substitution of cash crop area for food crop area rather than through productivity increases, 1/ and/or if the supply of food faced by the cash crop producers is highly inelastic, the nutritional effect may be negative. Such negative effects were found by Gross and Underwood (1971) in sisal production in Brazil.

The issue of nutritional effects of expanded production of non-food cash crops is widely disputed. On the one hand, it is argued that substitution of non-food crop area for food crop area will lead to reductions in food production which, in turn, will result in negative nutritional effects. This argument is particularly forceful in the case of semi-subsistence farmers who reduce the area grown with food partially or totally for home consumption in order to grow a larger area with non-food crops. On the other hand, it is argued that (i) farmers will substitute cash crops for food crops only if it

1/ Improved productivity of cash crops would, of course, be expected to cause some area substitution.
results in increasing net returns and, (ii) only part of the gains in net returns are required to compensate for the loss in consumption of home grown food through expanded food purchase. Thus, if cash crops result in higher net returns, producers can maintain an unchanged food consumption with part of the higher net returns left over for consumption of additional food or other commodities. Thus, the nutritional effect is likely to be positive. 4.83 The explanation for the divergence between the two viewpoints is to be found in the assumptions made. If the expansion of cash crop production in a given region results in significant increases in food prices either because food supplies are reduced or because additional incomes from cash crop production among well-nourished households cause increasing food demand, their net nutritional effects may be negative. Such a situation could occur if the marketing system for food commodities is deficient in moving food to the region, or if public policy, including foreign trade policies, directly or indirectly prohibits such movement of food. In such cases local food prices may be very sensitive to changes in local supply and demand. Furthermore, in the case of substitution of cash crops for food crops grown partially or totally for home consumption, large differentials between the price paid to the producer for food be grams - the shadow price of home consumption - and the price the farmer must pay for food in the market place may have negative effects on food consumption if cash crops are introduced or expanded. 4.84 On the other hand, if it is assumed that (i) an expansion of cash crop production does not affect food prices significantly and (ii) the spread between producer and retail prices is small, then expanded cash crop production would be expected to improve the farmer's capacity to meet nutritional
requirements of his family provided, of course, the net revenues from cash crops exceed those from food crops (if this is not the case, farmers would not expand cash crop production). Under the above assumptions, urban consumers would not be affected while additional incomes obtained by small farmers, rural labor and rural services would be expected to have a position nutritional impact.

4.85 In the assessment of most cash crop projects, a potential impact on food prices is either ignored or assumed to be insignificant. The effect of many projects on the food supply of a given country is likely to be so small that food prices would not be affected at the national level. A price effect is even less likely if free foreign trade in food is assumed. However, local food prices may in fact be greatly affected by a given project because of market imperfections and public policy. This together with the earlier mentioned spread between the shadow price of home consumption and retail prices of food, may - but need not - result in negative nutritional effects of cash crop projects. The impact of such projects on the intra-family distribution of incomes, budget control, and time allocation as well as a transfer to a more cash oriented income pattern may also cause significant changes - positive or negative - in the consumption pattern and nutrition of the low-income farm household.

4.86 Empirical studies of the effect of cash crop projects on consumption and nutrition are very scarce. The dispute over the nutritional effects of such projects is probably not a result of conceptual differences but is rather caused by insufficient empirical evidence to assist in making the right assumptions in a given situation.
Supporting Research

4.87 Research expected to be useful for developing, improving, or applying methods for incorporating nutritional considerations into the design and assessment of agricultural and rural development projects cuts across a number of disciplinary lines. Thus, there are no natural and well-defined border lines for such research. Research specifically aimed at the development or improvement of such methods is very limited. However, a considerably amount of research aimed at other goals have produced - or is likely to produce - findings useful for the above purpose. Attempts were made to identify those areas of research expected to be most relevant to the topic under consideration. These areas are discussed below. Other research areas with some relevancy were left out. The "degree of relevancy" was determined on the basis of judgment and was, therefore, subjective.

4.88 The second judgment to be made was related to whether a given activity was to be called research or not. A number of activities such as the earlier discussed AID project may be considered partly research and partly operational activities. As long as the relevant activities are included, it is the opinion of the author that the question as to where in the paper they appear is of little significance. Accordingly, little time was spent on this question. Activities with a clearly identifiable operational component were discussed previously. Other activities are discussed below.

4.89 Activities of recent origin including on-going work are emphasized. The importance of earlier work is not overlooked. It is implicitly recognized as a base without which the more recent work would not have developed. One final disclaimer: The research review presented below focuses on areas of research, not on individual projects. Individual projects are cited to illu-
strate the type of work involved and the results obtained. No attempts are made to make an exhaustive list of completed or on-going projects. Such an annotated bibliography would be useful but is not developed here.

**Project Assessment Procedures**

4.90 In addition to the "project specific" and "non-project specific" activities mentioned earlier, some of which have a significant research component, two areas of research should be mentioned here: (i) Research to estimate cost effectiveness of nutrition related programs, projects, and policies, and (ii) research on the use of a social demand function in benefit-cost analyses related to nutrition and other basic needs.

4.91 A number of recent studies have focused on the use of cost effectiveness analyses to evaluate alternative policies and programs on nutritional grounds. Reutlinger and Selowsky (1976) compare the effects of target-oriented and general food subsidy programs on food consumption by households with malnourished members. The cost effectiveness, defined in terms of the fiscal cost of achieving a given consumption increase, was estimated for each program type. Intra-household distribution of the additional consumption was not explicitly treated. Selowsky expands this work to deal explicitly with the cost effectiveness of a number of alternative programs and policies to obtain a given increase in calorie consumption by children in malnourished households rather than household consumption as such (Selowsky 1978 and 1979).

4.92 As pointed out by Selowsky (1979) and Scandizzo and Knudsen (1980) the cost effectiveness approach is "incomplete from the point of view of a full welfare economics analysis" (Selowsky 1979, p. 993). Cost-benefit analysis based on a social demand function provides a fuller welfare analysis.
Suggested by Harberger (1978), the use of a social demand function to evaluate nutrition effects of projects and policies was briefly discussed by Selowsky (1979) and further developed and used for empirical analysis by Scandizzo and Knudsen (1980). The social demand function is an attempt to measure project impact on the achievement of basic needs. It is an attempt to value the contribution to the achievement of specified basic needs according to society's value judgment. It represents a combination of the market demand for a particular basic needs good — such as nutrients — and the needs for such a good which are not met through the market place but which society desires to meet. But the extent to which a given basic need is met through the market place is a function of the price of the good. Thus, at some sufficiently low price, needs may be met through the market exchange. However, as prices increase, this is not likely to continue to be the case. As prices increase, some households will be unable to translate the "basic needs" into effective demand. At this point the social demand curve departs from the market demand curve and a price premium is placed on the good in cost benefit analysis. The size of the premium will increase for increasing prices.

In some sense, the social demand function represents the case of a merit good where the weight placed on the "merit" depends on the degree to which the basic need for the good is met through the market place. A much more complete discussion of the concept of social demand function is provided in the above mentioned references.

Identification of High-Risk Groups

Efforts to develop functional classifications were discussed in an earlier section of this paper. These efforts may include research elements. A comprehensive study by Schofield (1979) is aimed at an effective identification
of high-risk groups. Another large study carried out by Wilson in Colombia focuses on this issue (personal communication—reports are not yet available). Other efforts are discussed by Joy (1979).

**Household Behavior**

4.95 Research to estimate price and income elasticities for individual foods and functional groups was discussed previously. Attempts have been made to estimate price elasticities of demand by income stratum from cross-sectional data using the assumption of want independence (Pinstrup-Andersen, Londono and Hoover 1976). However, the assumption of want independence is likely to be violated for individual food commodities. Goodwin and Brandt (1980) provides an empirical comparison of this approach and a time-series approach. A two-stage approach in which the want independence assumption is applied to estimate elasticities for groups of food commodities while time series data are used to estimate the elasticities for individual foods was used by de Janvry, Bieri and Nunez (1972). Scobie (1980) provides an annotated bibliography of studies within this general area. Other research on the estimation of elasticities is discussed in an earlier section.

4.96 Closely related to the above are efforts to estimate consumption functions for individual commodities and calories. A large number of such consumption functions have been estimated either from macro data (e.g. Reutlinger and Selowsky 1976) or household consumption surveys (e.g. Knudsen and Scandizzo 1979). 1/

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1/ Results from consumption surveys in 55 developing countries are reported in FAO (1979).
The theory of household economics appears to offer great promise in the area of research on household behavior and nutrition. Based on this theory, a number of studies of agricultural households have been carried out during recent years (e.g. Barnum and Squire 1979, Andrews and Moore 1976, and Evenson and King-Quison 1979). In some household economics studies, emphasis has been on time allocation (e.g. Franklin and Valdes 1979, Kumar 1979, and Evenson, Popkin, and King-Quison 1979). Nutrition related issues are of major concern in a few such studies (e.g. Chermichovsky 1978, Smith and Liedholm 1977, and Singh and Squire 1978) including AID-supported research being planned for selected Central American countries. However, it appears that nutritional issues in general have played very minor roles in household economics research to date. This is surprising since such research tends to be carried out among low-income households in which the probability of malnourished members is likely to be high and since the theory of household economics appears to offer a powerful tool for obtaining policy relevant information on some of the key questions on nutritional/consumption/production relationships. This is undoubtedly an area where additional, imaginative research could have a high pay off.

**Consumption/Nutrition Effects of Public Policies**

Research in this area includes analyses of public food distribution and pricing policies carried out by IFPRI for selected developing countries (Kumar 1979, George 1979, Ahmed 1979, and Gavan and Chandrasekera 1979). In those studies, analyses were made of the effects of public distribution systems on food prices, demand for various foods by different income groups, caloric intake of various urban and rural income classes and program costs. A series of case studies aimed at the evaluation of food subsidy programs in
selected countries is currently being planned by AID. One of these studies—an analysis of the Egyptian food price subsidies—was recently initiated by IFPRI with AID funding.

4.99 Other research in this area includes analyses of the nutritional effects of income growth and alternative income distribution patterns in Bangladesh, India, Indonesia, Morocco, Pakistan, and Sri Lanka (Knudsen and Scandizzo 1979); and in Colombia (Pinstrup-Andersen and Caicedo 1978). McCarthy (1977) analyzes the nutritional effects of selected economic policies and, using a general equilibrium model, Taylor (1978) analyzes the effects of selected pricing and other policies on food consumption patterns. Also using a general equilibrium model, McCarthy and Taylor (1980) analyze the effects of a number of public policies on food consumption by various consumer groups in Pakistan. Other studies based on a social accounting matrices are under way for various countries including Egypt and Honduras.

4.100 Recent work on consumption linkages is also highly relevant to the topic of this paper, although the implications of consumption linkages extend far beyond nutritional considerations. Research in this area includes analyses of consumption patterns, their relationship to income distribution and their expected reaction to changes in public policy. Recent studies include (Mellor 1976) on India, (Bell and Hazell 1980) on the Muda region of Malaysia, and (King and Byerlee 1977) on Sierra Leone.

4.101 Another area where public investment and policy offers great opportunities for nutritional improvements is the area of agricultural research and technological change. Analyses of the nutritional impact of technological change in agriculture are scarce. Intuitively, one would expect that expanded food production would result in improved human nutrition. However, substitution among food commodities in production, consumption, and/or foreign trade,
as well as the actual distribution of the additional food between malnourished and well-nourished people may greatly influence the magnitude of the nutritional improvement actually obtained.

4.102 An analysis of this issue was carried out for the population of Cali, Colombia (Pinstrup-Andersen et al 1976). The study estimated the distribution of supply increases of each of 22 food commodities among consumer groups (nutrient-deficient and non-nutrient deficient groups), the related adjustments in total food consumption for each group and implications for calorie and protein nutrition. It was found that the relative increase in total nutrient supply was a poor indicator of relative nutritional impact. There are three principal reasons for this: (i) the proportion of the total supply increase obtained by nutrient-deficient groups varies considerably among commodities, (ii) the adjustment in the consumption of foods, other than those for which supply is increased, is of considerable importance in determining the final nutritional implications, and (iii) income effects need not be closely correlated with the relative supply increase.

4.103 Other research in this area includes analyses by Ryan (1974 and 1977a) on the relative priority to be assigned to the goal of better protein quality versus that of higher yields in agricultural research on selected commodities. Other work by Ryan (1977b) analyses the effect of the Green Revolution and associated substitution of wheat for pulses in India on the supply of calories and protein.

4.104 One additional area of research to which reference should be made is the agricultural sector models and related research on the nutrition and consumption effects of alternative agricultural policies. Such work has been undertaken in a number of countries including Nigeria, Korea, and Colombia (Thodey, Smith 1970, 1973, and 1975).
Other Research

4.105 Other research on the economics of nutrition includes: (i) analysis of the effects of improved nutrition on labor productivity and human capital (Selowsky and Taylor 1973), and (ii) analysis of the relationships between nutrition and health and demographic factors (Johnston and Meyer 1977, Berg 1973, Srinivasan 1977, Chowdhury and Chen 1977). It should finally be noted that policy research in general may produce analytical tools and empirical findings of great significance for nutrition/consumption related issues.

State of Art

4.106 While nutritional deficiencies are used extensively to justify agricultural projects, programs and policies, they play a very minor role in the design of these activities. Efforts to incorporate nutritional considerations into agricultural project and policy design have gained considerable support during recent years. International institutions such as FAO and WFC, together with some developing country government and donor agencies, are beginning to assign resources to such efforts. However, up to the present, very little has actually been accomplished. There are a number of reasons for this. First of all, most of the relevant activities have been initiated during the last year or two and it would be unrealistic to expect major results within such a short time span. Secondly, a clear conceptual and analytical framework for incorporating nutritional goals into project and policy design is absent. Nutritional effects of most agricultural projects and policies are indirect. The estimation of these effects depends on reliable estimates of other, more direct effects such as the effect on the production and supply of individual food commodities, the employment effect and the impact on income earnings in the various population groups. If these
direct effects are not estimated with acceptable reliability, efforts to estimate nutritional effects will fail. One of the major bottlenecks for successful estimation of nutritional effects of agricultural projects is the lack of appropriate disaggregation in the analysis of direct effects (output and income effects). In spite of increasing emphasis on equity issues, economic analyses used to guide agricultural projects and policies are only rarely disaggregated on income groups. Unfortunately, unless such disaggregation is performed, the analyses are of little or no use for estimating nutritional consequences.

4.107 Failure to distinguish between project specific and non-project specific relationships is another outcome of the lack of an appropriate conceptual framework. Efforts to estimate the nutritional consequences of a given agricultural project or policy through the analysis of project specific as well as non-project specific issues become excessively resource and time consuming and are usually abandoned before they are completed. If efforts to estimate nutritional efforts of agricultural projects and policies are to be successful, a body of non-project specific data, which the individual project can draw upon, must be generated and periodically up-dated.

4.108 Past and on-going work on functional classification, estimation of income and price elasticities of demand by income group, improving the understanding of intra-household decision-making of a number of other topics discussed in earlier parts of this paper assist in the development and up-dating of such data. However, a great deal more work is needed on these and related topics to make the results useful to project planners.
4.109 Some recent efforts to estimate nutritional consequences of agricultural projects on the basis of aggregate data may produce misleading results. Changes in total nutrients supply or changes in total or per capita incomes provide no reliable measures of nutritional effects. Yet, if pressure is placed on the project planner to provide an estimate of nutritional impact and if no appropriate analytical tools and/or data are accessible to the planner, he may be forced into such useless activities. Therefore, it is important that a call for analysis of the nutritional impact is accompanied by the appropriate analytical tools and data, or means to obtain such data. Analytical tools that are effective yet workable within the resource and time constraints present in project preparation and appraisal must be developed, tested and made available to the project planner.

4.110 While the review of past and on-going activities did not reveal such analytical tools, it did identify a number of useful elements. Furthermore, a number of on-going research and testing activities look promising. The strengthening of national capacities to deal with the interface between agriculture and public policy on the one hand and consumption/nutrition issues on the other is a particularly important factor. Attempts have been made in a few developing countries to strengthen both institutional and professional capacity in this area. The success of these and similar attempts elsewhere is critical to sustained incorporation of nutritional goals into agricultural and other public policy. Yet, institutional factors, vested interests and lack of financial and professional support are likely to oppose success. Furthermore, the apparent desire by some international institutions and donor agencies to obtain quick answers to complicated questions through short-term, large-scale
studies may hamper the development of institutional and professional capacity to deal with the issues on a sustained basis in the individual countries.

4.111 What, then, are current options for incorporating nutritional effects into the design of agricultural projects and policies and what are the most urgent needs for research, testing and other supporting activities? The last section of the paper addresses these questions.

V. RECOMMENDATIONS

5.01 It is recommended that activities be expanded simultaneously in four areas:

(i) Collection and analysis of selected non-project specific data and estimation of key parameters,

(ii) Incorporation of certain routine procedures at the project preparation and appraisal levels,

(iii) Research and testing of certain procedures which may be introduced into project preparation and appraisal at a later point in time, and

(iv) Other research in support of the above.

Each of these four areas are discussed below.

On Non-project Specific Data and Parameters

5.02 Some work has been done and more is underway to identify high-risk population groups, the specific character of the nutritional problem and its expected causes. It is recommended that such work be expanded and performed for all countries of interest and for which it has not been done. Without sufficient knowledge about who suffers from what nutritional problems and why, effective assessment of the nutritional effects of projects cannot be performed. In some cases, income levels may be used as a proxy for nutritional levels.
Although no single agricultural and rural development project should be charged with this work, it might be carried out in close collaboration with such projects. Once obtained, the information must be periodically updated.  

5.03 It is further recommended that key parameters as defined earlier be estimated for the countries of interest where data are available. Of principal importance are price and income elasticities of demand by functional group or income class. Estimation of parameters related to consumption decisions on home consumption by semi-subsistence farmers should not be attempted as part of operations until additional research has been completed.  

5.04 It is further recommended that improved nutrition and strategies for its achievement be incorporated into country analyses carried out by national and international aid agencies e.g. the World Bank, national development plans developed by individual developing countries and - in particular--into agricultural and food sector analysis and plans. These strategies should ideally provide guidelines for overall commodity priorities, regional priorities and a series of other topics needed for project identification and policy design. Current and planned food sector strategy reviews discussed previously would ideally be focused on this matter.  

5.05 It is recommended that strong financial and professional support be offered to the development and/or improvement of national institutional and professional capacities to deal with agricultural, food, and nutritional planning and policies in an integrated manner. While studies per se may provide needed information, only by strengthening national capacities for integrated planning and implementation of plans in developing countries will a sustained impact be obtained. It is recommended that a significant portion of the financial and professional assistance currently being planned for "food
sector strategy reviews" be aimed specifically at the development of such national capacity. Finally, it is recommended that international aid institutions and national donor agencies develop or strengthen their own analytical capacity in this area.

On Project Preparation and Appraisal

5.06 If improved nutrition is to receive the same recognition as other goals of agricultural and rural development project, it must enter into the decision-making process on project design at an early stage of the project cycle. If improved nutrition is an important goal in a country's development plan it should naturally enter into the project identification phase. Unfortunately, however, in most countries and for most project planners, there is no tradition for the integration of nutrition and agriculture in development plans and projects. If such tradition is to be developed, planners must be convinced of its utility. Ex post analyses of the nutritional effects of selected projects together with the illustration of the conceptual relationships relating nutrition to agriculture and the development of workable methods for dealing with nutrition questions at the project identification and preparation stages would assist in demonstrating the utility of an integrated approach.

5.07 One way to assist project planners at the early phases of the project cycle is to make available to him a list of issues and project elements expected to be particularly sensitive to nutritional effects and for which project modifications might imply large nutritional gains without unacceptable large losses in the degree to which other goals are achieved. Such a list could be incorporated in the "manual" or guidelines for project preparation. The list should be short and to the point. Its primary purpose would be to assure that the most relevant nutrition related questions were asked during
project identification and preparation. This would assist in judging what trade-offs exist between nutritional effects and other project goals in the particular case, how these trade-offs are best dealt with in project design, and whether nutrition related sub-projects or policies are to be recommended. The degree to which formal analysis can be performed at this early phase of the project cycle depends on the amount of relevant non-project specific information available.

5.08 As the potential project proceeds through the project cycle and estimates are made of output and income effects it is recommended that dis-aggregated analyses be performed. The disaggregation should follow functional groups or - if such groups are not identified - income strata. This would include estimates of how the incomes generated by the project are distributed among such groups as landless labor, low-income farmers, etc. and how incomes of the various groups may be affected through commodity price changes. It is further recommended that due consideration be given to the effect of crop substitutions expected to be caused by the project. In the case of cash crops, attempts should be made to estimate or judge how local food supply and food prices will be affected by crop area substitution and expanded incomes.

5.09 Until further research and testing are done (discussed below) the above disaggregation of the output and income effects and the consideration of area substitution and food price effects of cash crop projects could be used as indicators of nutritional effects. A more formal quantitative analysis of the links between the distribution, substitution and price effects and consumption/nutrition should not be attempted as a routine operation in project assessment until further research and testing has been completed.
5.10 Thus, at this point in time it would be premature to attempt quantitative ex ante estimation of consumption/nutrition effects of agricultural and rural development projects on a routine basis. The above mentioned check-list, disaggregation of output and income effects and estimation of crop substitution and price effects would provide some foundation for judgments as to the effects of possible modification in project design, needs for nutrition-oriented sub-projects and effects of alternative public policies.

5.11 A series of internal World Bank reports, memos and notes illustrate how nutritionally sensitive issues may be identified in project proposals and appraisal reports. Ideally, such issues would be considered at the project identification and preparation phases. It is towards this aim, the above check-list might serve. Furthermore, to assist in the identification of this issues, the above recommended institutional and professional capacity is important wherever project decisions are made, i.e. in developing countries, donor agencies and international aid institutions. There is a pronounced scarcity of such capacity in all three groups.

On Research and Testing of Project Assessment Procedures

5.12 It is recommended that research and testing on procedures to assess nutritional effects of agricultural and rural development projects be continued and expanded. Among the issues deserving additional research and testing are: (i) the use of social demand functions in project assessment, (ii) the use of distributional weights to incorporate nutritional effects into project appraisal, (iii) possible integration of nutritional considerations, (iv) consideration of some form of "Nutrition Impact Statement" in project appraisal, and (v) development of a quantitatively oriented, comprehensive approach.
5.13 A social benefit analysis of supplemental feeding of children and pregnant and lactating women in Tamil Nadu applied both distributional weights \(^1\) and a social demand function (Knudsen 1980). While social benefit analyses have been performed on a number of projects within the Bank (e.g. Bruce and Kimaro 1978, Cleaver 1980), the use of a social demand function to assign basic needs weights is new and deserves additional testing in agricultural and rural development projects. The utility of distributional weights appears to be limited unless those weights can be assigned in accordance with some measurable preferences of society. If the fulfilment of basic needs—such as nutritional ones—is looked upon as a social externality, as suggested by Harberger (1979), then the social demand function does offer a means for estimating shadow prices that are in accordance with society's preferences.

5.14 Possibilities for the integration and estimates of nutritional effects should be explored. Earlier recommendations regarding disaggregated analysis of the income effects do, in fact, have many elements in common with the Statement and a coordination of the two activities seems natural.

5.15 Requests for assessment of project effects on specific topics such as environment, the well-being of women, etc., which cannot be quantified within an acceptable resource and time frame frequently result in an "Impact Statement" which in qualitative terms evaluates the likely project effects on the issue of interest. Such an impact statement may be useful if sufficient information is available. It may also be relatively useless and merely an attempt to meet institutional requirements. Frequently, even when based on

\(^1\) Using the methodology developed by Squire and van der Tak (1975).
solid information, an impact statement is of little use in project design, partly because it does not consider the impact of alternatives and partly because it is developed at an advanced stage in the project cycle. Incorporation of a nutrition impact statement into project appraisal should be considered only if sufficient information is available and only if alternative project designs are considered. Thus, the earlier mentioned efforts to integrate nutritional considerations into initial stages of the project cycle, e.g. a check-list, might result in a nutrition impact statement. Institutionalizing such a statement in project appraisal in isolation is not recommended.

Towards a More Comprehensive Yet Workable Approach: The Caloric Consumption Indicator

5.16 Ideally, ex ante assessment would show how selected nutrition indicators such as mortality of selected groups, work capacity, or anthropometric measures would be affected by the project under consideration. However, cost and time considerations, together with unavoidable uncertainties associated with the results of any ex ante assessment approach would undoubtedly point in the direction of an approach considerably less "perfect", yet providing effective--although possibly rough--estimates of nutritional effects of agricultural and rural development projects.

5.17 The assessment approach suggested below is a compromise between cost and time considerations and "degree of perfection". It is recommended that further research and testing be undertaken to explore the feasibility of the approach for routine project assessment. The approach attempts to estimate how a given project would affect consumption by households with malnourished
members, ignoring intra-family food distribution \(^1\). Project impact on intra-household distribution of income and budget control, time allocation of individual household members, and seasonal variations in food availability is also ignored in this approach.

5.18 Both output and income effects are considered. The approach assesses the nutritional effects in terms of total change in calorie consumption by malnourished households caused by the project. \(^2\) The approach requires quantitative estimates of project impact on the supply and home consumption of each of the food commodities affected and the resulting price changes. It also requires quantitative estimates of project impact on incomes by functional group and the resulting change in consumption. The approach is briefly outlined below.

5.19 Development and empirical testing of a model to estimate the output effect on calorie consumption by various income groups is reported elsewhere (Pinstrup-Anderson, Londono, and Hoover, 1976). Basically, the model estimates (i) how an increase in the supply of each of a number of food commodities is distributed among income strata, (ii) the corresponding adjustment in the consumption of all foods, and (iii) the resulting impact on calorie and protein consumption by income stratum. A model to estimate the income effect has also been developed and empirically tested (Pinstrup-Andersen and Caicedo 1978). This model estimates how calorie and protein consumption by various income strata is affected by changes in stratum incomes.

\(^1\) If the necessary data are available, consumption by malnourished members of the household may be substituted for household consumption. This would clearly improve the approach but also increase costs.

\(^2\) The effect on the consumption of other nutrients, e.g. protein may also be estimated.
Thus, on the basis of expected impact of a project on commodity supply, home consumption and incomes by the various groups of interest, the models may be combined to provide an estimate of the total change in calorie and protein consumption by malnourished households. Together with estimates of project costs, such a measure may provide useful guidelines for project design, if improved nutrition is a major goal. Using sensitivity analysis for alternative project elements and designs, the cost-effectiveness of such alternatives may be estimated at the margin, e.g. the cost (in terms of project benefits foregone or resource costs) of improving the calorie intake by target households by a certain amount.

Further details on the application of the approach mentioned above may be useful to illustrate its potential utility and the additional work involved for the project planner. Three types of projects will be mentioned: (i) projects expected to have an income effect but no output or price effects, (ii) projects aimed at the expansion of export crop production with expected output and income effects, and (iii) projects aimed at the expansion of food crop production with expected output and income effects.

Any nutritional effects of the first type of projects must come about through changes in the incomes of households with malnourished members and subsequent changes in food consumption. In order to apply the "calorie consumption indicator", for a particular project of this type, the project impact on incomes of households with malnourished members must be estimated (shown as 12 in Figure 2). On the basis of income elasticity estimates available from the "non-project specific data base" described elsewhere, the change in food, calorie and - if of interest - protein consumption by these households may be estimated (14 in Figure 2).
5.23 The result of the analysis up to this point may be expressed as the change in calorie and protein consumption (number of calories and grams of protein) among households with malnourished members which is expected if the project is implemented. It may also be expressed as a percentage change in existing energy or energy-protein deficiencies. A number of refinements may be incorporated if the information is available, e.g. malnourished groups may be separated according to severity of the deficiencies and the project impact of each of such separate groups may be estimated.

5.24 While the above information may be useful in itself, its primary utility for project design relates to the choice among alternative projects or project designs. Suppose that a given project modification results in an expected reduction in net economic benefits from the project of x dollars while expected calorie consumption among households with calorie deficient members increases by y calories. The cost of expanding the calorie consumption by one calorie is than x/y. This ratio may be compared to the least expensive alternative way to expand calorie consumption. One decision rule might then be to accept the project modification only if the expansion in the calorie consumption cannot be obtained at a lower cost by some alternative means. Using this approach as a partial guideline for: (i) choice among projects, (ii) project design, and (iii) modifications of on-going projects assures that efforts to achieve nutritional goals through agricultural and rural development projects do not ignore more cost effective alternatives for reaching these goals.

\[1\] Rather than "grams of protein" it would be preferable to estimate an energy/protein ratio, e.g. net utilizable protein per unit of energy. Other nutritional indicators, e.g. energy density, may also be estimated.
5.25 The only difference between the above and the other two types of projects is that the effect of output changes and resulted price changes on calorie and protein consumption must be considered. In the case of export crop promotion, food production may—but need not—fall. If it falls due to, say, area substitution, the output effect may be negative. Reduced food production may cause a reduction in home consumption and/or market supply. If the market supply falls, food prices are likely to increase at least to the point where food imports may begin to replace the reduced supply. Furthermore, income increases brought about by the project will introduce additional upward pressures on food prices. Thus, to analyze the nutritional consequences of export crop projects with an effect on food output it is necessary to estimate (i) the change in the consumption of home grown food by households with malnourished households (shown as 9 in Figure 2), (ii) the change in market supply of food (8 in Figure 2) and the resulting price changes (10) taking into account both domestic and import supply, (iii) the change in total incomes (3), (iv) the effect on food demand and prices (11, 12, 13, 14) and (v) the change in calorie and protein consumption by households with malnourished members as previously discussed (14).

5.26 The third type of project is expected to result in expanded output of certain food commodities and possibly a reduction in the output of others (through commodity substitution at the producer level). The types of analysis to be performed are similar to those mentioned for export crop projects.

5.27 While elements of the approach presented above has been developed and empirically tested, the approach has not been tested in its totality. Therefore, it is important that such testing and adaptation of the approach be performed before it is introduced into routine project assessment.
On Supporting Research

5.28 There is an urgent need for the development and testing of assessment approaches such as the one mentioned above, which could be applied within reasonable resource and time constraints. While this in itself would be a major research undertaking, additional research is needed to facilitate \textit{ex ante} assessment of consumption and nutrition effects of agricultural and rural development projects and policies. Additional research and testing are recommended on the following topics: 1/

1. Development and testing of workable methods to estimate or approximate price elasticities of demand by food commodity and functional group. Price elasticity estimates by income stratum or functional group are critical to the kind of assessment suggested here. Yet, disaggregated time series data are very scarce and currently used methods for estimating price elasticities from cross-sectional data are not acceptable when applied at the individual commodity level. Innovative work in this area combined with procedures for collection of the appropriate time series data might have a high pay-off.

2. Research to improve our understanding of the consumption and production decisions made by semi-subsistence rural households with particular emphasis on: a) the interaction between the two; b) the effect of changes in intra-household distribution of income control and time allocation on food consumption by individual household members, c) the effect of production and

1/ See National Academy of Sciences (1976) and Taylor (1977) for a more comprehensive research agenda on nutrition economics and policy.
price risks and seasonal variation in food availability on consumption and nutrition, and d) *ex post* evaluation of the consumption and nutrition effect of technological change agricultural policies and rural development projects within the semi-subsistence rural household. Current knowledge on these issues is grossly deficient for *ex ante* assessment of the consumption and nutrition effects of agricultural and rural projects for small farm agriculture. Research is underway on some of these issues, particularly the question of time allocation.

3. *Ex post* evaluation of the consumption and nutrition effects of agricultural policies and projects as well as technological change in selected areas and for selected commodities. The need for additional *ex post* evaluation of cash-crop projects is particularly urgent. Findings from *ex post* evaluations are likely to be useful for the preparation of *ex ante* assessment. Furthermore, such findings would provide guidelines for the design of projects to be pursued, even in the absence of formal *ex ante* assessment. They may also assist in the design of public policies and strategies for institutional and technological change. In particular, the findings would be useful for the design of public policy measures aimed at facilitating desirable consumption/nutrition effects and correcting or compensating for undesirable ones.

4. Additional research on the use of macro models for the assessment of the likely consumption and nutrition effects of alternative public policy measures and projects.
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Appendix

Terms of reference

(i) review and summarize past and ongoing research and operational activities related to methodologies and assessment of the nutritional consequences of development projects; (ii) identify gaps in current knowledge and currently available methodology for incorporating a nutritional component into the assessment of agricultural projects; and (iii) suggest means to fill the most critical of these gaps.
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